# IELM: An Open Information Extraction Benchmark for Pre-Trained Language Models

Chenguang Wang<sup>1</sup>, Xiao Liu<sup>2</sup>, Dawn Song<sup>3</sup>

<sup>1</sup>Washington University in St. Louis, <sup>2</sup>Tsinghua University, <sup>3</sup>UC Berkeley chenguang@wustl.edu, liuxiao21@mails.tsinghua.edu.cn, dawnsong@berkeley.edu

## Abstract

We introduce a new open information extraction (OIE) benchmark for pre-trained language models (LM). Recent studies have demonstrated that pre-trained LMs, such as BERT and GPT, may store linguistic and relational knowledge. In particular, LMs are able to answer "fill-in-the-blank" questions when given a pre-defined relation category. Instead of focusing on pre-defined relations, we create an OIE benchmark aiming to fully examine the open relational information present in the pretrained LMs. We accomplish this by turning pre-trained LMs into zero-shot OIE systems. Surprisingly, pre-trained LMs are able to obtain competitive performance on both standard OIE datasets (CaRB and Re-OIE2016) and two new large-scale factual OIE datasets (TAC KBP-OIE and Wikidata-OIE) that we establish via distant supervision. For instance, the zeroshot pre-trained LMs outperform the F1 score of the state-of-the-art supervised OIE methods on our factual OIE datasets without needing to use any training sets.1

## 1 Introduction

Pre-trained language models (LM), such as BERT (Devlin et al., 2018) and GPT-3 (Brown et al., 2020), have revolutionized NLP over the last several years and advanced the state-of-theart results in a wide set of downstream NLP tasks. Recent studies show that a considerable amount of linguistic (Hewitt and Manning, 2019; Clark et al., 2019) and relational knowledge (Petroni et al., 2019; Talmor et al., 2019; Jiang et al., 2020; Petroni et al., 2020) has been captured by the pretrained LMs via pre-training on large-scale textual corpora. These approaches often design "fill-in-theblank" questions based on pre-defined relations. For example, a question "Bob Dylan was born in \_" is manually created for the LMs to answer the "birthplace" relation of "Bob Dylan".

Most existing approaches that evaluate what pretrained LMs have learned are based on benchmarks with pre-defined relation categories. Yet, the benchmarks present two limitations. First, most benchmarks only cover a limited number of pre-defined relations. Therefore, it is unclear whether the pretrained LMs have stored general open relation information. For example, the Google-RE in LAMA benchmark (Petroni et al., 2019) includes only three relations (i.e., "birthplace", "birthdate", and "deathplace"), while there are hundreds of relations available in the real world scenario. Second, a majority of benchmarks evaluate LMs in a close manner. This means that the gold relation is given to the models. For example, "was born in" is given as the model's input. Besides, the existing benchmarks often provide a single gold relation for each input sentence. However, an input sentence may indicate multiple relations, e.g., containing both "birthplace" and "birthdate" information about an argument or entity. We are curious: instead of the limited relational information, can we systematically benchmark the general information stored in the pre-trained LMs?

In this work, we set up a new open information extraction (OIE) benchmark, called IELM, towards testing the general and open relational information stored in pre-trained LMs. We refer to OIE as it is a task that is designed to extract open relations from massive corpora without requiring a pre-defined relation category. As shown in Figure 1, we successfully convert pre-trained LMs to zero-shot OIE systems. We apply them to two standard OIE datasets, including CaRB (Bhardwaj et al., 2019) and Re-OIE2016 (Stanovsky and Dagan, 2016; Zhan and Zhao, 2020), as well as two new large-scale factual OIE datasets in our IELM benchmark. We show that the zero-shot pre-trained LMs outperform the fully supervised state-of-the-arts on fac-

<sup>&</sup>lt;sup>1</sup>Our code and datasets are available at https://github. com/cgraywang/IELM.



Figure 1: Summary of our approach. The zero-shot open information extraction system takes a noun phrase (NP) chunked sentence as input, and outputs a set of triples. The approach first conducts argument extraction by encoding NPs as argument pairs, then performs predicate extraction via decoding using the parameters (i.e., attention scores) of the pre-trained language models. The output extractions are then evaluated on our IELM benchmark.

tual OIE datasets. Standard OIE datasets rely on human annotations and often consist of thousands of gold triples and sentences. Unlike those datasets, we create two large-scale OIE datasets, namely TAC KBP-OIE and Wikidata-OIE, via distant supervision from knowledge graphs. For example, Wikidata-OIE is constructed via aligning English Wikipedia to Wikidata triples, resulting in millions of triples and documents. The design of zero-shot LMs for OIE is important: by encoding the noun chunks as arguments in the input, we only make use of the parameters of pre-trained LMs to decode the predicates (or relations) between the arguments. To the best of our knowledge, this is the first attempt to systematically evaluate pre-trained LMs in a zero-shot OIE setting. To summarize, our key contributions are the following.

- We benchmark the general relational information in pre-trained LMs on our IELM benchmark. Besides two standard OIE datasets (CaRB and Re-OIE2016), we also create two largescale factual OIE datasets for our benchmark. The two new OIE datasets are called TAC KBP-OIE and Wikidata-OIE, which are constructed via distant supervision from two knowledge graphs (TAC KBP and Wikidata). Our benchmark is a general OIE benchmark, helping the development of future OIE systems.
- 2. We enable the zero-shot capabilities of pretrained LMs for OIE by encoding the arguments

in the input and decoding predicates using the parameters of pre-trained LMs. The pre-trained LMs are particularly good at recovering factual arguments and predicates.

3. We test the OIE performance of 6 pre-trained LMs (BERT and GPT-2 (Radford et al., 2019) families) and 14 OIE systems on IELM benchmark. The zero-shot LMs achieve state-of-theart OIE performance on TAC KBP-OIE and Wikidata-OIE, even outperforming fully supervised OIE systems.

## 2 Language Models as Zero-Shot Information Extractors

For open information extraction (OIE), we take an input as a NP-chunked sentence and output a set of triples. Below is an example.

**Input** <u>Dylan<sub>NP</sub></u> was born in <u>Minnesota<sub>NP</sub></u>, and was awarded <u>Nobel Prize<sub>NP</sub></u>. **Output** (Dylan; born in; Minnesota), (Dylan; awarded; Nobel Prize).

NP denotes the noun phrase.

## 2.1 Argument Extraction

Follow traditional linguistic OIE systems such as Stanford OpenIE (Angeli et al., 2015) and OpenIE5 (Saha et al., 2017, 2018), we treat each NP pair as an argument pair (e.g., "Dylan" and "Minnesota"). We then utilize the parameters of LMs to extract the predicates (e.g., "born in") between the pair in the input as below.

## 2.2 Predicate Extraction

The predicate extraction problem is formulated as extracting a set of sequences in the input that are associated with an argument pair. We particularly use the attention scores in a pre-trained LM to measure the relevance between a sequence and the argument pair. We frame the process as a search problem. Given an argument pair, we aim to search for the sequences with the largest attention scores connecting the pair. To compute a score for every possible sequence is computationally expensive especially when the sequence length is large, the exhaustive search is therefore intractable. We adapt beam search as an approximate strategy to efficiently explore the search space. Beam search maintains the k-best candidates. This means the time cost of beam search does not depend on the sequence length, but on the size of the beam and

	Step 0	Step 1 Step 2 Step 3		Key:	Dylan	was	born	in	Minnesota
	( <u>Dy</u>	Query: Dylan	x	x	x	x	x		
Step	Action	Partial candidate	Total score	was	0.1	х	x	х	x
0	START	(Dylan;	0	born	0.2	0.1	x	x	x
1	YIELD	(Dylan; born	0.2						
2	YIELD	(Dylan; born in;	0.5	in	0.05	0.05	0.3	х	x
3	STOP	(Dylan; born in; Minnesota)	0.7	Minnesota	0.1	0.06	0.1	0.2	x
	(a		(b) A	ttenti	on ma	atrix.	<b>.</b>		

Figure 2: Illustration of predicate extraction with a pre-trained language model (LM). The upper part of (a) represents the general search steps of producing the triple (*Dylan*; *born in*; *Minnesota*) from the input " $\underline{Dylan}_{NP}$  was born in  $\underline{Minnesota}_{NP}$ " encoded with argument noun phrases (NP). The lower portion shows the corresponding step-by-step process. (b) shows the attention scores generated through the forward pass of the LM over the corresponding input.

the average length of the candidates. In general, the beam search starts with the first argument (e.g., "Dylan"). At each step, beam search simply selects top-k next tokens with the largest attention scores, and just keeps k partial candidates with the highest scores, where k is the beam size. When a candidate produces the second argument (e.g., "Minnesota"), the candidate is complete.

We show a running example as follows. Let's first consider the search from left to right with beam size equal to 1. An example search process is shown in Figure 2. Given an argument pair "Dylan" and "Minnesota", at each step, the search performs one of the following actions:

- START the search from first argument. The first argument is added as an initial candidate into the beam. In Figure 2(a), at step 0, "Dylan" is added into the beam. The total attention score is initialized to 0.
- YIELD a new partial candidate in the beam if the current candidate has not reached the second argument. This action conducts the following: The next largest attended token is appended to the end of the current candidate to yield the new candidate. The total score is increased by the associated attention score. At step 1 of Figure 2(a), "born" is appended to the current candidate to yield the partial candidate, since "born" has the largest attention score (0.2 as highlighted in Figure 2(b)) with "Dylan" in the attention matrix. The total score becomes 0.2. Note that we only consider the single head attention in this example for simplicity. "x" in Figure 2(b) marks the tokens (prior to the current token) that are not considered in the search to prevent searching

backward. Step 2 takes the same action, and the score becomes 0.5.

• STOP the search step if the candidate has reached the second argument, then add the candidate as a valid triple into the beam. As beam size equals to 1, (Dylan; born in; Minnesota) is returned for the given pair. The final score of the triple is 0.7.

We also notice triples are often in reverse order in the sentence, thus enabling bidirectionality by running the algorithm in both directions (left to right and right to left). We merge the subwords as words, and only consider word-level attention. The beam search is implemented by the breadth-first search, which is efficient as the time complexity is  $O(k \cdot d)$ . d is the maximum depth of the search tree.

## **3** The IELM Benchmark

#### 3.1 Datasets

## 3.1.1 Standard OIE

We adopt two standard OIE datasets below.

**CaRB** CaRB (Bhardwaj et al., 2019) is a crowdsourced OIE dataset, where the input sentences are from the OIE2016 (Stanovsky and Dagan, 2016).

**Re-OIE2016** Re-OIE2016 (Zhan and Zhao, 2020) is also generated based on the input sentences in the OIE2016, and is further enhanced by human annotations.

## 3.1.2 Factual OIE

In addition, we introduce two large-scale factual OIE datasets based on knowledge graphs (KG).

Method	AIDA			
	dev	test		
Spitkovsky and Chang 2012	26.0	28.2		
Kolitsas et al. 2018*	-	82.4		
Ours	63.8	64.5		

Table 1: Evaluation of unsupervised entity linking of Wikidata-OIE on AIDA benchmark. An asterisk (\*) indicates a supervised method.

**TAC KBP-OIE** TAC Knowledge Base Population (KBP) Slot Filling is a task to search a document collection to fill in a target entity for predefined relations (slots) with a given entity in a reference KG. We adapt the dataset as an OIE dataset. In particular, we use a document sub-collection of the TAC KBP 2013 task (Surdeanu, 2013) as the input, and use the official human annotations regarding the documents as gold extractions.

Wikidata-OIE Besides TAC KBP-OIE, we create a larger factual OIE dataset based on the English Wikipedia. Different from TAC KBP, there are no gold triple annotations for Wikipedia. Since a large amount of Wikidata triples are from English Wikipedia, we create the dataset using distant supervision (Zhang et al., 2017) by aligning Wikidata triples to Wikipedia text. We employ an unsupervised entity linker based on a pre-built mentionto-entity dictionary (Spitkovsky and Chang, 2012) to extract potential gold arguments for scalability considerations. The entity linker links an arbitrary entity mention in a sentence to a Wikipedia anchor, which is further linked to a Wikidata entity. For each sentence in Wikipedia articles containing two linked arguments, if there is a Wikidata triple describing a relation holding the two arguments, we denote the Wikidata triple as a gold extraction.

Unlike TAC KBP-OIE which is built based on human annotations, Wikidata-OIE is derived from automatic annotations. Therefore, we evaluate our unsupervised entity linker on the standard AIDA benchmark (Hoffart et al., 2011) consisting of Wikipedia entities. Table 1 shows that it significantly improves the unsupervised performance (Spitkovsky and Chang, 2012) and reaches competitiveness with a supervised method (Kolitsas et al., 2018). Given the scale of Wikidata-OIE, we sacrifice acceptable effectiveness for efficiency.

The statistics of the datasets are shown in Table 2. For CaRB and Re-OIE2016, we report the statistics of the corresponding test sets. We include a dataset

Dataset	# of triples	# of arguments	# of predicates	# of documents
Re-OIE2016	1,508	3,328	1,506	595
CaRB	2,715	6,226	2,715	641
TAC KBP-OIE	27,655	39,661	41	3,877,207
Wikidata-OIE	27,368,562	6,047,494	1,156	6,047,494

Table 2: Dataset statistics of the IELM benchmark.

comparison in Appendix A.3.

#### 3.2 Pre-Trained Language Models for OIE

Unidirectional Language Models Given an input sequence  $\mathbf{x} = \{x_1, x_2, \dots, x_N\}$ , unidirectional LMs assign a joint probability to the sequence by factorizing it as  $p(\mathbf{x}) = \prod_t p(x_t | x_{t-1}, \dots, x_1)$ , where  $p(x_t | x_{t-1}, \dots, x_1) = \sigma(\mathbf{Wh}_t + \mathbf{b})$ .  $\mathbf{h}_t$  is the output vector of a neural network at position t.

We consider GPT-2 (Radford et al., 2019), where  $h_t$  is produced by Transformer decoders (Vaswani et al., 2017). GPT-2 is pre-trained on WebText containing 40GB of text. We explore all four pre-trained GPT-2s with different model sizes: GPT-2 (117M), GPT-2<sub>MEDIUM</sub> (345M), GPT-2<sub>LARGE</sub> (774M), and GPT-2<sub>XL</sub> (1558M).

**Bidirectional Language Models** Different from unidirectional LMs that predict the next word given the previous words, bidirectional LMs take both left and right context of the target word into consideration, formally,  $p(x_t) =$  $p(x_t|x_1, \ldots, x_{t-1}, x_{t+1}, \ldots, x_N)$ .

We use BERT (Devlin et al., 2018) that enables bidirectional context modeling via a masked LM objective and utilizing the Transformer architecture. BERT is pre-trained on BooksCorpus and English Wikipedia. We use both its pre-trained settings: BERT<sub>BASE</sub> (109M) and BERT<sub>LARGE</sub> (335M).

#### **3.3** Comparison Methods

We compare our method with a wide set of OIE systems including both neural and traditional linguistic OIE systems. Most OIE systems are based on supervised learning, which are indicated with asterisks (\*) in Table 3. We provide details of the comparison systems in Appendix A.5.

## 3.4 Evaluation Method

## 3.4.1 Standard OIE

On CaRB and Re-OIE2016, we follow the original evaluation proposed in (Bhardwaj et al., 2019) and (Stanovsky and Dagan, 2016; Zhan and Zhao, 2020), and report precision, recall, F1, area under the curve (AUC) for compared OIE systems. AUC is calculated from a plot of the precision and recall values for all potential confidence thresholds. The F1 is the maximum value among the precisionrecall pairs. We follow the matching function proposed for each dataset, i.e., lexical match for Re-OIE2016, and tuple match for CaRB. The CaRB evaluation function is stricter as it penalizes long extractions.

## 3.4.2 Factual OIE

We report precision, recall, and F1 of the OIE systems on two large-scale factual OIE datasets: TAC KBP-OIE and Wikidata-OIE. We introduce *exact match* as the matching function for them as below.

**Matching Function** The matching functions for standard OIE datasets are generally flexible. For example, the lexical match of Re-OIE2016 judges an argument or predicate as correct if and only if it includes the syntactic head of the gold argument or predicate. Unlike these matching functions, our exact matching function requires both arguments and predicates are linked to the gold extractions.

For TAC KBP-OIE, we judge an argument to be correct if and only if it matches the name of the gold argument and the span position of the gold argument in the sentence. The main challenge is how to properly link a predicate, since there are often many ways to express it. We follow Stanford OpenIE (Angeli et al., 2015) to produce the predicate mapping between the OIE relations and TAC KBP predicates. A predicate is correct if the pair of OIE relation and gold predicate exists in the predicate mapping. The predicate mapping is constructed in two steps. First, a collection of predicate mappings was constructed by a single annotator in approximately a day. Second, predicate mappings were finalized through the following learning procedure. This process matches OIE relations to the TAC KBP predicates by searching for co-occurrent relations in a large distantly-labeled corpus, and decides pairs of OIE relations and TAC KBP predicates that have a high PMI<sup>2</sup>. The basic idea is that the more often the argument pairs of the triples and TAC KBP triples are linked, the more likely the corresponding relations or predicates are linked to each other. Example predicate mappings are shown in Appendix A.4.

For Wikidata-OIE, we link an argument based on the entity linker used in Wikidata-OIE construction (Sec. 3.1). An argument is correct if the linked argument matches the name of the gold argument and the span position of the gold argument in the sentence. The predicate mapping is bootstrapped from TAC KBP-OIE's mapping. In addition, we normalize each predicate phrase of the triples by lemmatization, and removing inflection, auxiliary verbs, adjectives, adverbs. One author manually filters out the bad predicate pairs. This process takes approximately a day. A predicate is correct if the OIE to gold predicate pair exists in the bootstrapped predicate mapping. An annotator randomly subsampled and checked 100 aligned triple-sentence pairs and concluded with a 93% accuracy of extracted triples.

**Metrics** We use the official scorer of TAC KBP Slot Filling 2013 to calculate precision, recall, and F1 for TAC KBP-OIE. Besides, like previous OIE systems, for LMs, we adopt two constraints from ReVerb (Fader et al., 2011), the antecessor of OpenIE5: (i) the frequency of predicates must be above a threshold aiming to avoid triples to be overspecified, and (ii) a predicate must be a contiguous sequence in the sentence avoiding predicates that have no meaningful interpretation. We set these parameters according to Sec. 4.4.

We only report precision, recall, and F1 based on the parameter study in Sec. 4.4 for pre-trained LMs on the IELM benchmark. We do not compute AUC as pre-trained LMs are treated as zeroshot OIE systems. We therefore do not tune the results with respect to different confidence. Our main focus is to benchmark the OIE performance of the LMs under a unified setting. Another reason is that it is computationally expensive to get the AUC on the two large-scale datasets: TAC KBP-OIE and Wikidata-OIE. We also do not report AUC for the compared OIE systems on TAC KBP-OIE and Wikidata-OIE. Instead, we use the confidence threshold that obtains the best F1 on Re-OIE2016 to compute the scores.

## 4 Results

In this section, we show that pre-trained LMs are effective zero-shot OIE systems, and exceed the previous state-of-the-art OIE systems on our largescale factual OIE datasets in IELM benchmark. To keep our evaluation as simple as possible, the hyperparameters and settings are shared across datasets. More experimental details are described in the appendix.

M-4h-J	#D	1	Ca	RB		1	Re-O	IE2016		TAC	KBP-	OIE	Wik	idata-	OIE
Method	#Params	Р	R	F1	AUC	Р	R	F1	AUC	Р	R	F1	Р	R	F1
MinIE (Gashteovski et al., 2017)	-	-	-	41.9	-	48.2	71.1	57.5	47.2	-	-	-	-	-	-
ClausIE (Del Corro and Gemulla, 2013)	-	-	-	44.9	22.4	-	-	64.2	46.4	-	-	-	-	-	-
OLLIE (Schmitz et al., 2012)	-	-	-	41.1	22.4	-	-	49.5	31.3	-	-	-	-	-	-
PropS (Stanovsky et al., 2016)	-	-	-	31.9	12.6	-	-	64.2	43.3	-	-	-	-	-	-
OpenIE4 (Christensen et al., 2011)	-	-	-	48.8	27.2	-	-	68.3	50.9	52.9	14.2	22.4	30.6	14.0	19.2
OpenIE5 (Saha et al., 2017, 2018)	-	-	-	48.0	25.0	61.1	76.5	67.9	45.8	57.0	14.6	23.2	26.3	14.4	18.6
Stanford OpenIE* (Angeli et al., 2015)	-	-	-	23.0	13.4	-	-	16.7	11.5	61.6	17.4	27.1	23.3	13.1	16.8
SenseOIE* (Roy et al., 2019)	640K			28.2											
SpanOIE* (Zhan and Zhao, 2020)	963K	60.9	41.6	49.4	30.0	79.7	74.5	77.0	65.8	-	-	-	-	-	-
NeuralOIE* (Cui et al., 2018)	5M	-	-	51.6	32.8	79.2	77.5	78.4	73.0	-	-	-	-	-	-
Multi <sup>2</sup> OIE* (Ro et al., 2020)	110M	60.9	45.8	52.3	32.6	86.9	81.0	83.9	74.6	-	-	-	-	-	-
RnnOIE* (Stanovsky et al., 2018)	965K	55.6	40.2	46.7	26.8	84.2	73.9	78.7	68.3	50.0	14.6	22.6	29.9	15.9	20.7
IMOJIE* (Kolluru et al., 2020b)	110M	64.7	45.6	53.5	33.3	88.1	67.1	76.2	63.1	58.2	14.9	23.8	31.2	16.2	21.3
OpenIE6* (Kolluru et al., 2020a)	220M	-	-	54.0	35.7	75.3	78.2	76.7	73.8	60.0	14.9	23.9	29.8	15.3	20.3
BERT <sub>BASE</sub> (zero-shot) (ours)	109M	21.2	18.3	19.7		25.9	34.0	29.4		61.6	18.8	28.8	32.0	18.9	23.7
BERT <sub>LARGE</sub> (zero-shot) (ours)	335M	22.4	20.2	21.2	-	30.7	38.5	34.1	-	61.7	19.0	29.1	32.3	19.1	24.0
GPT-2 (zero-shot) (ours)	117M	23.1	19.8	21.3	-	25.1	38.3	30.3	-	61.6	18.2	28.1	32.4	18.1	23.2
GPT-2 <sub>MEDIUM</sub> (zero-shot) (ours)	345M	23.7	20.0	21.7	-	26.8	39.9	32.0	-	62.1	18.7	28.7	33.1	18.2	23.5
GPT-2 <sub>LARGE</sub> (zero-shot) (ours)	774M	24.2	20.5	22.2	-	27.4	41.6	33.0	-	62.4	19.0	29.1	34.2	18.3	23.8
GPT- $2_{XL}$ (zero-shot) (ours)	1558M	24.5	21.0	22.7	-	29.3	43.4	35.0	-	62.7	19.5	29.7	35.7	18.5	24.4

Table 3: Compare the quality of different OIE systems. An asterisk (\*) indicates a supervised method.

## 4.1 OIE Results

Table 3 shows the results. While zero-shot OIE systems synthesized by pre-trained LMs obtain notably lower scores compared to previous OIE systems on standard OIE datasets, they outperform the previous OIE systems on factual OIE datasets. We also find that larger LMs obtain improved results on all datasets. For example,  $BERT_{LARGE}$  outperforms  $BERT_{BASE}$  due to its larger model size. GPT-2s share similar trends. This is because larger LMs store richer relational information. This finding is consistent with previous studies (Petroni et al., 2019, 2020).

#### 4.1.1 Standard OIE

The main reasons for the degraded performance of pre-trained LMs on standard OIE datasets are three-fold. First, the comparison methods mainly involve supervised systems that are trained on OIE datasets, which are denoted with asterisks (\*) in Table 3. Besides the supervised systems, the remaining comparison systems all require human involvement, such as providing linguistic patterns for the extraction. In contrast, the pre-trained LMs are used as zero-shot OIE systems without using any training sets. Second, the zero-shot OIE modules still have room to improve. For example, approximately 30.0% of the argument extraction errors are due to the spaCy noun chunker. 16.9% of the gold extractions contain predicates outside the argument pairs. The current predicate extraction only allows searching between the arguments, and thus cannot handle such cases. Third, standard OIE benchmarks

such as CaRB and Re-OIE2016 mainly examine the general information extraction capability. The zero-shot approach is not able to recall the information of interest in LMs. We might need a specific module (e.g., ranking) to locate such information. Interestingly, pre-trained LMs achieve comparable performance with supervised Stanford OpenIE. The result indicates pre-trained LMs contain informative patterns that are useful for OIE.

## 4.1.2 Factual OIE

As shown in Table 3, the best zero-shot OIE system based on GPT- $2_{XL}$  obtains a +2.6% and a +3.1% absolute F1 improvement on TAC KBP-OIE and Wikidata-OIE respectively over the previous supervised state-of-the-art. Due to the computation cost of OIE systems (Sec. 4.3), we only select several best performed OIE systems on the standard OIE datasets for the large-scale OIE experiments including: linguistic OIE systems (OpenIE4, OpenIE5, Stanford OpenIE) and neural OIE systems (RnnOIE, IMOJIE, OpenIE6).

Compared to the results on standard OIE datasets, pre-trained LMs consistently achieve state-of-the-art performance on both datasets. Both datasets emphasize measuring factual arguments and predicates in the reference KGs. Previous studies (Petroni et al., 2019, 2020) show that LMs have stored a considerable amount of factual information via pre-training on large-scale text. We draw the same conclusion. To the best of our knowledge, our IELM benchmark is the first benchmark that includes factual OIE datasets. More importantly, both

Method	MinIE	ClausIE	OLLIE	PropS	OpenIE 4	OpenIE 5	Stan	ford OpenIE	SpanOIE	RnnOIE
Sentences/sec.	8.9	4.0	14.5	4.6	20.1	3.1		2.5	19.4	149.2
Method	NeuralOIE	IMOJIE	Multi <sup>2</sup> OIE	OpenIE 6	$\text{BERT}_{\rm BASE}$	$BERT_{\rm LARGE}$	GPT-2	$\text{GPT-2}_{\rm MEDIUM}$	$\text{GPT-2}_{\text{LARGE}}$	$\text{GPT-2}_{\rm XL}$
Sentences/sec.	11.5	2.6	21.2	142.0	16.2	11.9	13.9	12.7	11.5	11.0

Table 4: Runtime on Re-OIE2016.

linguistic and neural OIE systems are derived from manually designed linguistic patterns or learned patterns. The result shows that the pre-trained attention weights capture a more flexible set of factual patterns. The result also suggests that our approach is capable of using such patterns. In order to scale our approach to large-scale datasets, the argument and predicate extraction are both efficient by design. In particular, the beam search for predicate extraction is efficient in exploring the relational sequences in the input sentence. Besides, the attention scores used in the beam search are produced via a single forward pass of the pre-trained LM over the input sentence without fine-tuning.

Moreover, we find that BERT LMs outperform GPT-2 LMs under similar model sizes. On both datasets,  $BERT_{BASE}$  performs better than GPT-2 in F1, and  $BERT_{LARGE}$  outperforms GPT-2<sub>MEDIUM</sub> in F1. This is mainly because the recall of BERT LMs is higher than that of corresponding GPT-2 LMs. The result indicates that the Cloze-style loss function (i.e., masked LM) of BERT is more effective and flexible in recovering information than the autoregressive LM objective. We also notice that the precision of GPT-2 LMs is higher than that of BERT LMs. The reason is that the autoregressive LM objective captures more accurate information than Cloze-style loss does by preventing extra noise (e.g., masked tokens) in pre-training.

Pre-trained LMs achieve competitive precision, e.g., the precision is greater than 60% on TAC KBP-OIE. However, only moderate recalls are obtained. Therefore, improving recall is clearly the future direction. We find that both argument and predicate extraction can be further improved. For example, the main cause of the moderate recall is the incorrect arguments caused by spaCy noun chunks as summarized in Sec. 4.2. Besides, we can incorporate predicates that are not between the argument pairs into the extractions, as we observe a number of gold triples are in inverted sentences. We also notice that the F1 gain over previous state-ofthe-arts on TAC KBP-OIE is smaller compared to that on Wikidata-OIE. A larger text corpus, e.g., Wikipedia, provides more information. We could improve the recall by running on larger corpora such as WebText2 and Common Crawl (Raffel et al., 2019; Brown et al., 2020) to collect more triples.

## 4.2 Error Analysis

There is still significant room to improve the results. We argue that we are measuring a lower bound for what LMs know. To further understand the shortcomings of the current method, we conduct an error analysis of the errors in precision on all datasets. We choose  $BERT_{LARGE}$  for the study. We sample 100 documents from the Wikidata-OIE dataset, and manually check the reasons for the errors. We find 33.1% of the errors are caused by incorrect arguments, while the predicate phrases are correct. The errors are due to the incorrect noun chunks detected by the spaCy. 18.3% of the errors are due to the missing pairs in predicate mapping. We also note that approximately 23.8% of the errors are actually correct triples that are not covered by Wikidata. For example, (Bob\_Dylan, residence, Nashville) does not exist in Wikidata, but it is a correct triple. The rest of the errors made by  $BERT_{LARGE}$  are incorrect predicate phrases, such as uninformative phrases. We find similar errors are made by  $BERT_{LARGE}$  on other datasets. Based on the above analysis, enhancing argument detection and predicate mapping is helpful to further improve the results.

#### 4.3 Runtime Analysis

The runtime of OIE systems is crucial in practice. We test the runtime of different OIE systems on Re-OIE2016. The results are in Table 4. We find ours is competitive in terms of efficiency given the size of the models.

#### 4.4 Parameter Study

We study the effects of the key parameters using  $BERT_{BASE}$  on TAC KBP-OIE as shown in Figure 3. We randomly sample 20% of the oracle query entities (provided by TAC KBP) as a hold-out



Figure 3: Parameter study with BERT<sub>BASE</sub> on TAC KBP-OIE hold-out subset.

dataset to tune the parameters, and use the best parameter setting achieved for all experiments. When studying the effect of a certain parameter, we keep the remaining parameters as default. We use F1 to measure the effects. Additional details are described in Appendix A.2.3.

## 5 Related Work

Pre-trained language models (LM), e.g., BERT (Devlin et al., 2018), GPT (Radford et al., 2018, 2019), and large LMs over 100B parameters (Brown et al., 2020; Chowdhery et al., 2022; Zeng et al., 2022) contain growing amount of linguistic and factual knowledge obtained via pre-training on large-scale corpora. To evaluate their abilities, researchers have created many knowledge benchmarks. LAMA leverages manually created prompts (Petroni et al., 2019, 2020). Recent studies have also developed soft prompts (Liu et al., 2021; Zhong et al., 2021)) for fact retrieval. KILT (Petroni et al., 2021) proposes a knowledge-intensive benchmark concerning several downstream tasks to evaluate LMs' ability in capturing knowledge. Wang et al. (2022) have utilized a set of knowledge-intensive structure prediction tasks to evaluate the knowledge in pre-trained LMs. Shen et al. (2022) have adapted KG completion as a benchmark to evaluate LMs. Besides relational knowledge, closedbook OpenQA (Roberts et al., 2020) benchmarks (in which LMs answer the open-domain questions without retrieving contexts) have also been adopted as a way to evaluate LMs' knowledge. While the existing benchmarks evaluate LMs in an implicit

way, the main difference is that our benchmark explicitly and interpretably evaluates triples from the textual corpora extracted using model parameters (e.g. attentions). In the field of neural network interpretation (Linzen et al., 2016; Adi et al., 2016; Tenney et al., 2019), in particular the pre-trained deep LM analysis, substantial recent work focuses on both visualizing and analyzing the attention (Vig, 2019; Jain and Wallace, 2019; Clark et al., 2019; Michel et al., 2019; Ramsauer et al., 2020). Instead of analyzing or visualizing, our benchmark quantitatively evaluates the relational information with respect to open information extraction.

Open information extraction systems, e.g., OL-LIE (Schmitz et al., 2012), Reverb (Fader et al., 2011), Stanford OpenIE (Angeli et al., 2015), OpenIE 5 (Saha et al., 2017, 2018), RnnOIE (Stanovsky et al., 2018), and OpenIE 6 (Kolluru et al., 2020a) aim to extract triples from web corpora for open schema KGs. Besides, NELL (Carlson et al., 2010), DeepDive (Niu et al., 2012), Knowledge Vault (Dong et al., 2014) extract information based on a fixed schema or ontology, where humans help improve the accuracy of the extractions. Probase (Wu et al., 2012) produces taxonomies instead of rich typed relations in general KGs. Our benchmark first evaluates LMs' unsupervised information extraction ability on common open information extraction datasets such as CaRB (Bhardwaj et al., 2019) and Re-OIE2016 (Zhan and Zhao, 2020), and then aligns the extracted triples to KG triples for large-scale knowledge extraction benchmark construction. Our algorithm is similar to

the generation algorithm in DeepEx (Wang et al., 2021). The focus of this work is to benchmark the zero-shot OIE performance of pre-trained LMs on both standard and factual OIE datasets. To further improve the OIE performance, the ranking module in DeepEx can be useful. The structure pre-training proposed in (Wang et al., 2022) can also be helpful.

## 6 Conclusion

We benchmark the general relational information in pre-trained language models (LM) in an open information extraction (OIE) setup. We find that the pretrained LMs contain a considerable amount of open relational information through large-scale evaluation on both standard OIE datasets and newly created large-scale factual OIE datasets in our IELM benchmark. We are able to turn pre-training LMs into zero-shot OIE systems to efficiently deliver the benchmark results. The reach of this result is broad and has potential downstream utility for deep neural network interpretation, information extraction, and knowledge graph construction. Although the results are promising, we argue that our results just indicate a lower bound about what the LMs have. We hope our results will foster further research in the LM OIE benchmark direction.

## 7 Limitations

For the limitations of our method, the argument extraction module of our algorithm relies on a thirdparty noun chunker. As reported, the noun chunker introduces the majority of the errors in our extraction results. A limitation in our benchmark is that we have not conducted a large-scale manual evaluation of our factual OIE datasets (TAC KBP-OIE and Wikidata-OIE). The main focus of our study is to provide a large-scale OIE benchmark. As a result, this makes our benchmark more challenging to be used than standard OIE datasets in terms of computation costs and infrastructure. Finally, we have only benchmarked BERT and GPT-2 on our datasets. Future work could include testing a wide range of language models on our benchmark.

## 8 Ethical Considerations

We hereby acknowledge that all of the co-authors of this work are aware of the provided *ACM Code of Ethics* and honor the code of conduct. This work is about benchmarking the zero-shot OIE capability of pre-trained language models including BERT and GPT. Our ethical considerations and the work's underlying future impacts are discussed in the following perspectives. Language models are known to present potential risks and limitations (Brown et al., 2020), and the corpus used in pre-training (such as Wikipedia) may introduce unwanted biases and toxicity. We do not anticipate the production of harmful outputs after using our method or datasets, especially for vulnerable populations.

## 9 Environmental Impact

We adopt the pre-trained language models BERT (Devlin et al., 2018) and GPT-2 series (Radford et al., 2019) in our IELM benchmark. The models' carbon footprints are estimated to be 22–28 kilograms (Gibney, 2022). Additionally, The focus of this study is to test the zero-shot OIE ability of pre-trained language models. We do not train language models on massive datasets. Instead, we only do inference on a few evaluation datasets. This cost is less than 0.1% energy than that of their pre-training. This demonstrates that developing proper zero-shot learning strategies for large language models can not only deepen our understanding of their latent mechanisms, but also further reduce the energy consumption and environmental impacts that language models with ever-growing size may cause.

## Acknowledgements

We would like to thank the anonymous reviewers for their suggestions and comments. This material is in part based upon work supported by Berkeley DeepDrive and Berkeley Artificial Intelligence Research.

## References

- Yossi Adi, Einat Kermany, Yonatan Belinkov, Ofer Lavi, and Yoav Goldberg. 2016. Fine-grained analysis of sentence embeddings using auxiliary prediction tasks. *arXiv preprint arXiv:1608.04207*.
- Gabor Angeli, Melvin Jose Johnson Premkumar, and Christopher D Manning. 2015. Leveraging linguistic structure for open domain information extraction. In *ACL*, pages 344–354.
- Sangnie Bhardwaj, Samarth Aggarwal, and Mausam Mausam. 2019. Carb: A crowdsourced benchmark for open ie. In *EMNLP*, pages 6262–6267.
- Tom B Brown, Benjamin Mann, Nick Ryder, Melanie Subbiah, Jared Kaplan, Prafulla Dhariwal, Arvind Neelakantan, Pranav Shyam, Girish Sastry, Amanda

Askell, et al. 2020. Language models are few-shot learners. *arXiv preprint arXiv:2005.14165*.

- Andrew Carlson, Justin Betteridge, Bryan Kisiel, Burr Settles, Estevam R Hruschka Jr, and Tom M Mitchell. 2010. Toward an architecture for neverending language learning. In AAAI, 3.
- Aakanksha Chowdhery, Sharan Narang, Jacob Devlin, Maarten Bosma, Gaurav Mishra, Adam Roberts, Paul Barham, Hyung Won Chung, Charles Sutton, Sebastian Gehrmann, et al. 2022. Palm: Scaling language modeling with pathways. *arXiv preprint arXiv:2204.02311*.
- Janara Christensen, Stephen Soderland, and Oren Etzioni. 2011. An analysis of open information extraction based on semantic role labeling. In *KCAP*, pages 113–120.
- Kevin Clark, Urvashi Khandelwal, Omer Levy, and Christopher D Manning. 2019. What does bert look at? an analysis of bert's attention. *arXiv preprint arXiv:1906.04341*.
- Lei Cui, Furu Wei, and Ming Zhou. 2018. Neural open information extraction. In *ACL*, pages 407–413.
- Luciano Del Corro and Rainer Gemulla. 2013. Clausie: clause-based open information extraction. In *WWW*, pages 355–366.
- Jacob Devlin, Ming-Wei Chang, Kenton Lee, and Kristina Toutanova. 2018. Bert: Pre-training of deep bidirectional transformers for language understanding. arXiv preprint arXiv:1810.04805.
- Xin Dong, Evgeniy Gabrilovich, Geremy Heitz, Wilko Horn, Ni Lao, Kevin Murphy, Thomas Strohmann, Shaohua Sun, and Wei Zhang. 2014. Knowledge vault: A web-scale approach to probabilistic knowledge fusion. In *KDD*, pages 601–610.
- Anthony Fader, Stephen Soderland, and Oren Etzioni. 2011. Identifying relations for open information extraction. In *EMNLP*, pages 1535–1545.
- Kiril Gashteovski, Rainer Gemulla, and Luciano del Corro. 2017. Minie: minimizing facts in open information extraction. ACL.
- Elizabeth Gibney. 2022. How to shrink ai's ballooning carbon footprint. *Nature*, 607(7920):648–648.
- John Hewitt and Christopher D Manning. 2019. A structural probe for finding syntax in word representations. In *NAACL*, pages 4129–4138.
- Johannes Hoffart, Mohamed Amir Yosef, Ilaria Bordino, Hagen Fürstenau, Manfred Pinkal, Marc Spaniol, Bilyana Taneva, Stefan Thater, and Gerhard Weikum. 2011. Robust disambiguation of named entities in text. In *EMNLP*, pages 782–792.
- Sarthak Jain and Byron C Wallace. 2019. Attention is not explanation. *arXiv preprint arXiv:1902.10186*.

- Zhengbao Jiang, Frank F Xu, Jun Araki, and Graham Neubig. 2020. How can we know what language models know? *TACL*, 8:423–438.
- Nikolaos Kolitsas, Octavian-Eugen Ganea, and Thomas Hofmann. 2018. End-to-end neural entity linking. *arXiv preprint arXiv:1808.07699*.
- Keshav Kolluru, Vaibhav Adlakha, Samarth Aggarwal, Soumen Chakrabarti, et al. 2020a. Openie6: Iterative grid labeling and coordination analysis for open information extraction. In *EMNLP*, pages 3748– 3761.
- Keshav Kolluru, Samarth Aggarwal, Vipul Rathore, Soumen Chakrabarti, et al. 2020b. Imojie: Iterative memory-based joint open information extraction. In ACL, pages 5871–5886.
- Tal Linzen, Emmanuel Dupoux, and Yoav Goldberg. 2016. Assessing the ability of lstms to learn syntax-sensitive dependencies. *TACL*, pages 521–535.
- Xiao Liu, Yanan Zheng, Zhengxiao Du, Ming Ding, Yujie Qian, Zhilin Yang, and Jie Tang. 2021. Gpt understands, too. *arXiv:2103.10385*.
- Paul Michel, Omer Levy, and Graham Neubig. 2019. Are sixteen heads really better than one? In *NIPS*, pages 14014–14024.
- Feng Niu, Ce Zhang, Christopher Ré, and Jude Shavlik. 2012. Elementary: Large-scale knowledge-base construction via machine learning and statistical inference. *International Journal on Semantic Web and Information Systems (IJSWIS)*, 8(3):42–73.
- Fabio Petroni, Patrick Lewis, Aleksandra Piktus, Tim Rocktäschel, Yuxiang Wu, Alexander H Miller, and Sebastian Riedel. 2020. How context affects language models' factual predictions. *arXiv preprint arXiv:2005.04611*.
- Fabio Petroni, Aleksandra Piktus, Angela Fan, Patrick Lewis, Majid Yazdani, Nicola De Cao, James Thorne, Yacine Jernite, Vladimir Karpukhin, Jean Maillard, et al. 2021. Kilt: a benchmark for knowledge intensive language tasks. In *NAACL*, pages 2523–2544.
- Fabio Petroni, Tim Rocktäschel, Patrick Lewis, Anton Bakhtin, Yuxiang Wu, Alexander H Miller, and Sebastian Riedel. 2019. Language models as knowledge bases? *arXiv preprint arXiv:1909.01066*.
- Alec Radford, Karthik Narasimhan, Tim Salimans, and Ilya Sutskever. 2018. Improving language understanding by generative pre-training.
- Alec Radford, Jeffrey Wu, Rewon Child, David Luan, Dario Amodei, and Ilya Sutskever. 2019. Language models are unsupervised multitask learners. *OpenAI Blog*, (8):9.

- Colin Raffel, Noam Shazeer, Adam Roberts, Katherine Lee, Sharan Narang, Michael Matena, Yanqi Zhou, Wei Li, and Peter J. Liu. 2019. Exploring the limits of transfer learning with a unified text-to-text transformer. *CoRR*, abs/1910.10683.
- Hubert Ramsauer, Bernhard Schäfl, Johannes Lehner, Philipp Seidl, Michael Widrich, Lukas Gruber, Markus Holzleitner, Milena Pavlović, Geir Kjetil Sandve, Victor Greiff, et al. 2020. Hopfield networks is all you need. *arXiv preprint arXiv:2008.02217*.
- Youngbin Ro, Yukyung Lee, and Pilsung Kang. 2020. Multi<sup>^</sup>2oie: Multilingual open information extraction based on multi-head attention with bert. In *Findings of EMNLP*, pages 1107–1117.
- Adam Roberts, Colin Raffel, and Noam Shazeer. 2020. How much knowledge can you pack into the parameters of a language model? *arXiv preprint arXiv:2002.08910*.
- Arpita Roy, Youngja Park, Taesung Lee, and Shimei Pan. 2019. Supervising unsupervised open information extraction models. In *EMNLP*, pages 728–737.
- Swarnadeep Saha, Harinder Pal, et al. 2017. Bootstrapping for numerical open ie. In ACL, pages 317–323.
- Swarnadeep Saha et al. 2018. Open information extraction from conjunctive sentences. In *COLING*, pages 2288–2299.
- Michael Schmitz, Stephen Soderland, Robert Bart, Oren Etzioni, et al. 2012. Open language learning for information extraction. In *EMNLP*, pages 523– 534.
- Jianhao Shen, Chenguang Wang, Linyuan Gong, and Dawn Song. 2022. Joint language semantic and structure embedding for knowledge graph completion. In *COLING*.
- Valentin I Spitkovsky and Angel X Chang. 2012. A cross-lingual dictionary for english wikipedia concepts.
- Gabriel Stanovsky and Ido Dagan. 2016. Creating a large benchmark for open information extraction. In *EMNLP*, pages 2300–2305.
- Gabriel Stanovsky, Jessica Ficler, Ido Dagan, and Yoav Goldberg. 2016. Getting more out of syntax with props. *arXiv preprint arXiv:1603.01648*.
- Gabriel Stanovsky, Julian Michael, Luke Zettlemoyer, and Ido Dagan. 2018. Supervised open information extraction. In *NAACL*, pages 885–895.
- Mihai Surdeanu. 2013. Overview of the tac2013 knowledge base population evaluation: English slot filling and temporal slot filling. *TAC*, page 2.
- Alon Talmor, Yanai Elazar, Yoav Goldberg, and Jonathan Berant. 2019. olmpics–on what language model pre-training captures. *arXiv preprint arXiv:1912.13283*.

- Ian Tenney, Patrick Xia, Berlin Chen, Alex Wang, Adam Poliak, R Thomas McCoy, Najoung Kim, Benjamin Van Durme, Samuel R Bowman, Dipanjan Das, et al. 2019. What do you learn from context? probing for sentence structure in contextualized word representations. *arXiv preprint arXiv:1905.06316*.
- Ashish Vaswani, Noam Shazeer, Niki Parmar, Jakob Uszkoreit, Llion Jones, Aidan N Gomez, Łukasz Kaiser, and Illia Polosukhin. 2017. Attention is all you need. In *NIPS*, pages 5998–6008.
- Jesse Vig. 2019. Visualizing attention in transformerbased language models. *arXiv preprint arXiv:1904.02679*.
- Chenguang Wang, Xiao Liu, Zui Chen, Haoyun Hong, Jie Tang, and Dawn Song. 2021. Zero-shot information extraction as a unified text-to-triple translation. In *EMNLP*.
- Chenguang Wang, Xiao Liu, Zui Chen, Haoyun Hong, Jie Tang, and Dawn Song. 2022. DeepStruct: Pretraining of language models for structure prediction. In *ACL*.
- Wentao Wu, Hongsong Li, Haixun Wang, and Kenny Q Zhu. 2012. Probase: A probabilistic taxonomy for text understanding. In *SIGMOD*, pages 481–492.
- Aohan Zeng, Xiao Liu, Zhengxiao Du, Zihan Wang, Hanyu Lai, Ming Ding, Zhuoyi Yang, Yifan Xu, Wendi Zheng, Xiao Xia, et al. 2022. Glm-130b: An open bilingual pre-trained model. *arXiv preprint arXiv:2210.02414*.
- Junlang Zhan and Hai Zhao. 2020. Span model for open information extraction on accurate corpus. In *AAAI*, pages 9523–9530.
- Yuhao Zhang, Victor Zhong, Danqi Chen, Gabor Angeli, and Christopher D Manning. 2017. Positionaware attention and supervised data improve slot filling. In *EMNLP*.
- Zexuan Zhong, Dan Friedman, and Danqi Chen. 2021. Factual probing is [mask]: Learning vs. learning to recall. In *NAACL*, pages 5017–5033.

## **A** The IELM Benchmark Details

Additional details of our open information extraction (OIE) benchmark IELM are described in this section.

#### A.1 Wikidata-OIE

In this section, we describe some technical details regarding the construction and evaluation of Wikidata-OIE.

#### A.1.1 Entity Linking

We use an unsupervised entity linker for both Wikidata-OIE dataset construction and OIE evaluation. The entity linker is originally developed in (Spitkovsky and Chang, 2012), which is based on a mention-to-entity dictionary. We build an enhanced dictionary as follows: we add new Wikipedia anchors to the dictionary which results in 26 million entries compared to the original 21 million entries. Then a Wikipedia anchor to the Wikidata item dictionary is used to further link the entities (or arguments) to Wikidata. If an argument is a pronoun, we further use neuralcoref<sup>2</sup> for coreference resolution.

## A.1.2 Predicate Mapping

The predicate mapping of Wikidata-OIE is constructed offline using the method in Sec. 3.4. In more detail, we randomly sampled a hold-out dataset including 2,000 documents from English Wikipedia for the bootstrapped predicate mapping construction based on the TAC KBP mapping (Angeli et al., 2015). To filter out the wrong predicate pairs, we manually check whether the top predicate phrases are true.

#### A.1.3 Gold Triples

For gold triples in Wikidata-OIE, we only preserve those triples describing predicates between arguments that can be linked to corresponding Wikipedia anchors. We rule out triples of attributes about arguments and triples of auxiliary predicates (such as topic's main category. P901) and finally result in 27,368,562 gold triple extractions.

#### A.1.4 Evaluation

Given the large number of source sentences and gold triples in Wikidata-OIE, a MongoDB database is maintained to store the gold triples to enable an efficient evaluation.

## A.2 Zero-Shot Language Model Based Open **Information Extraction**

In this section, we introduce additional details about how we adapt pre-trained language models (LM) as zero-shot OIE systems.

## A.2.1 Argument Extraction

We use spaCy noun chunker  $^{3}$  to annotate the noun phrases in the sentences.

#### Algorithm 1 Beam search with attention scores.

- Input: Argument pair  $(arg_0, arg_1)$ , sentence s, attention matrix  $\mathbf{A}_{s}$ , action manager  $\mathcal{O} = \{ \mathsf{START}, \mathsf{YIELD}, \mathsf{STOP} \},\$ beam size k
- **Output:** Triples  $T_{(arg_0, arg_1)}$ 1:  $T_{(arg_0, arg_1)} \leftarrow \{\text{START}(arg_0)\} \triangleright Start$  by adding the first argument as a candidate in the beam
- 2: while  $\exists c \in T_{(arg_0, arg_1)}[\mathcal{O}(c) = \texttt{YIELD}]$  do
- $T_{(arg_0, arg_1)} \leftarrow \emptyset$ 3: ▷ Initialize a new beam
- for each  $c \in T_{(arg_0, arg_1)}$  do if  $\mathcal{O}(c) = \text{YIELD then}$ 4:
- 5:
- $\begin{array}{ccc} & T_{(arg_0, arg_1)} & \leftarrow & \mathbf{I}_{(arg_0, arg_1)} & \leftarrow \\ \{ \mathsf{YIELD}(c, s, \mathbf{A}_s) \} \triangleright \textit{Yield} \text{ a new candidate if not reached} \end{array}$ 6: the second argument
- 7: else
- $T_{(arg_0, arg_1)} \leftarrow T_{(arg_0, arg_1)} \cup \{\mathsf{STOP}(c, t)\}$ 8:  $\triangleright$  *Stop* then produce a valid triple if reached the second argument
- g٠ end if
- 10: end for
- $T_{(arg_0, arg_1)} \leftarrow \text{TOP}(k, \widetilde{T}_{(arg_0, arg_1)})$ k-best candidates in the beam 11: ▷ Maintain
- 12: end while
- 13: return  $T_{(arg_0, arg_1)}$

## A.2.2 Predicate Extraction

We first describe predicate extraction introduced in Sec. 2.2 in detail.

- Beam Search. The inputs of the search algorithm are an argument pair  $(arg_0, arg_1)$ , a sentence s, an attention matrix  $\mathbf{A}_s$  of s. Both  $arg_0$  and  $arg_1$  are identified by the noun chunker in s.  $A_s$ is the attention matrix associated with s from the forward pass of an LM without fine-tuning. The search gets started by adding the first argument  $arg_0$  as the initial candidate in the beam. While there are still new candidates waiting to be yielded, the search continues, and the top k candidates sorted by the attention scores are maintained in the beam. The details of the proposed beam search are described in Algorithm 1. In practice, we implement an action manager  $\mathcal{O}$  to decide which action to take at each step. Given a candidate c in the beam,  $\mathcal{O}(c) = \text{START}$  always happens at the beginning of the search. If c has not reached the second argument  $arg_1$  yet,  $\mathcal{O}(c) =$ YIELD. Otherwise,  $\mathcal{O}(c) =$ STOP.
- Implementation Details. For Wikidata-OIE, we randomly split the English Wikipedia data into 20 partitions, and map the data partitions to 20 distributed servers to run. Each server is configured with four Tesla K80 12Gs. We set the max sequence length to 256, and batch size as 32 for BERT<sub>LARGE</sub> and 4 for GPT- $2_{\rm XL}$ . We use implementations of pre-trained LMs in the

<sup>&</sup>lt;sup>2</sup>https://github.com/huggingface/neuralcoref

<sup>&</sup>lt;sup>3</sup>https://spacy.io/usage/linguistic-features/#noun-chunks

Transformers package <sup>4</sup>. We use spaCy sentencizer <sup>5</sup> to segment the documents into sentences. BERT<sub>LARGE</sub> takes approximately 48 hours, and GPT-2<sub>XL</sub> costs around 96 hours. The resulting triples from the 20 servers are then reduced to a data server. The batch sizes of BERT<sub>BASE</sub>, GPT-2, GPT-2<sub>MEDIUM</sub>, GPT-2<sub>LARGE</sub> are 64, 32, 16, 8 respectively.

## A.2.3 Parameter Settings

We then discuss the parameter setup of our OIE systems as below.

The parameter settings are shared across all OIE datasets. All the choices are based on the parameter study in Sec. 4.4. The beam size of Algorithm 1 is set to 6. The attention score threshold is set to 0.005, and the number of relation/predicate frequencies is set to 10. To generate the attention weight matrix  $A_s$  of a sentence, we reduce the weights of every attention head in the last layer of pre-trained LMs using the mean operator. We analyze the effects of various parameters below.

Figure 3(a) illustrates the effects of various beam sizes in Algorithm 1. We find that in general, the larger the beam size is, the better F1 the setting achieves. This is because our method is able to reserve more potentially correct triples when more candidates are allowed. However, F1 improvement gradually becomes subtle, while the computation costs increase more significantly. For efficiency consideration, we do not explore larger beam sizes. We set the beam size as 6.

Figure 3(b) compares the effect of different thresholds of the total score. We set the threshold as 0.005 since it achieves the best result. Note that the summed attention score is normalized by the length of the triple to penalize the cumbersome triples. The threshold is effective. This is mainly because of the relational information contained in the self-attention matrix: the score in the attention matrix is representing the chance of the triples to be the true triples based on the stored information. Figure 3(c) shows the impact of the predicate frequency threshold in identifying common predicates. The best result is achieved when it equals 10. This shows that while our method mostly identifies frequent predicates, it is also able to capture some rare predicates.

Figure 3(d) shows the comparison between the attention weights of the last layer and the mean of

all layers. The attention weights of the last layer perform better. This is due to the attention weights in lower layers being low-level linguistic knowledge according to (Clark et al., 2019; Ramsauer et al., 2020), which are less relevant to the relational information. Figure 3(e) compares the impact of different attention reductions, i.e., mean, max, over the attention heads of the last layer. We find the "mean" performs better. The reason is that the token often intensively attends to several specific tokens in the sequence (Michel et al., 2019), and the "mean" operator is less sensitive to such biases.

## A.3 The Number of Predicates of Standard and Factual OIE Datasets

Note that there are more predicates in standard OIE datasets than that in factual datasets. This is because, for standard OIE, predicates are open and not attached to a certain schema. These predicates were extracted from the input sentences and are usually natural language utterances. For factual OIE, the predicates are unified into a fixed KG schema. For example, for a person's birthplace, there are multiple natural language expressions like "was born in" or "gave birth" in standard OIE datasets, while only a single "birth\_place" predicate exists in the factual OIE sets.

## A.4 Predicate Mapping Examples

We show example predicate mappings in a dictionary below.

- per:city\_of\_birth: born in, born at, born, birth city, hometown.
- org:founded\_by: established by, founded by, founded, founder, co-founder of.

where the keys are KG predicates, e.g., per:city\_of\_birth and org:founded\_by. The values are the corresponding OIE relations.

## A.5 Comparison Systems

We compare our zero-shot OIE systems with the following OIE systems.

## A.5.1 Neural OIE Systems

The following neural network based systems are selected.

• SenseOIE (Roy et al., 2019)<sup>6</sup> learns to ensemble various previous unsupervised OIE systems' ex-

<sup>4</sup> https://github.com/huggingface/transformers

<sup>5</sup>https://spacy.io/api/sentencizer

<sup>&</sup>lt;sup>6</sup>The code is not available.

tractions using supervised learning to combine their strengths.

- SpanOIE (Zhan and Zhao, 2020)<sup>7</sup> presents the Re-OIE2016 datasets for a more rigorous evaluation and a span-based (instead of sequence labeling) extraction model.
- RnnOIE (Stanovsky et al., 2018)<sup>8</sup> is one of the state-of-the-art OIE systems. It uses LSTM to model the OIE problem as a sequence tagging problem, and is trained on a large-scale OIE training set.
- NeuralOIE (Cui et al., 2018)<sup>9</sup> is an encoderdecoder based architecture that adopts the copy mechanism to conduct OIE.
- IMOJIE (Kolluru et al., 2020b)<sup>10</sup> is a sequence generation based OIE model that uses BERT at encoding time.
- Multi<sup>2</sup>OIE (Ro et al., 2020)<sup>11</sup> models OIE as a sequence labeling problem that combines BERT with multi-head attention blocks.
- OpenIE6 (Kolluru et al., 2020a)<sup>12</sup> is one of the state-of-the-art OIE systems. It treats OIE as a 2-D grid labeling task, and trains a BERT family architecture for the task.

Note that while our methods are zero-shot without needing to use the specific training sets, all the neural OIE systems are supervised on corresponding training sets.

## A.5.2 Linguistic OIE Systems

We also compare our systems with the following linguistic pattern based systems developed prior to the use of neural networks.

- MinIE (Gashteovski et al., 2017)<sup>13</sup> proposes to minimize facts in OIE by representing information by annotations rather than extraction and removing redundant specific information.
- ClausIE (Del Corro and Gemulla, 2013)<sup>14</sup> is a clause-based approach by first identifying lin-

guistic structure and then their information and attributes.

- OLLIE (Schmitz et al., 2012)<sup>15</sup> uses contextual sentence decomposition to conduct OIE.
- PropS (Stanovsky et al., 2016)<sup>16</sup> proposes proposition structure which is implied from syntax using dependency trees.
- OpenIE4 (Christensen et al., 2011)<sup>17</sup> is the successor to OLLIE using similar argument and relation expansion heuristics to create OIE extractions from semantic role labeling frames.
- OpenIE5 (Saha et al., 2017, 2018)<sup>18</sup> is one of the state-of-the-art OIE systems, which is the successor to OLLIE, and it improves extractions from noun relations, numerical sentences, and conjunctive sentences depending on the linguistic patterns.
- Stanford OpenIE (Angeli et al., 2015)<sup>19</sup> leverages POS tag and dependency parser, and generates self-contained clauses from long sentences to extract the triples.

#### The TAC KBP-OIE and Wikidata-OIE B **Datasets**

We show samples of our zero-shot OIE extractions and the gold triples on both TAC KBP-OIE and Wikidata-OIE datasets.

#### TAC KBP-OIE **B.1**

**OIE Extractions and Gold Extractions** We randomly sample 100 documents from the TAC KBP-OIE corpus, then sample sentences from those documents. The uncurated triples and the corresponding gold triples of the sampled sentences based on our best methods BERTLARGE and GPT- $2_{\rm XL}$  are shown in Figure 4 and Figure 5 respectively. We also randomly sample sentences in which BERT<sub>LARGE</sub> differs from GPT- $2_{\rm XL}$  in the resulting triples for comparison, which are illustrated in Figure 6. In each table, "ID" represents the document ID of a sampled sentence in the TAC KBP-OIE corpus. "Sentence" indicates the sampled sentence. "Triples to gold triples" column contains the extraction triples (on the left side of

<sup>7</sup> https://github.com/zhanjunlang/Span\_OIE

 $<sup>^{8} {\</sup>tt https://github.com/gabrielStanovsky/supervised-oie}$ 

 $<sup>^{9}</sup>$ We use the BERT implementation available at https://github.com/dair-iitd/ imojie. 10 https://github.com/dair-iitd/imojie

<sup>11</sup>https://github.com/youngbin-ro/Multi20IE

<sup>12</sup> https://github.com/dair-iitd/openie6

<sup>13</sup>https://github.com/uma-pi1/minie

<sup>14</sup> https://www.mpi-inf.mpg.de/departments/

databases-and-information-systems/research/ambiverse-nlu/clausie

<sup>15</sup> https://github.com/knowitall/ollie

<sup>16</sup> https://github.com/gabrielStanovsky/props

<sup>17</sup> https://github.com/allenai/openie-standalone

<sup>18</sup> https://github.com/dair-iitd/OpenIE-standalone

<sup>19</sup> https://nlp.stanford.edu/software/openie.html

" $\rightarrow$ ") and their corresponding gold triples (on the right side of " $\rightarrow$ ").

## **B.2** Wikidata-OIE

**OIE Extractions and Gold Extractions** Similar to TAC KBP-OIE, we randomly sample 100 documents from the Wikidata-OIE corpus (i.e., English Wikipedia), then sample sentences from those documents. Similar to TAC KBP-OIE, Figure 7 and Figure 8 show the uncurated triples and the corresponding gold triples of the sampled sentences based on our zero-shot systems  $BERT_{LARGE}$  and  $GPT-2_{XL}$ respectively. Figure 9 illustrates the randomly sampled sentences in which  $BERT_{LARGE}$  extracts different triples compared to that from GPT- $2_{\rm XL}$ . In each table, "ID" represents the Wikipedia page's title of the sampled sentence. "Sentence" indicates the sampled sentence. "Triples to gold triples" column contains the triples (on the left side of " $\rightarrow$ ") and their corresponding gold triples (on the right side of " $\rightarrow$ ").

ID SF13_ENG_001	Sentence Bashardost left Pakistan for France in 1981.	Triples to gold triples         (Bashardost, left, Pakistan) → (Ramaran Bashardost, per.countries, of_residence, Pakistan)           Ologalas Filmt, as, Group Chairman) → (Douglas Filmt, pertitle, Chairman)         (Douglas, Filmt, as, Group Chairman)
SF13_ENG_004 SF13_ENG_007	* Douglas Flint will succeed Stephen Green as Group Chairman and Stuart Gulliver will be appointed Group Chief Executive , following Michael Geoglegan's decision to retire early next year. * HSBC said in a statement	
	Medaumined Tanava', head of AI - Arhar University, told a schoolgirl to remove her nitaph when he spotted her during a tour of an AI - Arhar affiliated school , the independent AI - Mary aI - Youn mewopaper reported this week . He took office in 2006 by defeating longtime incumbent Anwar Chowdhyr from Pakistan, who was later barred for alleged financial	(Mohammed Tantawi, head of, Al-Azhar University) → (Mohammed Sayed Tantawi, per:employee_or_member_of, Al-Azh University)
F13_ENG_009		(Longtime Incumbent Anwar Chowdhry, from, Pakistan) → (Anwar Chowdhry, per:origin, Pakistan)
13_ENG_010 13_ENG_011 13_ENG_011	In addition to his wife, Wendy , Dio is survived by son Daniel, grandchildren Julie and Joey , and father Pat . Marshall is charged with grand larceny and fraud and faces up to 25 years in prison if convicted. Marshall , a Tony Award - winning Broadway producer and former U. S. adjonant , sat stonelike as the jury forewoman read each	(Dio, is survived by son, Daniel) → (Ronnie James Dio, perchildren, Daniel) (Marshall, is charged, rand) → (Anthony Marshall, percharges, frand) (Marshall, -, Argod, ward-Winning Broadway Producer) → (Anthony Marshall, pertitle, producer)
	Marshall, a Tony Award - winning Broadway producer and former U.S. diplomat, sat stonelike as the jury forewoman read each verdict aloud, the word "guilty" clearly resonating in the otherwise silent courtroom.	
F13_ENG_011	venific thand, the word " gaily" clearly resonanting in the otherwise silent contromon. The blackboad sics or of one of America" most illustrions finallies appeared to lister impossibly as venifiets finding him gaily on 14 control of grand larceny, comprings and fraud were read to a posted contromon. But Manhall " son, Fhilip, rold a different sosy. Al Coefed * American speciment AdM and different sosy.	(Him, guilty, Grand Larceny) $\rightarrow$ (Anthony Marshall, per.charges, grand larceny)
F13_ENG_011 F13_ENG_012	But Marshall 's son, Philip, told a different story. Al - Oaeda 's American spokesman Adam Gadahn, also known as Azzam the American, called on Muslims in the West on Sunday	(Marshall'S Son, ,, Philip) → (Anthony Marshall, per.children, Philip) (Adam Gadahn, also known, Azzam) → (Adam Gadahn, per.alternate_names, Azzam)
	to carry out more attacks like the deadly showing at the US base in Fort Hood, Texas. Gadahn, also known as Azzam the American, was born in 1978. Gadahn grew up in California and converted to Islam before he moved to Pakistan in 1998 and attended an al - Qaida training camp	
F13_ENG_012 F13_ENG_012	Gadahn grew up in California and converted to Islam before he moved to Pakistan in 1998 and attended an al - Qaida training camp six warst later, according to media properts	(Gadahn, , also known as, Azzam) → (Adam Gadahn, per:alternate_names, Azzam) (Gadahn, in, California) → (Adam Gadahn, per:statesorprovinces_of_residence, California)
F13_ENG_012	six years later, according to media reports. Gadaha moved to Pakistan in 1998, according to the FB1, and is said to have attended an al - Qaida training camp six years later, serving as a translator and consoltant for the group.	$({\rm Gadahn,movedto,Pakistan}) \rightarrow ({\rm AdamGadahn,per.countries\_of\_residence,Pakistan})$
F13_ENG_014		$(\text{He, lived in, Lebanon}) \rightarrow (\text{Mohammed Oudeh, per:countries_of_residence, Lebanon})$
F13_ENG_015 F13_ENG_017	Attest the strainer and a specific provide the second strain and second and specific particular specific provide the second strain and specific particular specific provide the strain specific provide strain specific provide strain specific provide strain specific provide specific	(Clifton, attended, Howard University) → (Lucille Clifton, per:schools_attended, Howard University) (Alexander Haig, devoted his, soldier) → (Alexander Haig, per:title, soldier)
F13_ENG_017 F13_ENG_017 F13_ENG_019	In 1979, he resigned and retired from the Army.	(He, and retired from, The Army) → (Alexander Haig, per:employee_or_member_of, Army)
F13_ENG_020	" Mike was a first - rate journalist , a valued member of our staff for 25 years and we will miss him , " Times Editor Russ Stanton said . "	(Mike, was, A First-Rate Journalist) → (Mike Penner, per:title, first-rate journalist)
F13_ENG_020 F13_ENG_024	Penner is survived by his brother, John, a copy editor at the Times, and his former wife, Times sportswriter Lisa Dillman. She was charged with theft in Beaumont, Texas, for allegedly failing to pay for \$10,000 worth of dental work in 2006.	(Penner, his brother ., John) → (Mike Penner, per:siblings, John) (She, was charged [Theft) → (Crystal Taylor, percharges, theft)
F13_ENG_025 F13_ENG_026	Michigan native Nancy Kissel was convicted of murder and sentenced in Hong Kong 's High Court in Sentember 2005	(Michigan Native Nancy Kissel, was convicted, Murder) — (Nancy Kissel, per-charges, murder) (Nichigan Native Nancy Kissel) — (Detrinic Neal memory and anticipation of anticipation Nancy York)
F13_ENG_026	Neal returned to New York and concentrated on stage work . In 1953, she married Roald Dahl, the British writer famed for "Charlie and the Chocolate Factory,." "James and the Giant Peach "and other tasks for children.	(Penner, His brother, John) → OMAE Penner, pers-hillpag, John) (She, was charged, Thel) → (Crystal Phyle, percharges, theft) (Michigan Native Nancy Kines), was convicted, Muriley) → (Nancy Kissel, percharges, muriley) (Mele, returned to, New York) → (Patricia Neal Jean Extractorgroupscies, of periodirece, New York) (She, married, Roald Dahl) → (Patricia Neal, per-poone, Roald Dahl)
F13_ENG_026	and other dates for conduct a lead has died of lung cancer at her home on Martha 's Vineyard , Massachusetts , on Sunday . Al Hakim 's son , Ammar al - Hakim , has been groomed for months to take his father 's place . Al - Hakim is the head of Supreme Tagi Islamic Council (SIIC ), the largest Shitter party in Iraq .	(Patricia, died of, Lung Cancer) → (Patricia Neal, per.cause_of_death, lung cancer) (Al-Hakim'S Son, "Ammar Al-Hakim) → (Abdul Aziz Al-Hakim, per.children, Ammar al-Hakim)
F13_ENG_027 F13_ENG_027 F13_ENG_027		(Patricia, doci of, Lang Cancor) → (Patricia Nea, pre-cance, of, Andu, lung cancer) (Al-Halami SSa, Annura Al-Halami) → (Abdu Aizz Al-Halain, pre-childran, Annur al-Halain) (Al-Halami, is, Supreme Iraqi Islami: Coancil) → (Abdul Aizz Al-Halain, pre-mployee_or_member_of, Supreme Iraqi Islam Coancil)
F13_ENG_027	His former Shiite partners have gathered again to form their own group , the Iraqi National Alliance (INA ), which includes the influential Supreme Iraqi Islamic Council (SIIC) of Ammar al - Hakim, who succeeded his father Abdul Aziz al - Hakim, who defin in a houphin in Irau has month after a cloup battle with cancer and the superstanding of the superstanding o	Council) (Al-Hakim, , who died in, Iran) → (Abdul Aziz Al-Hakim, per:country_of_death, Iran)
F13_ENG_028	died in a hospital in Iran last month after a long battle with cancer . "I'd rather have Sully doing this than some stranger , or some hotshot trying to be the next Billy Mays, " said the guy who actually	(The Next Billy Mays, his son, Billy Mays Iii) → (Billy Mays, per.children, Billy Mays III)
F13 ENG 029	is the next Billy Mays, his son Billy Mays III. Fignon continued cycling during and after a stint in the Army, and drew attention in the early 1980s when he managed to keep up	(Fignon, during and after a stint in, The Army) → (Laurent Fignon, per:employee_or_member_of, the Army)
F13 ENG 029	If a starter have Saliy doing this that some stranger, or some bothed trying to be the next Hully May, ", usat the goy who schuldy figures continued (sping doing and after a start in the k-arty, and be well as the stranger of the stranger of the schuldy stranger is made to be seen up with Hundi during a race in which matters and professional node together. Largert Planck Papers we be schuld with a stranger in Fane 1997 and hull or stranger i	
F13_ENG_030	Anderson became the Tigers ' manager in June 1979 and built on a foundation that included Alan Trammell at shortstop , Lou Whitaker at second base. Kirk Gibson in the outfield and Jack Morris on the pitching staff.	$\begin{array}{llllllllllllllllllllllllllllllllllll$
F13_ENG_030	In addition to his wife, Carol, Anderson is survived by his sons, Lee and Albert; his daughter, Shirlee Englebrecht; and many erandehildren	$(Anderson, is survived by his sons, Lee) \rightarrow (Sparky Anderson, perchildren, Albert)$
F13_ENG_031	in addition to nis wise (_arms, Anderson is survived by nis sons, Lee and Anders ; nis suggint -, ninnee engleerecent ; and many granchildren . Blake Edwards, a writer and director who was hailed as a Hollywood master of serwshall farces and rude comelles like " Victor / Victoria" and the "Pin Panhert" movies, (ide) Vedeoseday night in Sharta Morica, Calif. He was 83. Hwang, who lives in Scoul under (gipt police security , has written books and delivered speeches condemning Kim 's regime as authoristication and lictoriaria.	$(Blake Edwards, , , writer) \rightarrow (Blake Edwards, per:title, writer)$
F13_ENG_032	Weang, who lives in Seoul under tight police security, has written books and delivered speeches condemning Kim 's regime as authoritaria and dictatorial.	$(Hwang, who lives, Seoul) \rightarrow (Hwang Jang-Yop, per:cities_of_residence, Seoul)$
F13_ENG_035	Kaczynska, who was 67, married Kaczynski in 1978 after meeting him in the northern Polish city of Gdansk, where they were	(Kaczynska, married, Kaczynski) $\rightarrow$ (Maria Kaczynska, per:spouse, Kaczynski)
F13_ENG_036	Upon academics . Upon his release he went into exile in India , where he masterminded the 1973 hijacking of a Royal Nepal Airlines plane known to he must be made at a february description of a february of the february Nepal Common party.	(His Release, exile, India) $\rightarrow$ (Girija Prasad Koirala, per:countries_of_residence, India)
F13_ENG_036	Open mit returns with mot cash in hum, 's meet ne disaktionization of 175 mpecange of a respin request commer pains anown to be carrying humdreds of fhousands of dollars' in cash to fund his humdel Nepalit Congress party. Koirala began his political career as a union organiser and was imprisoned for seven years in 1960 after a failed uprising against	$({\rm Koirala, began  his, A  Union  Organiser}) \rightarrow ({\rm Girija  Prasad  Koirala,  pertitle,  union  organiser})$
F13_ENG_036	the monarchy . Koirala was born in 1925 in Bihar of India where his father Krishna Prasad Koirala and his family were living in exile .	(Koirala, was born in 1925 in, Bihar) → (Girija Prasad Koirala, per.city_of_birth, Bihar)
F13_ENG_036 F13_ENG_037	Koirala was born in 1925 in Bihar of India where his father Krishna Prasad Koirala and his family were living in exile . Koirala was born in 1925 in Bihar of India at he time when his father Krishna Prasad Koirala along with his family was exiled by Rana rulers.	(Koirala, was born in 1925 in, Bihar) → (Girija Prasad Koirala, per.city_of_birth, Bihar) (Chabrol'S Survivors, third wife, Aurore Paiot) → (Claude Chabrol, per.spouse, Aurore Paiot)
F13_ENG_037	Tabalani "s unriver ado includo hin third vife, narme Pajer, who acted as his script superviser on early all of the movies from 1986 on and whom he married in 1983, and Pajer's "d supplict", Ceiter Maitres, who was an assistant directore on his films and wrote the script with him for "The Girl CL in Thev" (2007). The joint statement sulf-complexity of the statement of the state	(Chabrol'S Survivors, third wife, Aurore Pajot) → (Claude Chabrol, per:spouse, Aurore Pajot)
F13_ENG_038	wrote the script with nim for Infe (inf. util in 1980 (2007). The joint statement said Cumingham was "an inspiring performer and dancer into his 80s, and a visionary choreographer and dedicated teacher throughout his life, he led quietly and by example," the statement said."	(Cunningham, was ", An Inspiring Performer) $\rightarrow$ (Merce Cunningham, per:title, performer)
F13_ENG_038		(Merce Cunningham, , The Nonagenarian Choreographer) → (Merce Cunningham, per:title, choreographer) (British Reality Television Star Jade, who died, Cancer) → (Jade Goody, per:cause_of_death, cancer)
F13_ENG_039 F13_ENG_041	Avecter Cummingutan , une nonagenariane contrologiappier , os paranning tos a wond winnou marking the second secon	(Don Hewitt, "The Cbs Newsman) → (Don Hewitt, per-title, newsman)
F13_ENG_041	"He was the consummate television newsman, "Don Hewitt, a longtime CBS News executive and creator of the long - running " 60 Minutes "news neoram" told Reuters. "	(Don Hewitt, ,, executive) $\rightarrow$ (Don Hewitt, per:title, executive)
F13_ENG_041	Hewitt was already a highly respected TV newsman . Denseld Events and the set of the set	(Hewitt, was, A Highly Respected Tv Newsman) → (Don Hewitt, pertitle, TV newsman) (Donald Shared Hawitt, here: New York) → (Don Hawitt, pertitle, TV newsman)
F13_ENG_041 F13_ENG_043 F13_ENG_044	deal Wonderday and Wonderday Description are starting and the starting of the starting of the starting of the starting of the Description of the starting of the Description of the starting of the Description of the starting of the Description of the starting of th	the wink, thus creating on the product of the manual $/$ (constrained product on the manual $/$ (constant) (Donald Shepped Hewitt, born, New York) $\rightarrow$ (Doen Hewitt, perstate or province, of birth, New York) (Eleanor Louise Greenwich, was born, $Oct. 1 \rightarrow$ (Ellic Greenwich, perstate of birth, 1940-10-23) (Danne, dick, Bladder Cancer) $\rightarrow$ (Dominick Edume, perscause, of each, bladder cancer)
F13_ENG_044	A intie more man a year arter Dunne near from nanaer cancer, me coorrui remnants of nis estate nave been consigned by nis family to Shira Galleries in Hudson, N. Y., which will auction them Nov. 20. Charles Gwathmey, an architect known for his influential modernist home designs and famous clients like director Steven Spielberg	(Dunne, died, Bladder Cancer) → (Dominick Dunne, per:cause_or_deam, bladder cancer) (Charles Gwathmey, " architect) → (Charles Gwathmey, per:title, architect)
F13_ENG_048	Charles Uwainmey, an architect known for his innuenna modernist nome designs and ramous cuents like director Steven Spielrerg , has died . Besides his wife , Mandelbrot is survived by two sons , Laurent , of Paris , and Didler , of Newton , Mass . , and three grandchildren	(Charles Gwatnmey, " architect) → (Charles Gwatnmey, per:tute, architect) (Mandelbrot, is survived by two sons Laurent) → (Benoit Mandelbrot, per:children, Laurent)
F13_ENG_049 F13_ENG_049	For years , he worked for IBM in New York . After several years spent largely at the Centre National de la Recherche Scientifique in Paris , Mandelbrot was hired by IBM in 1958	(He, for, Ibm) → (Benoit Mandelbrot, per:employee_or_member_of, IBM) (Mandelbrot, was hired by, Ibm) → (Benoit Mandelbrot, per:employee_or_member_of, IBM)
	For yeas, see worked net most in view took. A After several years spent langely at the Centre National de la Recherche Scientifique in Paris , Mandelbrot was hired by IBM in 1958 to work at the Thomas J. Watson Research Center in Yorkown Heights , N. Y. Although be worked frequently with academic researchers and served as a visiting professor at Harvar and and the Massachuset institute of Technology. It was not until 1937 that the server server as a visiting professor at Harvar and and the Massachuset institute of Technology. It was not until 1937 that	
F13_ENG_056	he began to teach at Yale, where he earned tenure in 1999.	(The Georgia Peanut Commission, director, Don Koehler) → (Georgia Peanut Commission, org:top_members_employees, D
F13_ENG_060	the Georgia Peanut Commission . "	Koehler) (The Aaas President, _Agre) → (American Association for the Advancement of Science, org:top_members_employees, Peter
	"We 'II be meeting with scientists, university and science policy officials to explore practical opportunities for exchange and	
F13_ENG_060	<sup>2</sup> We 'll be meeting with scientists, university and science policy officials to explore practical opportunities for exchange and collaboration, "Agre, the AAAS president, was quoted as saying. However, Alan Leshner, chief executive officer of the American Association for the Advancement of Science, noted that Nobels	$\frac{Agre}{(The American Association, chief executive, Alan Leshner)} \rightarrow (American Association for the Advancement of Scientific Advancement of Scient$
	the Georgia Paranet Geometricon . <sup>1</sup> We T1 be meeting with scientists	Agero) (The American Association, chief executive, Alan Leshner) → (American Association for the Advancement of Scien orgetop,members_employees, Alan Leshner)) (The U.S. High Speed Rail Association, "Andy Runc) → (U.S. High Speed Rail Association, org:top,members_employees, An
F13_ENG_060 F13_ENG_062 F13_ENG_064	are generally given for work that 's a decade old or more, and that the U.S. mustin't become complacent. "First of all, they never have complificating," said Andy Kurz, president of the U.S. High Speed Rail Association, a nonprofit that advocates a national high - speed rail network." (Chan's double at NATO's "millipter cannation in the former Vinordavia helped mod Reime into naivine a bieser role in U.N.	ergetor_members_employees, Alan Leshner) (The U.S. High Speed Rail Association, an Andy Knuz) → (U.S. High Speed Rail Association, org:top_members_employees, An Knuz) (The Stockholm International Peace Research Institute, director of, Bates Gill) → (Stockholm International Peace Research In
F13_ENG_062	are generally given to work that 's a decade old or more, and that the U. S. mista' 1 become complacedt. "Fint of all, they are what even oph funding, "said Andy Knur, president of the U. S. High Speed Rail Association, a nonprofit that advocates a national high-speed rail network." Cham's shock at MOT's smillary comparing in the former Vigoslavia helped proof Beijing into playing a bigger role in U. N. peacekeeping, said Bates Gill, director of the Stockholm International Peace Research Institute and co- author of a recent report	orgene, members_employees. And Lechner) (The U.S. High Speed Rail Association, "andy Kunzi) → (U.S. High Speed Rail Association, orgene, members_employees, An Kunzi) (The Stockholm International Peace Research Institute, director of, Bates Gill) → (Stockholm International Peace Research In tuite, orgene_members_employees, Bates Gill)
F13_ENG_062	are generally given to work that 's a decade old or more, and that the U. S. mista' 1 become complacedt. "Fint of all, they are what even oph funding, "said Andy Knur, president of the U. S. High Speed Rail Association, a nonprofit that advocates a national high-speed rail network." Cham's shock at MOT's smillary comparing in the former Vigoslavia helped proof Beijing into playing a bigger role in U. N. peacekeeping, said Bates Gill, director of the Stockholm International Peace Research Institute and co- author of a recent report	ergetor_members_employees, Alan Leshner) (The U.S. High Speed Rail Association, an Andy Knuz) → (U.S. High Speed Rail Association, org:top_members_employees, An Knuz) (The Stockholm International Peace Research Institute, director of, Bates Gill) → (Stockholm International Peace Research In
F13_ENG_062	are generally given to work that 's a decade old or more, and that the U. S. mista' 1 become complacedt. "Fint of all, they are what even oph funding, "said Andy Knur, president of the U. S. High Speed Rail Association, a nonprofit that advocates a national high-speed rail network." Cham's shock at MOT's smillary comparing in the former Vigoslavia helped proof Beijing into playing a bigger role in U. N. peacekeeping, said Bates Gill, director of the Stockholm International Peace Research Institute and co- author of a recent report	orging, members, employees, Maa Leshner) (The U.S. High Speed Rail Association, and McMar) → (U.S. High Speed Rail Association, orging, members, employees, An Kmri) (The Stockholm International Peace Research Institute, director of, Bates Gill) → (Stockholm International Peace Research In tate, orging, members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- gring, members, employees, Bates Gill)
FI3_ENG_062 FI3_ENG_064 FI3_ENG_064 FI3_ENG_068	are generally given be work that 'a decade dolor more, and that the U.S. muint'i tecome complexitence. "First of all, dispersion between a planning, 'and Jangk Lang, "general dollar d	orgene, numbers, employees, Ala Lechner) (The U.S. High Speed Rail Association, and Kanzi) → (U.S. High Speed Rail Association, orgetor, members, employees, An Kanz) (He U.S. High Speed Rail Association, and My Kanzi) → (U.S. High Speed Rail Association, orgetor, members, employees, An kanz) tati, orgetor, members, employees, Bates Gill) (He Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- orgetor, members, employees, Bates Gill) (The Indoor Taming Association, director of, John Oversteet) → (Indoor Taming Association, orgetor, employee Jatho Oversteet)
F13_ENG_062 F13_ENG_064 F13_ENG_064 F13_ENG_068	are generally given be work that 'a decade dolor more, and that the U.S. muint'i tecome complexitence. "First of all, dispersion between a planning, 'and Jangk Lang, "general dollar d	orgene, numbers, employee, Ala Ledner) (The U.S. High Speed Rail Association, and Kunz) → (U.S. High Speed Rail Association, orgetor, members, employees, An Kunz) (He U.S. High Speed Rail Association, and My Kunz) → (U.S. High Speed Rail Association, orgetor, members, employees, An kunz) (He Sockholm International Peace Research Institute, director, eff. Bates Gill) → (Stockholm International Peace Research In stat, orgetor, numbers, employees, Bates Gill) (He Sockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute orgetor, numbers, employees, Bates Gill) (The Indoor Taming Association, director of, John Overstreet) → (Indoor Taming Association, orgetor, nembers, employees, hint Overster) (The Swits Batkers Association, -Patrick Otler) → (Swits Batkers Association, orgetor, nembers, employees, Patrick Otler)
F13_ENG_062 F13_ENG_064 F13_ENG_064 F13_ENG_068 F13_ENG_076 F13_ENG_076	are generally given be work that 'a decade dolor more, and that the U.S. muint'i tecome complexitence. "First of all, dispersion between a planning, 'and Jangk Lang, "general dollar d	orgeno, members, employees, Ala Leshner) (The U.S. High Special Talvascuino, engle Markani) → (U.S. High Special Rail Association, orgetor, members, employees, An (The Steckholm International Peace Research Institute, director of, Bares Gill) → (Stockholm International Peace Research In this, orgotor, members, employees, Bases Gill) (The Stockholm International Peace Research Institute (incluse, Bares Gill) → (Stockholm International Peace Research Institu- group, members, employees, Bates Gill) (The Indoor Tanning Association, director of, John Overstreet) → (Indoor Tanning Association, orgetor, pembers, employee, Jahn Overstreet) (The Swiss Bankers Association, apartice Odier) → (Swiss Bankers Association, orgetor, members, employees, Patrick Odier) (The Swiss Bankers Association, in, Banel) → (Swiss Bankers Association, orgetor, Joedbaparters, Basel)
F13_ENG_062 F13_ENG_064 F13_ENG_064 F13_ENG_068 F13_ENG_076 F13_ENG_076	are generally green betwerk hat "a decade dolor of new, and that be U.S. musit "tecome compared technological" are generally green betwerk hat "a decade dolor of new spectra of the U.S. Third Specific Rel Accession, a nonpetit that advocates a statistical high - spectral intervents". Chun "a shock at NATO" 's milling campaign in the former Yugoshris helped prod Beijing into playing a begree role in U.S. Shock at NATO" is milling campaign in the former Yugoshris helped prod Beijing into playing a begree role in U.S. 'Shou and the Coll Accession of the Socksholm International Paces Research Internation and social technologies and the spectra of the social of spectra of the production of the spectra of th	orgene princhers, employees, Alan Leshner) (The U.S. High Speed Rail Association, arXiv Shark (arXiv - U.S. High Speed Rail Association, orgetop_members, employees, ArX The Stockholm International Peace Research Institute, director of, Bates Gill) → (Stockholm International Peace Research Institute, orgetop_members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute, orgetop_members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute, orgetop_members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute, Other Institute, Gills, Stockholm International Peace Research Institute, orgetop_members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute, Other Institute, Gills, Stockholm International Peace Research Institute, Gills, Stockholm, Institute, Stockholm, Institute, Stockholm, Institute, Stockholm, Stockholm, Institute, Stockholm, Institute, Stockholm, Stockholm, Institute, Stockholm, Stockholm, Stockholm, Stockholm, Institute, Stockholm, St
F13_ENG_062 F13_ENG_064 F13_ENG_064 F13_ENG_068 F13_ENG_076 F13_ENG_076 F13_ENG_077 F13_ENG_078 F13_ENG_082	are generally green betwerk hat "a decade dolor more, and that be U.S. musit "tecome compared technological" are generally green betwerk hat "a decade dolor more, and that be U.S. musit "tecome compared kat Accession as nonpetit that advances a starting high-specific interments". Chun "s shock at NATO" s multing campaign is the former Yugoshris helped prod Beijing into playage a begre role in U.S. Chun "s shock at NATO" s multing campaign is the Kenner Yugoshris helped prod Beijing into playage a begre role in U.S. Son : ante stores is for example," a stand group of priori off the coard of Starting and Taliban who openie across Non : ante stores is for example, a stand group of priori off the coard of Starting and Taliban who openie across Non : ante stores is the comparison of the Stackholm Intermentional Pacce Research huttine. " In real supprise that configurity comparison bances are store in how and the made rule has by transferring a tax from rich dectors and heir weakly costners to straggling and Businesses," John Centret, directer of the Boker Taming Association interest in duch like ones Switzerland signed this weak with Germany and Britin. In majority of over the Switzerland signed this weak with Germany and Britin. American base as stray constrained and store in Ham and engling strate the stransferring is had france there the numerican duch like ones Switzerland signed this weak with Germany and Britin. American base at any cynebibed last non by by Swits Banker Association in Bad. "American base at any cynebibed last non by by a swits Banker Association in Bad. "American base at any constraint more to than had have a worrestin". "American base at a discussion of the Town More Like Center in An Advec."	orgenp numbers, employes, Mai Lehner) (The U.S. High Special Talvascuino, regular March → (U.S. High Special Rail Association, orgenp_members, employees, Ar- The Stockholm International Peace Research Institute, director of, Bates Gill) → (Stockholm International Peace Research In- titis, orgenp, members, employes, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research In- stite, orgenp, members, employes, Bates Gill) (The Indoor Taming Association, director of, John Overstreet) → (Indoor Taming Association, orgenp, members, employed, March Stockholm International Peace Research Institute, Gill) (The Swits Bathers Association, "Patrick Odier) → (Swits Bathers Association, orgenp_members, employees, Patrick Odier) (The Swits Bathers Association, Basel) → (Swits Bathers Association, orgeny, of Deadquarters, Basel) (The Thomas More Law Centre, in, Anna Arbor) → (Thomas More Law Centre, orgenty, Cheadquarter, Man Arbor)
F13_ENG_062 F13_ENG_064 F13_ENG_064 F13_ENG_066 F13_ENG_076 F13_ENG_076 F13_ENG_077 F13_ENG_078 F13_ENG_078	are generally green for work that "a decade dolor more, and that the U.S. mutine". Heccure constants, a nonprotein that advances a statistication of the "special relations.". Clima "s shock at NATO"'s milling: camping in the former Yigoshrish helped prod Baying mon playing as bagger role in U.S. Clima "s shock at NATO" s milling: camping in the former Yigoshrish helped prod Baying mon playing as bagger role in U.S. S. Wasser, and the Clina	orgene_numbers_employees, Alan Lehner) (The U.S. High Speed Rail Association, and Kenz) → (U.S. High Speed Rail Association, orgetog_members_employees, Al Kanz) (He U.S. High Speed Rail Association, and Kenz) → (U.S. High Speed Rail Association, orgetog_members_employees, Al kanz) (He Sockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- orgetog_members_employees, Bates Gill) (He Sockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- orgetog_members_employees, Bates Gill) (The Indoor Taming Association, director of, John Overstreet) → (Indoor Taming Association, orgetog_members_employ- han Overstreet) (The Swits Bathers Association, _Patrick Odler) → (Swits Bathers Association, orgetog_members_employ-es, Patrick Odler) (The Swits Bathers Association, in, Batel) → (Swits Bathers Association, orgetog_members_employ-es, Patrick Odler) (The Thomas More Law Center, in, Ann Arbor) → (Thomas More Law Center, engelsy, Chadquarters, Ann Arbor) (The Swits Indices, Law Center, In, Ann Arbor) → (Thomas More Law Center, engelsy, employees, May Robinson)
F13_ENG_062 F13_ENG_064 F13_ENG_064	are generally green betwerk hat a decade old or more, and had be U.S. meint "tecome competencial are generally green betwerk hat a decade old or more, and had be U.S. meint "tecome competencial and advected an advected an advected biological set of the set of the set of the set of the set of the Chune" shock at NATO" similary campaign in the former Yugoshain helped prod Beijing min playing a bigger role in U.S. N- execteving a state Call, advected the Bockkohn International Paces Research Internation and one structure at the Bockkohn International and the set of the Bockkohn International Paces Research International Paces Research International structure and more sophisticand means of visions: a previous player and helper challengers to the international system," and Back Cill, directed the Bockkohn International Paces Research International Paces Research International system, "a sub Back Cill, directed the Bockkohn International Paces Research International system," and Back Cill, directed the Bockkohn International Paces Research International Paces and here weakly consomers to struggling mult biosness, "Adva Deventer, directed the Backor Taking Association to Bocking and their weakly consomers to struggling mult biosness," Adva Deventer, directed the Backor Taking Association International direction weakly consomers to struggling mult biosness, "Adva Deventer, directed the Backor Taking Association International system," and an any epithiolismes in the system of the weakly NZ association in Back- tonaria method weak and any epithiolismes in the system of the weakly association in Back- maters of the Thomas Marker and Structure and the marker association in Back- maters of the Thomas Marker and Marker " New solitons may be exact Circ for the marker and Visional Research Association in Back- tonaria (Carearia Structure), you and the granting more poblems hand your generation, "add Research Hongson, yeaged teachadges, " add Research Structure), you and the granting more poblems hand your generati	orgene princhers, employee, Ala Ledner) (The U.S. High Speed Rail Mosciation, and My Kani) → (U.S. High Speed Rail Association, orgetop_members, employees, Ar The Stockholm International Peace Research Institute, director of, Bates Gill) → (Stockholm International Peace Research In stitut, orgetop, members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute, orgetop_members, employees, Ara (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute, (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- regine), matcher, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Del Godor Taminig Association, orgetop_members, employee, Araet Order) (The Stockholm International Peace (Stockholm Order) → (Stockholm International Peace Research Institu- (The Stockholm Association, Bates) → (Stovis Baakers Association, orgetop_members, employees, Patick Oder) (The Stockholm Association, Bates) → (Stovis Baakers Association, orgetop_members, employees, Patick Oder) (The Thomas More Law Center, in Ann Abor) → (Thomas More Law Center, orgetop_of, Jocalquaters, Ann Abbr) (The Stockholm Out; May Redoineou) → (Naismal Council for Adoption, orgetop_member, employees, May Robinsou) (The Bipartisan Policy Center, Jason Gunnet) → (Bipartisan Policy Center, orgetop_member, employees, May Robinsou) (The Bipartisan Policy Center, Jason Gunnet) → (Bipartisan Policy Center, orgetop_member, employees, Association) (The Bipartisan Policy Center, Jason Gunnet) → (Bipartisan Policy Center, orgetop_member, employees, Bason Gunnet)
F13_ENG_062 F13_ENG_064 F13_ENG_064 F13_ENG_068 F13_ENG_068 F13_ENG_068 F13_ENG_078 F13_ENG_082 F13_ENG_082 F13_ENG_084	are generally green betwerk hat a decade old or more, and had be U.S. meint "tecome competencial are generally green betwerk hat a decade old or more, and had be U.S. meint "tecome competencial and advected an advected an advected biological set of the set of the set of the set of the set of the Chune" shock at NATO" similary campaign in the former Yugoshain helped prod Beijing min playing a bigger role in U.S. N- execteving a state Call, advected the Bockkohn International Paces Research Internation and one structure at the Bockkohn International and the set of the Bockkohn International Paces Research International Paces Research International structure and more sophisticand means of visions: a previous player and helper challengers to the international system," and Back Cill, directed the Bockkohn International Paces Research International Paces Research International system, "a sub Back Cill, directed the Bockkohn International Paces Research International system," and Back Cill, directed the Bockkohn International Paces Research International Paces and here weakly consomers to struggling mult biosness, "Adva Deventer, directed the Backor Taking Association to Bocking and their weakly consomers to struggling mult biosness," Adva Deventer, directed the Backor Taking Association International direction weakly consomers to struggling mult biosness, "Adva Deventer, directed the Backor Taking Association International system," and an any epithiolismes in the system of the weakly NZ association in Back- tonaria method weak and any epithiolismes in the system of the weakly association in Back- maters of the Thomas Marker and Structure and the marker association in Back- maters of the Thomas Marker and Marker " New solitons may be exact Circ for the marker and Visional Research Association in Back- tonaria (Carearia Structure), you and the granting more poblems hand your generation, "add Research Hongson, yeaged teachadges, " add Research Structure), you and the granting more poblems hand your generati	orgene princhers, employee, Ala Ledner) (The U.S. High Speed Rail Mosciation, and My Kani) → (U.S. High Speed Rail Association, orgetop_members, employees, Ar The Stockholm International Peace Research Institute, director of, Bates Gill) → (Stockholm International Peace Research In stitut, orgetop, members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute, orgetop_members, employees, Ara (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institute, (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- regine), matcher, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Del Godor Taminig Association, orgetop_members, employee, Araet Order) (The Stockholm International Peace (Stockholm Order) → (Stockholm International Peace Research Institu- (The Stockholm Association, Bates) → (Stovis Baakers Association, orgetop_members, employees, Patick Oder) (The Stockholm Association, Bates) → (Stovis Baakers Association, orgetop_members, employees, Patick Oder) (The Thomas More Law Center, in Ann Abor) → (Thomas More Law Center, orgetop_of, Jocalquaters, Ann Abbr) (The Stockholm Out; May Redoineou) → (Naismal Council for Adoption, orgetop_member, employees, May Robinsou) (The Bipartisan Policy Center, Jason Gunnet) → (Bipartisan Policy Center, orgetop_member, employees, May Robinsou) (The Bipartisan Policy Center, Jason Gunnet) → (Bipartisan Policy Center, orgetop_member, employees, Association) (The Bipartisan Policy Center, Jason Gunnet) → (Bipartisan Policy Center, orgetop_member, employees, Bason Gunnet)
F13_ENG_062 F13_ENG_064 F13_ENG_064 F13_ENG_068 F13_ENG_068 F13_ENG_068 F13_ENG_078 F13_ENG_082 F13_ENG_082 F13_ENG_084	are generally green betwerk hat a decide of our press, and bud be U.S. means 1 become software and the second a	orgging methods, employees, Alan Leshner) (The U.S. High Speed Rail Association, and My Kanz) → U.S. High Speed Rail Association, orgetog-members, employees, Art The Sockholm International Pace Research Institute, director of, Bates Gill) → (Stockholm International Pace Research In stitut, orgetog-members, employees, Bates Gill)           (The Sockholm International Pace Research Institute, director of, Bates Gill) → (Stockholm International Pace Research Institute, orgetog-members, employees, Bates Gill)           (The Sockholm International Pace Research Institute, director, Bates Gill) → (Stockholm International Pace Research Institute, orgetog-members, employees, Bates Gill)           (The Sockholm International Pace Research Institute, director, Bates Gill) → (Stockholm International Pace Research Institute, orgetog-members, employees, Bates Gill)           (The Sockholm International Pace Research Institute, director, Pates Association, and Control (Fernational Control (Fe
F13_ENG_064 F13_ENG_064 F13_ENG_064 F13_ENG_064 F13_ENG_076 F13_ENG_076 F13_ENG_076 F13_ENG_078 F13_ENG_078 F13_ENG_082 F13_ENG_084 F13_ENG_084	are generally green betwerk har a decide older prize, and hub bet 1.5. means 1. Eccent complexed. The second seco	orgene princhers, employee, Ala Leshner) (The U.S. High Speed Rail Association, and My Kani) → (U.S. High Speed Rail Association, ergetor, members, employees, Ari The Stockholm International Peace Research Institute, director (J. Bates Gill) → (Stockholm International Peace Research In- titute, orgetor, members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research In- titute, orgetor, members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- regretor, members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- regretor, members, employees, Bates Gill) (The Stockholm International Peace Research Institute, director, Bates Gill) → (Stockholm International Peace Research Institu- regretor, members, employees, Bates Gill) (The Stockholm Association, Bates) → (Stovins Batters Association, orgetor, members, employee, Parick Other) (The Stockhalters Association, Bate) → (Stovins Batters Association, orgetor, Gendaguaters, Bate) (The Thomas More Law Center, in Ann Ahor) → (Thomas More Law Center, orgetor, of Jeadaguaters, Ann Ahor) (The Bipartisan Policy Center, Jason Gunnet) → (Bipartisan Policy Center, egrotor, employees, Mary Roblinson) (The Bipartisan Policy Center, Jason Gunnet) → (Bipartisan Policy Center, egrotor, employees, and polyces, Mary Roblinson)

Figure 4:  $\textsc{BERT}_{\rm LARGE}$  on TAC KBP-OIE.

ID SF13_ENG_001	Sentence But in a sign of just how disenchanted some Afghans have become with their government, Bashardost, a doctoral scholar who lived in France for two decades, is widely believed to be at least fourth in popularity among 42 candidates in the August elections.	Triples to gold triples (Bashardost, " A Doctoral Scholar) → (Ramazan Bashardost, per:title, scholar)
SF13_ENG_001	Bashandost left Pakistan for France in 1981	
SF13_ENG_007	Mohammed Tantawi, head of A-A-Arbar University, told a schoolgirl to remove her niqab when he spotted her during a tour of an A1-Arbar affiliated school, the independent Al-Massy al-Youn newspaper reported this week. He took office in 2006 by defenting longime incumbent Anwar (Chowdry from Phätstan, who was later barred for alleged financial	(Bashardost, left, Pakistan) → (Ramazan Bashardost, per.coantries_of_residence, Pakistan) (Mohammed Tantawi, head, Al-Azhar University) → (Mohammed Sayed Tantawi, per.employee_or_member_of, Al-Azhar Uni- versity)
SF13_ENG_009	He took office in 2006 by defeating longtime incumbent Anwar Chowdhry from Pakistan, who was later barred for alleged financial corruption.	$(Long time Incumbent Anwar Chowdhry, from, Pakistan) \rightarrow (Anwar Chowdhry, per:origin, Pakistan)$
SF13_ENG_010 SE13_ENG_011	In addition to his wife, Wendy, Dio is survived by son Daniel, grandchildren Julie and Joey, and father Pat. Marchall is charated with grand lacenty and from and force up to 25 years in prices if convicted	(Dio, is survived by son, Daniel) → (Ronnie James Dio, per:children, Daniel) (Marchall with Grand) → (Anthony Marchall per:change (rand))
SF13_ENG_011 SF13_ENG_011	Marthall is charged with grande larcery and fined and faces up to 25 years in prison if convised. Marthall is charged with grande larcery and fined and faces up to 25 years in prison if convised. Marthall is, Tony Wand-Warning Renordwarp producer and famere U.S. diplomat, sat storebles as the jury forervoman read each verdict aloud, the word "guilpy" clarity resonating in the otherwise silter controom. The blueblood critics of one of America's most limits appeared to listen impassively as verdics; finding him guilty on	(Marshall, with, Fraud) → (Anthony Marshall, per.charges, fraud) (Marshall, _ producer) → (Anthony Marshall, per.title, producer)
SF13_ENG_011	The blueblood second guilty creanly resonanting in the other was shear countroom. The blueblood second of one of America's most illustrious similies appeared to listen impassively as verdicts finding him guilty on 14 sound of more discovery approximately and fored your mode to a source of a source of the so	$(\mathrm{Him},\mathrm{guilty}\;\mathrm{on},\mathrm{Grand}\;\mathrm{Larceny}) \rightarrow (\mathrm{Anthony}\;\mathrm{Marshall},\mathrm{per:charges},\mathrm{grand}\;\mathrm{larceny})$
SF13_ENG_011 SF13_ENG_012	14 counts of grand larceny, conspiracy and fraud were read to a packed courtroom. But Marshall's son, Philip, told a different story.	(Marshall'S Son, ., Philip) → (Anthony Marshall, per-children, Philip)
	but starsmits sour, runny, tout a unretent story. Al-Qaeda's American spokesuma Adam Gadahn, also known as Azzam the American, called on Muslims in the West on Sunday to carry out more attacks like the deadly shooting at the US base in Fort Hood, Texas.	(Adam Gadahn, , also known, Azzam) → (Adam Gadahn, per:alternate_names, Azzam)
SF13_ENG_012 SF13_ENG_012	Gadahn, also known as Azzam the American, was born in 1978. Gadahn grew up in California and converted to Islam before he moved to Pakistan in 1998 and attended an al-Qaida training camp	(Gadahn, also known as, Azzam) → (Adam Gadahn, per:alternate_names, Azzam) (Gadahn, in, California) → (Adam Gadahn, per:statesorprovinces_of_residence, California)
SF13_ENG_012	six years later, according to media reports. Gadahn moved to Pakistan in 1998, according to the FBI, and is said to have attended an al-Qaida training camp six years later,	$(Gadahn, moved to, Pakistan) \rightarrow (Adam \ Gadahn, per.countries\_of\_residence, Pakistan)$
SF13_ENG_014	serving as a translator and consultant for the group. After the Munich attack, he lived in Lebanon, Jordan and several Eastern European countries, where he had close ties to Communist	$({\rm He, livedin, Lebanon}) \rightarrow ({\rm Mohammed Oudeh, per:countries\_of\_residence, Lebanon})$
SF13_ENG_015	Autor the Waiter and active in recursion, source and several reasons rearrange and construction where the number of the several several reasons constructions, where he had cover us to Community bols intelligence agencies. Clifton attended Howard University but left before graduating to parsase poetry.	(Clifton, attended, Howard University) → (Lucille Clifton, per.schools_attended, Howard University)
SF13_ENG_017 SF13_ENG_017	Clifton attended Howard University but left before granulating to pursue poetry. "Alexander High devold bis caret to even sings our country, both as a solder and as a diplomat," Albright said. " In 1999, he resigned and retired from the Army. McGreger is survived by his wite, Lord, and four children, danghters Jordan, Taylor and Landri, and a son, Logan. "Mike was a first-separatile, a value methor of our staff for 25 years and se will miss him," Times Bdine Rass Stanton said.	(Alexander Haig, as, soldier) = (Alexander Haig, perrulk, soldier) (He, resigned and, The Amny) = (Alexander Haig, perrulk, soldier) (Me, gregged, by his wife, Luri) => (Alei McGregge perspose, Lori) (Make, wa, A. First Read Lorandiar) => (Mike Pennet, perrulk, first-atte pennlast)
SF13_ENG_019 SF13_ENG_020	McGregor is survived by his wife, Lori, and four children, daughters Jordan, Taylor and Landri, and a son, Logan. "Mike was a first-rate journalist, a valued member of our staff for 25 years and we will miss him," Times Editor Russ Stanton said.	(Mcgregor, by his wife, Lon) → (Keli McGregor, per:spouse, Lon) (Mike, was, A First-Rate Journalist) → (Mike Penner, per:title, first-rate journalist)
SF13_ENG_020	Penner is survived by his brother, John, a copy editor at the Times, and his former wife. Times sportswriter Lisa Dillman. She was charged with theft in Beaumont, Texas, for allegedly failing to pay for \$10,000 worth of dental work in 2006.	(Penner, by his brother, John) $\rightarrow$ (Mike Penner, persiblings, John)
SF13_ENG_024 SF13_ENG_025	Michigan native Nancy Kissel was convicted of murder and sentenced in Hong Kong's High Court in September 2005.	(Sne, was charged with, Theft) → (Crystal Taylor, percharges, theft) (Michigan Nation Nanew Vireal, convicted of Murder) → (Nanew Vireal, percharger, murder)
SF13_ENG_026 SF13_ENG_026	Neal returned to New York and concentrated on stage work. In 1953, she married Roald Dahl, the British writer famed for "Charlie and the Chocolate Factory," "James and the Giant Peach"	(Meal, returned, New York) → (Patricia Neal, perstates provinces, of zeroidence, New York) (She, married, New York) → (Patricia Neal, perstates provinces, of zeroidence, New York) (She, married, Roald Dahl) → (Patricia Neal, perspose, Roald Dahl)
SF13_ENG_026	and other tales for children. Oscar-winning actress Patricia Neal has died of lung cancer at her home on Martha's Vineyard, Massachusetts, on Sunday.	(Neal bas diad of Lung Cancer) -+ (Patricia Neal personnes of death lung cancer)
SF13_ENG_027 SF13_ENG_027	Al-Hakim's son, Ammar al-Hakim, has been groomed for months to take his father's place. Al-Hakim is the head of Supreme Iraqi Islamic Council (SIIC), the largest Shiite party in Iraq.	(retain, and one of c. ang Cameer) of united retain persisting of the analysis of the analy
SF13_ENG_027		Council) (Al-Hakim, died in a, Iran) → (Abdul Aziz Al-Hakim, per.country_of_death, Iran)
	His former Shitle partners have gathered again to form their own group, the Iraqi National Alliance (INA), which includes the influential Supreme Iraqi Islamic. Concruit (SIC) of Annur al-Halam, who succeeded his thirther Abdu Azir al-Halam, who died in a hopdinal I fan last normal her also gathere with cancer. "If a rhather have Saly doing this fam some atraager, or norma bothort prigato he the next Rilly Mays," said the gay who actually is then ench Rilly Mays. Is on Rilly Mays III.	
SF13_ENG_028	"Td rather have Sully doing this than some stranger, or some hotshot trying to be the next Billy Mays," said the guy who actually is the next Billy Mays, his son Billy Mays III.	(The Next Billy Mays, , his son, Billy Mays Iii) $\rightarrow$ (Billy Mays, per-children, Billy Mays III)
SF13_ENG_029	Fignon continued cycling during and after a stint in the Army, and drew attention in the early 1980s when he managed to keep up with Hinault during a race in which amateurs and professionals rode together.	$(Fignon, during and after a stint in, The Army) \rightarrow (Laurent Fignon, per:employee_or_member_of, the Army)$
SF13_ENG_029 SF13_ENG_030	Epono continued cycling during and after a stati in the Army, and dreve attention in the early 1990s when he managed to keep up with Hamah during a nex in which ammeters and professionals neds together. Laurent Patrick Figuon was horn in Paris on Aug. 12, 1990. Auderson heccamic the Tigger in June 1999 and built on a foundation that included Alan Trammell at shortsop. Leu	(Laurent Patrick Fignon, was born in, Paris) → (Laurent Fignon, per:city_of_birth, Paris) (Anderson, became, The Tigers' Manager) → (Sparky Anderson, per:title, manager)
SF13_ENG_030	In addition to his wife, Carol, Anderson is survived by his sons. Lee and Albert: his daughter, Shirlee Englebrecht: and many	(Anderson, escaine, the regets immiges) → (Sparky Anderson, perchildren, Lee) (Anderson, is survived by his sons, Lee) → (Sparky Anderson, perchildren, Lee)
SF13 ENG 031	Blake Edwards a writer and director who was bailed as a Hollywood master of screwball farces and rule comedies like "Vic-	(Blake Edwards writer) → (Blake Edwards. per:title, writer)
SE13 ENG 032	tor/Victoria" and the "Pink Panther" movies, died Wednesday night in Santa Monica, Calif. He was 88. Hwang, who lives in Seoul under tight police security, has written books and delivered speeches condemning Kim's regime as	(Hwang, who lives Secol) → (Hwang Jane, Yon percities of residence Secol)
SE13 ENG 035	authoritarian and dictatorial. Kaczynska, who was 67, married Kaczynski in 1978 after meeting him in the northern Polish city of Gdansk, where they were both	(Kaczynska married Kaczynski) → (Maria Kaczynska personase Kaczynski)
SF13 ENG 036	academics. Upon his release he went into exile in India, where he masterminded the 1973 hijacking of a Royal Neral Airlines plane known to	(His Release, he went into, India) → (Girija Prasad Koirala, per:countries_of_residence, India)
SE13 ENG 036	be carrying hundreds of thousands of dollars in cash to fund his banned Nepali Congress party. Koirala began his political career as a union organiser and was imprisoned for seven years in 1960 after a failed uprising against	(Koirala, career as, A Union Organiser) → (Girija Prasad Koirala, per.title, union organiser)
	Koirala was born in 1925 in Bihar of India where his father Krishna Prasad Koirala and his family were living in exile.	
SF13_ENG_036 SF13_ENG_036	Koirala was born in 1925 in Bihar of India at the time when his father Krishna Prasad Koirala along with his family was exiled by Pana ruler:	(Koirala, was born in 1925 in, Bihar) → (Girija Prasad Koirala, per:city_of_birth, Bihar) (Koirala, born in 1925, Bihar) → (Girija Prasad Koirala, per:city_of_birth, Bihar)
SF13_ENG_037	Chabrol's survivors also include his third wife, Aurore Pajot, who acted as his script supervisor on nearly all of his movies from 1068 as an advantation of the second s	(Chabrol'S Survivors, wife, Aurore Pajot) $\rightarrow$ (Claude Chabrol, per.spouse, Aurore Pajot)
SF13 ENG 038	two to rain whith ite matrix to (95), and reply Campione). Cever smaster, we use an assume material wave the script with him PTD (edi Cat in ProV (201)). The joint statement and Camingham was, "an impring performer and dancer into his 806, and a visionary choreographer and dedicated extecher threegoed his lift, he led equival and y camage", the statement stat. Mercy Camingham, the consignment in Corresponder, hy planning for a world whom him. Accurt as Mondy Learned her whome of Him Interply Evelocities and LaG Cooky who deal of cancer last year, of rape.	(Cunningham, was, An Inspiring Performer) → (Merce Cunningham, per:title, performer)
SF13_ENG_038	dedicated teacher throughout his life, he led an impring performant and united into the work, and a visionary envicously environment and dedicated teacher throughout his life, he led and any second	(Merce Cunningham, was van napining Fertonine) → (Merce Cunningham, perinter, performer) (Merce Cunningham, , The Nonagenarian Choreographer) → (Merce Cunningham, periitle, choreographer)
SF13_ENG_039 SF13_ENG_041	A court on Monday cleared the widower of British reality television star Jade Goody, who died of cancer last year, of rape. Don Hewitt, the CBS newsman who invented the highly popular TV newsmagazine "60 Minutes" and produced it for 36 years, died	(Goody, Cancer) → (Jade Goody, percause_of_death, cancer) (Don Hewitt, The Cbs Newsman) → (Don Hewitt, pertitle, newsman)
SF13_ENG_041	Wednesday. "He was the consummate television newsman." Don Hewitt, a lonetime CBS News executive and creator of the lone-running "60	(Don Hewitt, , , rae cos Newsman) → (Don Hewitt, per.title, newsman) (Don Hewitt, , , executive) → (Don Hewitt, per.title, executive)
	Minutes" arms are small build Builton "	
SF13_ENG_041 SF13_ENG_041 SF13_ENG_043	Nimites newly program, non-receivers. Hervist was already a highly respected TV newsman. Donald Shepard Hervist was horn in New York on Dec. 14, 1922, and grew up in the suburb of New Rochelle. Eleance Louise (networkish was horn in Broskly no OK. 23, 1940.	(Hewitt, was, A Highly Respected Tv Newsman) → (Don Hewitt, persitile, TV newsman) (Donald Shepard Hewitt, born, New York) → (Don Hewitt, perstatocoprovince, of_birth, New York) (Eleasor Louise Greenwich, Nom in, Oct.) → (Ellic Greenwich, perslate, of_birth, 1940-10-23)
SF13_ENG_043	Encanor Louise Greenwich was boin in Brooklyn on Cer. 23, 1940. A little more than a year after Dunne died from bladder cancer, the colorful remnants of his estate have been consigned by his family to Stair Galleries in Hudson, N.Y., which will auction them Nov. 20.	(Ineador Louise Greenwar, boin in, Oct.) → (Ente Greenwar, per.aute_ot_butu, 1940-10-25) (Dunne, died, Bladder Cancer) → (Dominick Dunne, per:cause_of_death, bladder cancer)
SF13_ENG_048	taminy to shart canteries in Huason, N. T., which will auction them Nov. 20. Charles Gwathney, an architect known for his influential modernist home designs and famous clients like director Steven Spielberg, has died.	$(Charles Gwathmey, ,, architect) \rightarrow (Charles Gwathmey, per:title, architect)$
SF13_ENG_049 SF13_ENG_049		(Mandelbrot, two sons, Laurent) → (Benoit Mandelbrot, per.children, Laurent) (He, worked, lbm) → (Benoit Mandelbrot, per.employee_or_member_of, IBM)
SF13_ENG_049 SF13_ENG_049	For years, he worked for BMM in New York. After several years, he worked for BMM in New York. After several years spential party in at the Contern National da B (Secherche Scientingiane) in Parts, Mandelbew was hirted by IBM in 1958 to work at the Thomas J. Watson Research Center in Yorknown Heights, N.Y. Although he worked frequently with academic researchers and access a a svisiting probases at H aury and and the Massachmetts Institute of Technology, it was not until 1957 that	(He, worked, Ibm) → (Benoit Mandelbrot, per:employee_or_member_of, IBM) (Mandelbrot, hired by, Ibm) → (Benoit Mandelbrot, per:employee_or_member_of, IBM)
	1958 to work at the Thomas J. Watson Research Center in Yorktown Heights, N.Y. Although he worked frequently with academic researchers and served as a visiting professor at Harvard and the Massachusetts Institute of Technology, it was not until 1987 that	
SF13_ENG_056	he began to teach at Yale, where he earned tenure in 1999. "It's an issue for everybody in the state because peanuts are a big part of our economy," said Don Koehler, executive director of the	(The Georgia Peanut Commission, director of, Don Koehler) → (Georgia Peanut Commission, org:top_members_employees, Don
SF13_ENG_060	researchers and served a sa visiting professor at Harvan and and the Massachusetts Institute of Technology, it was not until 1987 that he begate to teach at Yale, where he cannel tenzem [1999]. "It's an issue for everybody in the state because peants are a big part of our economy," said Don Koehler, executive director of the Georgin Peant Commission." We It he meeting with scientists, university and science policy officials to explore practical opportunities for exchange and collab-	Kochler) (The Aaas President, "Agre) → (American Association for the Advancement of Science, org:top_members_employees, Peter C.
SF13_ENG_060	oration," Agre, the AAAS president, was quoted as saying.	Agre) (The American Association, " Alan Leshner) → (American Association for the Advancement of Science,
SF13_ENG_060	Issoverer, Aust Leutiner, chief electristic officiel on the American Association for the Availatements of sensor and some time Availatement of the	(1ne American Association, Alla Lestiner) → (American Association for the Advancement of Science, org:top=methods_employees. Alla Leshner) (The American Association, of, Mary Good) → (American Association for the Advancement of Science, org:top=methods_employees.pmployees.mployees. Mary Good)
	chairman of the National Transportation Safety Board; Mary Good, a former president of the American Association for the Advance- ment of Science; Roger Martin, dean of the Rotman School of Management; Brian O'Neill, a former president of the Insurance	org:top_members_employees, Mary Good)
SF13_ENG_062	men is Sector, poge sum, case is menore the former stronger and the sector stronger and the sector process on the meanure initiate for flighteen starting stronger and the stronger and the stronger and the sector stronger and the "First of all, they never have enough funding," and Andy Kenz, president of the U.S. High Specel Rail Association, a nonprofit that above are anatomic high-oped rail network. The former Yugoslavia helped prof Beijing into playing a bigger role in UN. Chain's shock at NAU's millinger comparing in the former Yugoslavia helped prof Beijing into playing a bigger role in UN. Desceleration, and Bates Clill directed the Stockholm International Pace Research Institute and co-subto of a recent report on	(The U.S. High Speed Rail Association, of, Andy Kunz) → (U.S. High Speed Rail Association, org:top_members_employees,
SF13_ENG_064	advocates a national high- speed rail network. " China's shock at NATO's military campaign in the former Yugoslavia helped prod Beijing into playing a bigger role in U.N.	Andy Kunz) (The Stockholm International Peace Research Institute, " Bates Gill) → (Stockholm International Peace Research Institute,
	peacekeeping, said Bates Gill, director of the Stockholm International Peace Research Institute and co-author of a recent report on China's peacekeeping activities.	org:top_members_employees, Bates Gill)
SF13_ENG_064	China's packeeping, sum to interest on a metabolic mean of the constant set of the constant and the constant of the constant set of the constant s	(The Stockholm International Peace Research Institute, , director of, Bates Gill) → (Stockholm International Peace Research Institute, org:top_members_employees, Bates Gill)
SF13_ENG_068		(The Indoor Tanning Association, director of, John Overstreet) → (Indoor Tanning Association, org:top_members_employees,
	star nates cont, unevelo or une sookaloam meriadioatar reace research manuer. T is not suppring that one primarily cosmetic business is trying to thou wandber under the bus by transferring a tax from rich doctors and their wealthy customers to struggling small businesses," John Overstrete, director of the ladoor Tanning Association, said in a statement Saurday.	John Overstreet)
SF13_ENG_076	The chairman of the Swiss Bankers Association, Patrick Other, told weekly NZZ am Sonntag that Italy and France have shown interest in deals like ones Switzerland signed this week with Germany and Britain	(The Swiss Bankers Association, ,, Patrick Odier) → (Swiss Bankers Association, org:top_members_employees, Patrick Odier)
SF13_ENG_076	The majority of voters in Switzerland, which manages more than 25 percent of the world's foreign-held private wealth, support banking suggests, according to a curvey published bet month by the Switz Banker. According in Basel	(The Swiss Bankers Association, in, Basel) → (Swiss Bankers Association, org::ity_of_headquarters, Basel)
SF13_ENG_078	"Americans have a right to know the truth – Islam is a religion of intolerance and violence," said Richard Thompson, legal director of the Thomas More I aw Center in Ann Arbor."	(The Thomas More Law Center, in, Ann Arbor) → (Thomas More Law Center, org:city_of_headquarters, Ann Arbor)
SF13_ENG_082 SF13_ENG_082	New solutions may be enacted for these orphans, though, said May Rohmon, CEO of the National Council for Adoption. "When you close a country, you end up causing more problems han you prevent," said Chack Johnson, CEO of the National Council for Adoption." "This is definitely of coldiacket problems," and Jason Grumer, president of the Biparisan Policy Center and an energy adviser to the	(The National Council, of, Mary Robinson) → (National Council for Adoption, org:top_members_employees, Mary Robinson) (The National Council, CEO of, Chuck Johnson) → (National Council for Adoption, org:top_members_employees, Chuck Johnson)
SF13_ENG_082	Council for Adoption." This is definitely a Goldilocks problem," said Jacon Grumet, president of the Binartican Policy Center and an anorrow solviour to the	(The Bipartisan Policy Center, "Jason Grumet) → (Bipartisan Policy Center, org:top_members_employees, Jason Grumet)
SF13_ENG_084	Obama campaign last year. "Banks are in strong need for the capital markets (to raise funds)" Li Fuan a director at the China Rowling	(The Chine Dealling Dealling Commission & director Li Even) + (Chine Dealling Dealling Commission
SF13_ENG_089	There is a sensitive processing and the processing and a state of the sensitive processing and the sens	(The China Bainking Regulatory Commission, a uncertor, El Funit) → (China Bainking Regulatory Commission, org:top_members_employees, Li Fuan) (Rosoboronexport, head of, Anatoly Isaikin) → (Rosoboronexport, org:top_members_employees, Anatoly Isaikin)
SF13_ENG_089	ACR VOUVAL and Interfax the relation's stanting read of Rossoboloutexplot, as saying finansary nonling is obcaung the communion of military-technical cooperation'' with Iran. Rossbornnewnort is the only company in Russia that is allowed to export arms, dual,use products and military-arelated services.	
SF13_ENG_091	Rousbonneerport is the only company in Rancia that is allowed to export arms, dual-use products and military-related services. With his wife, Cornelie, Middelhoff invested money in 2000 and 2001 with Esch in funds that were formed to buy five properties from KarstadQuelle, as Arcanade was then known, and leased back to the department start echain before Middelhoff joined the	(Rosoboronexport, is the only company in, Russia) → (Rosoboronexport, org:country_of_headquarters, Russia) (Arcandor, , Karstadaquelle) → (Arcandor, org:alternate_names, KarstadaQuelle)
SF13_ENG_091	noun sanandeene, si Atchinot was inen anowa, ana reases suck to the ceptantient sare cuan tectore studention joines une company, according to Middlehfler spokestman. Arcandor's mail-order subsidiary Quelle is in worse shape however, Klaus-Hubert Goerg told a press conference in the western city of Elson, where Arcandor is based.	$(Arcandor,, Essen) \rightarrow (Arcandor, org:city_of_headquarters, Essen)$
3413_ENG_091	of Essen, where Arcandor is based.	(лихинол, " коми) → (лихинбой, ugxity_01_пенициянств, комен)

Figure 5: GPT-2 $_{\rm XL}$  on TAC KBP-OIE.

			gold triples
ID SF13 ENG 005	Sentence The men, who live in the Chicago area, were identified as David Coleman Headley	BERT <sub>LARGE</sub> (Rana, a native of, Canada) → (Tahawwur Hussain Rana, per:origin, Canada)	GPT-2 <sub>XL</sub>
	, 49 , a US citizen , and Tahawwur Hussain Rana , 48 , Rana , a native of Pakistan and citizen of Canada .		•
SF13_ENG_006	Khan died at his music centre near San Francisco in the United States after a pro- longed kidney ailment , the news agency said .	(Khan, died at his, The United States) → (Ali Akbar Khan, per:country_of_death, United States)	
SF13_ENG_006		•	(He, of, All-India Radio) → (Ali Akbar Khan, per:employee_or_member_of, A India Radio)
SF13_ENG_006	By his early 20s he was music director of All-India Radio in Lucknow, broadcasting as a solo arist and composing for the radio's or chestra. Defying his father, Khan moved to Bombay and began writing scores for films . including Chetan Anand's "A andhiyan" (1952), Satyajit Ray's "Devi" (1960) and Tapan Sinha's "Hungry Stones" (1960).	(Khan, moved, Bombay) $\rightarrow$ (Ali Akbar Khan, per:cities_of_residence, Bombay)	•
SF13_ENG_007	) and Tapan Sinha" s " Hungry Stones " (1960). In 1966 he graduated from the faculty of theology at Al-Azhar, the 10th century university that has trained the majority of Sunni Muslim clerics from Africa and Aric		(He, graduated from, Al-Azhar) $\rightarrow$ (Mohammed Sayed Tantav per:schools_attended, Al-Azhar)
SF13_ENG_009	He became AIBA president in 2006 by defeating longtime incumbent Anwar Chowdhry of Pakistan, who was later barred for alleged financial corruption.	•	$(Long time Incumbent Anwar Chowdhry, by, Aiba President) \rightarrow (Anwar Chowdh per-employee_or_member_of, AIBA)$
SF13_ENG_011 SF13_ENG_012	Marshall could get a lengthy prison term if convicted of grand larceny. Gadahn, also known as Azzam al - Amriki, was dressed in white robes and wearing	(Gadahn, known as, Azzam Al-Amriki) → (Adam Gadahn, per:alternate_names,	(Marshall, of, Grand Larceny) → (Anthony Marshall, per:charges, larceny)
3113_140_012	a white turban as he called for attacks on what he described as " high - value targets	(Gauani, known as, Azzani Ar-Anniki) → (Auani Gauani, per.anernate_names, Azzam al-Amriki)	
SF13_ENG_012	Gadahn grew up on a farm in California and converted to Islam before moving to Pakistan in 1998 and reportedly attending an al - Qaida training camp .	$({\rm Gadahn,  to,  Pakistan}) \rightarrow ({\rm Adam  Gadahn,  per: countries\_of\_residence,  Pakistan})$	
SF13_ENG_012 SF13_ENG_015	He was born in Oregon on Sept. 1, 1978 to a Jewish family.	(Her Sister, son ,, Graham) → (Lucille Clifton, per:children, Graham)	(He, born in, Sept.) → (Adam Gadahn, per:date_of_birth, 1978-09-01)
SF13_ENG_015	Besides her sister, Philip, survivors include a son, Graham; three daughters, Sidney, Gillian and Alexia; and three grandchildren. In addition to her daughter, of Columbia, other survivors include two daughters	(Her Daughter, "Sidney Clifton) → (Lucille Clifton, perchildren, Sidney Clifton)	-
	<ul> <li>Sidney Clino of Los Angeles and Gillian Clifton - Monell of Fort Washington , Md.,; a son , Graham Clifton of Wichita ; a sister ; and three grandchildren .</li> <li>Haig , 85 , died early Saturday in a Baltimore , Maryland , hospital .</li> </ul>		
SF13_ENG_017		(Haig, died early, A Baltimore, Maryland, Hospital) → (Alexander Haig, per:stateorprovince_of_death, Maryland)	•
SF13_ENG_019	McGregor was born in Iowa, but grew up in Colorado where his father, Brian, was a coaching legend at Arvada West. Kissel was born in Adrian, Michigan, but her family had also lived in Minneapolis.	(Mcgregor, but grew up, Brian) → (Keli McGregor, per:parents, Brian)	•
SF13_ENG_025 SF13_ENG_025	Kissel, 46, of Adrian, Michigan, was convicted of drugging then bashing her hus- band Robert to death in a Juyury Hong Kong apartment and centenced to life in	-	(Kissel, in, Minneapolis) → (Nancy Kissel, per:cities_of_residence, Minneapoli (Kissel, of, Michigan) → (Nancy Kissel, per:statesorprovinces_of_residen Michigan)
SF13_ENG_026	prison in September 2005. Neal had lung cancer and died at her home in Edgartown , Massachusetts on Martha	(Neal, died at her home in, Edgartown) → (Patricia Neal, per:city_of_death, Edgar-	
SF13_ENG_026	's Vineyard, said longtime friend Bud Albers of Knoxville. She grew up in Knoxville, Tenn., where Neal was turned onto acting at 10 after seeing an impassioned speech about "demon rum" at the local temperance union	town)	(She, in, Tenn.) → (Patricia Neal, per:statesorprovinces_of_residence, Tennesse
	seeing an impassioned speech about "demon rum" at the local temperance union speaking contest. Al-Hakim, who died Wednesday of lung cancer in Tehran, was a symbol for many		
SF13_ENG_027	of the re-emergence of Iraq's Shiite political majority after decades of oppression		(Al-Hakim, who died, Tehran) $\rightarrow$ (Abdul Aziz Al-Hakim, per:city_of_dea Tehran)
SF13_ENG_028	under Sadcam russen s sumi-tec regime. TAMPA Heart disease, exacerbated by cocaine use, killed celebrated TV pitch- man Billy Mays, according to the Hillsborough County medical examiner's final autopsy report released Friday.	(Celebrated Tv Pitchman Billy Mays, killed, Tampa) $\rightarrow$ (Billy Mays, per-cause_of_death, TAMPA Heart disease)	
SF13_ENG_030	Family spokesman Dan Ewald said Anderson died from complications from demen- tia	(Anderson, died from, Dementia) → (Sparky Anderson, per:cause_of_death, de- mentia)	
SF13_ENG_031	He served in the Coast Guard during World War II and had a rare leading role in the low - budget thriller "Strangler of the Swamp " (1946.)	(He, in, The Coast Guard) → (Blake Edwards, per:employee_or_member_of, Coast Guard)	
SF13_ENG_031	low - budget thriller " Strangler of the Swamp " ( 1946 ) . His agent Lou Pitt confirmed he had died , while the " Entertainment Tonight " news show and website reported that he died in Santa Monica on Wednesday night from	(He, died, Complications) → (Blake Edwards, per:cause_of_death, complications)	
SF13_ENG_033	complications of pneumonia, with Andrews at his side . In a career that spanned seven decades, Ginzburg authored several groundbreaking studies in various fields – such as quantum theory, astrophysics, radio-astronomy and diffusion of cosmic radiation in the Earth's atmosphere – that were of "Nobel		(Ginzburg, in, The Lebedev Physics Institute) $\rightarrow$ (Vitaly Ginzburger:employee_or_member_of, Lebedev Physics Institute)
SF13_ENG_035	Prize caliber," said Gennady Mesyats, the director of the Lebedev Physics Institute in Moscow, where Ginzburg worked. Kaczynska, who died aged 59, married Kaczynski in 1978.		
SF13_ENG_035 SF13_ENG_037	Prime Minister Francois Fillon called Chabrol a " great director , producer and screenwriter ( who ) was one of the grand figures of the ' Nouvelle vague , ' which revolutionized the style and techniques of cinema by looking at real experience ,	(Kaczynska, matried, Kaczynski) → (Maria Kaczynska, per:spouse, Kaczynski) (Alp Chabrol, was, director) → (Claude Chabrol, per:title, film director); (Chabrol, director, Producer) → (Claude Chabrol, per:title, producer)	•
SF13_ENG_038	true life , that which is indiscreet and subtle . " Cunningham's survivors include a brother, Jack Cunningham of Centralia.		(Cunningham'S Survivors, brother, Jack Cunningham) → (Merce Cunningham)
SF13_ENG_038	Mercier Philip Cunningham was born in Centralia, Wash., on April 16, 1919.		(cumingiani ) (where cumingiani) → (where cumingiani) per.siblings, Jack Cumingham) (Mercier Philip Cumingham, was born in, April) → (Merce Cunninghaper.date_of_birth, 1919-04-16)
SF13_ENG_041	A year after enrolling in New York University on a track scholarship , Hewitt	(Hewitt, ,, New York University) → (Don Hewitt, per.schools_attended, New York University)	-
SF13_ENG_041	dropped out . By the time Hewitt was 6, his family was living in New Rochelle, N.Y.	-	(Hewitt, in, New Rochelle) → (Don Hewitt, per:cities_of_residence, N Rochelle)
SF13_ENG_043	Greenwich also worked as an arranger and singer , a role that saw her working with	(Greenwich, worked as an, Singer) $\rightarrow$ (Ellie Greenwich, pertitle, singer)	-
SF13_ENG_044	artists including Frank Sinatra and Ella Fitzgerald . Dunne was born in 1925 in Hartford, Connecticut, to a wealthy Roman Catholic		(Dunne, was born in 1925 in, Connecticut) → (Dominick Dun
SF13_ENG_044	family and grew up in some of the same social circles as the Kennedys. In 1957, Dunne moved to Los Angeles to work on the CBS showcase " Playhouse in control of the same social circles are solved as the solved as th	(Dunne, moved to, Los Angeles) → (Dominick Dunne, per:cities_of_residence,	er:stateorprovince_of_birth, Connecticut)
SF13_ENG_044	90. " Dunne found his greatest prominence as a celebrity journalist while covering the 1995 murder trial of football star and actor O.J. Simpson, who had been accused of	Los Angeles)	$({\rm Dunne,\ as,\ A\ Celebrity\ Journalist}) \rightarrow ({\rm Dominick\ Dunne,\ per-title,\ celebrity\ jonalist})$ nalist)
SF13_ENG_045	killing his ex-wife Nicole Brown Simpson and her friend Ronald Goldman. Goldstein died in New York on Aug . 28 .	$(\text{Goldstein, died, Aug.}) \rightarrow (\text{Adam Goldstein, per:date_of_death, XXXX-08-28})$	•
SF13_ENG_046	After acting in movies and television, Meredith receded into a quiet life in Santa Fe , writing , painting , golfing and acting in a stage production of " The Odd Couple .	(Meredith, in, Santa Fe) $\rightarrow$ (Don Meredith, per:cities_of_residence, Santa Fe)	
SF13_ENG_046	In high school and at Southern Methodist University , where , already known as Dandy Don ( a nickname bestowed on him by his brother ) , Meredith became an	(Dandy Don, where , Southern Methodist University) $\to$ (Don Meredith, per:schools_attended, Southern Methodist University)	
SF13_ENG_046	all - American . He spent much of his life backing away from the nickname Dandy Don , particularly during his secluded later decades in New Mexico .	(He, the nickname, Dandy Don) $\rightarrow$ (Don Meredith, per:alternate_names, Dandy	
SF13_ENG_048	during his secluded later decades in New Mexico . The group, known variously as the Five or the Whites (for the color of most of their buildings) or the New York School, consisted of Gwathmey, Michael Graves,	Don) -	(Gwathmey, of, The New York School) → (Charles Gwathm per:employee_or_member_of, New York School)
SF13_ENG_048	Eisenman, John Hejduk and Richard Meier. Meier, who said he had known Gwathmey for 50 years, has particularly fond memories from the time when Gwathmey was first courting his second wife. Bette -	(Gwathmey, his second wife , Bette-Ann Damson) $\rightarrow$ (Charles Gwathmey, per:spouse, Bette-Ann Damson)	•
SF13_ENG_057	Ann Damson, and they all picked corn for dinner in a field adjacent to a barn Meier was renting on the East End of Long Island. By 2013, automakers will have dozens of plug-in electric hybrid vehicles and fully electric vehicles, said Jason Forcier, a vice president at battery maker A123 Systems	*	(A123 Systems Inc., a vice president, Jason Forcier) → (A123 Systems In org:top_members_employees, Jason Forcier)
SF13_ENG_058	Inc. Access Industries, a privately held company founded in 1986 by Len Blavatnik, has a diverse portfolio of investments in industry, real estate, media and telecom-	(Access Industries, founded in 1986 by, Len Blavatnik) → (Access Industries, emofounded her Lan Blavatnik)	-
SF13_ENG_069	munications . & anot: The indications are positive & anot: said Vincent Cogliano, director of the	org:founded_by, Len Blavatnik)	$(Iarc, , director of the, Vincent Cogliano) \rightarrow (International Agency for Research$
SF13_ENG_082	Monographs program at IARC, which decides on carcinogen classifications. "There hasn't been a concerted push to open doors for Muslim orphans because the expectation would be that those efforts would fall flat." said Chuck Johnson, chief	•	(anc, curced o us, vincen cognino) / (internation regery to restauch Cancer, org:top_members_employees, Vincent Cogliano) (Adoption, in, Alexandria) → (National Council for Adopti org:city_of_headquarters, Alexandria)
SF13_ENG_084	executive of the National Council for Adoption, a policy group in Alexandria, Va. "The scenario itself is secret," said Eileen McMenamin, vice president of com- munications for the Binyerityan Policy Center (BPC), which is busines the event	(The Bipartisan Policy Center, , vice president of, Eileen Mcmenamin) → (Biparti- san Policy Center, org.top_members_employees, Eileen McMenamin)	
SF13_ENG_088	dubbed " Cyber ShockWave . " Bank Julius Baer Co., based in Basel, Switzerland, sued because WikiLeaks posted		(Bank Julius Baer Co., based, Basel) → (Bank Julius B
SF13 ENG 094	accountholder information from its Cayman outpost amid allegations of money laundering and tax evasion. The other personal sector and the sec		org:city_of_headquarters, Basel) (Rapiscan,
SF13_ENG_094 SF13_ENG_096	The other manufacturers are two US companies, L-3 Communications and Rapiscan Systems, a unit of OSI Systems, and British rival Smiths Detection. Freedom was founded in the 1930s by R.C. Hoiles and is still majority owned by	•	org country of headouarters LIS)
	Freedom was founded in the 1930s by R.C. Hoiles and is still majority owned by the Hoiles family. Shares of Millipore have more than doubled since Martin D. Madaus took over as	<ul> <li>(Millipore, have, Martin D.) → (Millipore Corp., org:top_members_employees,</li> </ul>	(Freedom, was founded in the, R.C. Hoiles) → (Freedom Communication org:founded_by, R.C. Hoiles)
SF13 ENG 098			

Figure 6:  $BERT_{\rm LARGE}$  vs. GPT-2 $_{\rm XL}$  on TAC KBP-OIE.

ID Appropriate_Rural_Technology_Institute	Sentence Appropriate Rural Technology Institute Appropriate Rural Technology Institute is an Indian non - governmental organi- zation founded by a group of about 20 scientists and technologists to develop innovative and environmentally friendly	$\begin{array}{l} \hline \textbf{Triples to gold triples} \\ (Appropriate Rural Technology Institute, is, An Indian Non-Governmental Organization) \rightarrow (appropriate_rural_refenology_institute_Q16245764, country.P17, india_Q668) \\ \end{array}$
Ayatollah_(Record_Producer)	rural technologies based on modern scientific knowledge in 1996. Ayatollah Lamon Dorrell, known as Ayatollah Lamo is a hip - hop record producer from Queens, New York who has produced for predominantly New York - based rappers including Mos Def, Talib Kweil, R. A. The Rugged Man, Tragedy Khadni, Wordworth, Vax Aire, AU-na G, Guru, M. O. P., Inspectah Deck, Comenga, Ghostaface Killah	(Ayatollah, A. A. Hip-Hop Record Producer)
Benjamin_Darbelet	as well as many others . Benjamin Darbelet Benjamin Darbelet is a French judoka .	(Benjamin Darbelet, is, A French Judoka) → (benjamin_darbelet,Q2456207, country_of_citizenship.P2 Genera O(1/2): (Benjamin_Darbelet_in_A French Judoka) → (benjamin_darbelet,Q2456207, sena P641 inde Q1422
Bharat_Khawas	He plays for club Tribhuvan Army in Martyr ' s Memorial A - Division League as a striker .	france.0142); (Benjamin Darbelet, is. A French Judoka) → (benjamin, darbelet.02456207, sport.P411, judo.01420 (He, plays, Club Tribbuvan Army) → (bbarat_khawas.04901128, member_of_sports_team.P5 negal_army_club.02994327); (He, plays, Club Tribbuvan Army) → (bbarat_khawas.04901128, sportP45)
Bill_White_(Shortstop)	White was born on May 1, 1860 in Bridgeport, Ohio, and he began his professional baseball career in 1883 with the	association_football.Q2736) (White, in, Bridgeport) → (bill_white_(shortstop).Q4911357, place_of_birth.P19, bridgeport_ohio.Q2062947)
Bob_Dylan.Q392	Pottsville Antharcites of the International Association . Dylan married Sara Lownds , who had worked as a model and a secretary to Drew Associates , on November 22 , 1965	(Dylan, married, Sara Lownds) → (Bob_Dylan,Q392, spouse.P26, Sara_Lownds,Q457433)
3ob_Dylan.Q392	In 1991, Dylan received a Grammy Lifetime Achievement Award from American actor Jack Nicholson .	(Dylan, received, Grammy Lifetime Achievement Award) → (Bob_Dylan,Q392, award_received.P16 Grammy_Lifetime_Achievement_Award.Q935843)
Boog_Powell	He also played for the Cleveland Indians and the Los Angeles Dodgers .	(He, also played for the, Cleveland Indians) → (boog_powell.Q4942810, member_of_sports_team.P54, clev land_indians.Q642553)
Boog_Powell Bouchrava Hammoudi Bavoun	He played in Major League Baseball as a first baseman and left fielder from through . most notably as a member of the Baltimere Orioles dynasty that won four American League pennants and two World Series championships between 1966 and 1971 He studied Economics at the University of Havana , Cuba .	(Hc, physed, A. First Baseman) → (boog_powell/Q4942810, position_played_on_team_J_speciality;P41 first_baseman.Q1236154) (Hc, studied Economics, Havana) → (bouchraya_hammond_bayean_Q4949324, educated_at/P69, unive
Cezaro Rossetti	Offician Social designations, he may know in Charama and Eucod in Designing	sity_of_havana.Q837320) (He, was, Glasgow) → (cezaro_rossetti.Q2947206, place_of_birth.P19, glasgow.Q4093)
Chan_Sau_Ying Christian_Mcgrath	Chan Sau Ying Chan Sau Ying is a retired athlete from Hong Kong who specialised in the 100 metres hurdles . He was born in the Bronx in 1972 and became interested in art and illustration as a small child .	(Chan Sau Ying, is, A Retired Athlete) → (chan_sau_ying.Q21858345, sport_P641, sport_of_athletics.Q542) (He, was born in, The Bronx) → (christian_mcgrath.Q5109897, place_of_birth.P19, the_bronx.Q18426)
Tiff_Michelmore	He was a regular presenter on BBC1 's "Holiday " programme from 1969 to 1986 , and presented other shows for BBC TV , ITV and BBC Radio . Crooked I Dominick Antron Wickliffe , better known by his stage name Crooked I or Kxng Crooked , is an American	(He, was, A Regular Presenter) → (cliff_michelmore.Q5132704, occupation.P106, television_presenter.Q947873) (Kxmr Crooked., An American Ramer) → (crooked i.O253695, country of clitzenshin.P27, united states.O30)
Denise_Johns	rapper from Long Beach, California. She graduated in 2002 and moved to Atlanta playing amateur beach volleyball on the east coast of America.	(She, playing, Amateur Beach Volleyball) → (denise_johns.Q5257690, sport.P641, beach_volleyball.Q4543) (She, competed at, The 1996 Summer Olympics) → (diana_rast.Q2491787, participant_of.P1344, 1996_sum
Diana_Rast	She also competed at the 1996 Summer Olympics .	mer_olympics.Q8531)
duard_Friedrich_Poeppig	Eduard Friedrich Poeppig Eduard Friedrich Poeppig was a German botanist , zoologist and explorer . After the Vietnam war , he became a county chairman of Democratic Party .	(Eduard Priedrich, was, A German Botanist) → (eduard_friedrich_poeppig.Q61501, field_of_work.P10 botany.Q441) (A County Chairman, of, Democratic Party) → (edward_l_romero.Q5344025, member_of_political_party.P10
adward_L_Romero	Atter the vietnam war , ne secame a county enairman of Democratic Party . Endre Tilli Endre Tilli was a Hungarian fencer .	(A County Charman, 6, Democratic Party) → (edwardrenor(Q5+440.5, member_co_poincal_party)+10 democratic_party_(united_states)(Q5552) (Ender Till, was, A Hungarian Fencer) → (endre_filli)(0162140, sourty_of_citizenshipP27, hungaryQ28); (Ender Till, was, A Hungarian Fencer) → (endre_filli)(0162140, sourtP611, fencingQ12100)
inrico_Porro	Porro competed at the 1908 Summer Olympics in London where he won the gold medal in Greco - Roman wrestling ,	
2rfan_Zeneli 2rminio_Favalli	the lightweight class . Erfan Zenell Erfan Zenell is a Finnish footballer of Kosovar Albanian descent who currently plays for HIK Helsinki as a striker of left winger . He then moved to Mantova before to join Palermo , where he spent seven seasons as a "rosanero " mainstay .	mer. dywneis (2011) [Gran Zzeeli, 1. A Finnish Footballer) → (crfan. zeneli Q2053367, country. of _crinzenship P27, Iniland Q33; (Efr Zzeeli, is, A Finnish Footballer) → (crfan. zeneli Q2053367, sport P641, association, football Q2736); (Erfan Zeneli (a, A Finnish Footballer) → (crfan. zeneli Q2053367, country_for_sport P532, finland Q33) (He, then moved is, Matnico) → (crminish forwalli Q1463877, member.g4.sport, learn P54, mark (He, then moved is, Matnico) → (crminish radial Q1463877, member.g4.sport, learn P54, mark
		toya 1911 s.s.d. O430993)
George_Dowty Harald_Fairbair	Donty was been in Pershore. Worcestershire in 1901. In the Saga of Harald Faihniar in "Heimskringla", "which is the most elaborate although not the oldest or most reliable source to the fit of Harald, it is written that Harald succeeded, con the death of his father Halfdan the Black Gardridarson, to the sovereignay of several small, and somewhat scattered kingdoms in Vestfold, which had come into his father 't hands through composed and inheritance	(Dowty, was born in, Pershore) → (george_dowty Q1507239, place_of_birthP19, pershore.Q767858) (Harald Fairhair, of his father, Halfdan the Black) → (harald_fairhair.Q206123, father.P22, hal dan_the_black.Q504932)
Hector_Dyer	Used for a set work by your set with humin running and the standard angle of the set of	(Hector Dyer, enrolled at, The Stanford University) → (hector_dyer.Q1364518, educated_at.P69, star ford_university.Q41506)
lenny_Magnussen	Thanks to the support she received , she was able to practise in all the courts of Denmark from 1909 , becoming the first woman to do so .	(The First Woman, ,, Denmark) → (henny_magnussen.Q56577333, country_of_citizenship.P27, denmark.Q35)
lina_Pervaiz_Butt sabella_Of_ValoisDuchess_Of_Bourbon	Hina Pervaiz Butt Hina Pervaiz Butt is a Pakistani politician who was a Member of the Provincial Assembly of the Punjab, since May 2013. She was the wife of Peter I, Dake of Bourbon.	(Hina Pervaiz Butt, is, A Pakistani Politician) → (hina_pervaiz_butt.Q47918210, occupation.P106, politician.Q8295 (She, was the wife of, Peter I) → (isabella_of_valois_duchess_of_bourbon.Q2363495, spouse.P26, p
aberta_Or_valors_Duchess_Or_Bourbon	Then from 1995, he played for Peruvian Second Division side Guardia Republicana.	(Site, was the wire of, Peeer I) → (nateria_of_vations_distribution_02250545), sponser2.0, p ter_i_duke_of_bourbon.Q444668) (He, played for, Peruvian Second Division Side Guardia Republicana) → (jahir_butrón.Q6123259, met
ahir_Butrón	Jahir Butrón Jahir Butrón Gotuzzo is a Peruvian footballer who plays as a center back .	(in: payor to, result, second state dama and payor a
oan_Of_France,_Duchess_Of_Berry ohn_Ogilvie_(Footballer)	She was the second anughter of King Louis XI of Prance and of his second wife Charlotte of Savoy ; her surviving siblings were King Charles VIII of Prance and Anne of Prance. He played for this in their most accessful era renowned for their front five known as The Panous Five .	(She, was the second daughter, King Louis Xi) → (joan_of_france_duchess_of_berry.Q236220, father.P2 boix_i_i_f_france_Q8088) (He, played for, Hibs) → (john_ogilvie_(footballer).Q6231147, member_of_sports_team.P34, hibs min_f_c_Q192597)
ohnedel_Cardel oseph_W_Nega	He moved to Sta. Joseph W . Nega Joseph W . Nega is a Judge of the United States Tax Court .	nan_1.c.Q192597) (He, to, Sta) → (johnedel_cardel.Q56599981, member_of_sports_team.P54, sta_lucia_realtors.Q3547751) (Joseph W. Nega, is, A Judge) → (joseph_w_nega.Q16733242, occupation.P106, judge.Q16533)
osejni_w_rega osé_Alejandro_Aguilar_López	Joneju W., regul zweju W., veju w a zwoje u na cunto state i za Conta. José Akjandro Aguilar Lépez José Akjandro Aguilar Lépez is a Mexican politician from the National Action Party .	(José Alejandro Aguilar López, is, A Mexican Politician) — (josé_alejandro_aguilar_Jópez (1838589 conntry_of_critizenship 127, mexico Q96); (José Alejandro Aguilar López, is, A Mexican Politician) – (josé_alejandro_aguilar_Jópez.Q18385891, occupation.P106, politician_Q82955); (José Alejandro Aguilar López.Q18208201, Constructional Construction Constru
Juan_Bautista_Azopardo	Juan Bautista Azopardo was born in Senglea , Malta , the son of Rosina and Salvatore Azopardo .	Laplez, anticidan pitor PIO2, in the bandwin Action (* 2017) (9) (0) (2) angunan signation anglez (2) existence in a finite pitor (* 2018) (2) (2) (2) (2) (2) (2) (2) (2) (2) (2
Kevin_Kerr_(Scottish_Footballer)	He signed for AGOVV Apeldoorn of Netherlands ' Eerste Divisie in January 2012 after his contract in Bielefeld had expired the previous summer .	(He, signed for, Agovv Apeldoorn) → (kevin_kerr_(scottish_footballer).Q326761, member_of_sports_team.P5 agovv_apeldoorn.Q292618)
.achezar_Kotev	Lachezar Kotev Lachezar Kotev is a Bulgarian footballer who plays as a midfielder for Vitosha Bistritsa .	(Tachezar Kotev, is, A Bulgarian Footballer) → (Iachezar_Jotev,Q49560773, sport.P641, association_football,Q2736 (Lachezar Kotev, is, A Midfielder) → (Iachezar_Jotev,Q49560773, position_played_on_team_J_speciality.P413, mi fielder.Q193592)
Marc_Zeno	In 1988, Zeno was drafted in the 7th round by the Pittsburgh Steelers .	(Zeno, was drafted in the, The Pittsburgh Steelers) → (marc_zeno.Q16196353, member_of_sports_team.P54, pit burgh_steelers Q191477)
Marcel_Dheere	Mared Dherer Mared Albert "Ching " Dherer was a Canadian professional ice bockey forward who played 11 games in the National Hockey League for the Montreal Canadiens .	(Marcel Albert "Ching, in, A Canadian Professional Lee Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), cou $r_0$ (mcrel_dheret_00 <sup>4</sup> 5008), member_of_sports_tamP54, montreal_canadiens_0188143); (A Canadian Profe sional locke Hockey, played, The National Hockey League) → (marcel_dheret_00 <sup>4</sup> 5008), leagueP18, n tional hockey teame(0218590); Marcel Albert Chine, nabred A Canadian Professional lockey Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), leagueP18, n tional hockey teame(0218590); Marcel Albert Chine, nabred A Canadian Professional lockey teame(0218500); Horael Albert Chine, nabred A Canadian Professional leader (He Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), leagueP18, n (Heret_Hockey, David); Marcel Albert Chine, nabred A Canadian Professional leader (Heret_Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), leagueP18, n (Heret_Hockey, David); Marcel Albert Chine, nabred A Canadian Professional leader (Heret_Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), leagueP18, n (Heret_Hockey, David); Marcel Albert Chine, nabred, A Canadian Professional leader (Heret_Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), leagueP18, n (Heret_Hockey, David); Marcel Albert Chine, nabred, A Canadian Professional leader (Heret_Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), leagueP18, n (Heret_Hockey, David); Marcel Albert Chine, nabred, A Canadian Professional leader (Heret_Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), leagueP18, n (Heret_Hockey, David); Marcel Albert Chine, nabred, A Canadian Professional leader (Heret_Hockey) → (marcel_dheret_00 <sup>4</sup> 5008), leader (Heret_Hockey) → (marcel_dheret_00 <sup>4</sup> 7508), leader (Heret_Hockey) → (marcel_dheret_00 <sup>4</sup> 7508), leader (Heret_00 <sup>4</sup> 7508), leader (He
Mark_Schultz_(Wrestler)	Mark Schultz was born in 1960 in Palo Alto , California to Dorothy Jean St . Germain and Philip Gary Schultz .	cel.dheero.06756083.sport.P641, ice_hockey.041466) (Mark Schultz, was boen in 1960 in, Docothy Jean St. Germain) → (mark_schultz_(wrestler).0348733 place_of_brith.P19, palo_alue_california.Q47265)
fichael_Jones_(Footballer) /like_Bellotti	Michael Jones Michael Jones is an English footballer , who plays for Cefn Druids . He is an alumnus of the Deha Sigma Phi fraternity .	place of birth P19, plao_alto_california Q47265) (Michael Jones, i, An English Footballer) $\rightarrow$ (michael_jones_(footballer),Q6831707, sport.P641, assoc tion_football.Q2736)
nike_Benom Mga_Semenova_Tyun-Shanskayu	He is an aumnus of the Dena Sigma Prin traternity. She learned to play chess at the age of 18 ; four years later she won the Leningrad city women 's chess championship.	(He, is an alumnus of, The Delta Sigma Phi Fratemity) → (mike_bellotti.Q14950800, educated_at.P69, califo nia_state_university_east_bay_Q1026916) (She, to play, Chess) → (0ga_semenova_tyua-shanskaya,Q2392240, sport.P641, chess.Q718)
Owen_Paterson	Owen Paterson Owen William Paterson is a British Conservative Party politician who was the Secretary of State for Environment, Food and Rural Affairs from 2012 to 2014.	(Owen Paterson, is, A British Conservative Party Politician) → (owen_paterson.Q197894, occupation.P106, poli cian.O82955)
han_Gongsheng haul Carrington (American Football)	Pan Gongsheng Pan Gongsheng is a Chinesse economist, banker , reformist and bureaucrat . Paul Carrington Paul Carrington is a former American football defensive end .	(Pan Gongsheng, is, A Chinese Economist) → (pan_gongsheng,Q9309080, country_of_citizenship.P27, china.Q148 (Paul Carrington, is, A Former American Football Defensive End) → (paul_carrington_(american_football),Q905701 sport.P641, american_football(Q1323)
'eter_Jebsen 'ina_Piovani	Peter Jebsen Peter Jebsen was a Norwegian businessperson and politician . Pina Piovani Pina Piovani was an Italian stage and film actress .	Pieter Jehsen, wa, A Norwegian Businessperson) → (piete Jehsen Q1773966, country_of_citizenship/P27, no wayQ20); (Pieter Jehsen, Was, A Norwegian Businessperson) → (pieter Jehsen, Q174366, occupation P106, bus nessperson Q43545); (Pieter Jehsen, was, Politician (28355); (Pieter Jehsen, Was, Politician (28355); (Pieter Jehsen, Was, Politican (28355); (Pieter Jehsen, Was, Politican (28355); (Pieter Jehsen, Was, Politican (28355); (Pieter Jehsen, Q173966, occupation P106, politican (28355); (Pieter Jehsen, Was, Politican (28355); (Pieter Jehsen, Vas, Pieter Jehsen, Pieter Jehsen
hina_Piovani Robert_GCole	Pina Plovani Pina Plovani was an Italian stage and tiim actress. Rapidly advancing through the ranks at Fort Benning as the parachute infantry battalions were expanded to regiments. he was a literaturant colonel commanding the 34 Battalion of the 502nd Parachute Infantry Regiment on June 6. 1944.	(Pina provani, was, An Italian Stage And Pilm Actress) → (pina_provani,Q3388983, country_of_citizenship.P2 indp;Q38) (He, was, A Licutenant Colonel) → (robert_g_cole Q969944, military_rank.P410, licutenant_colonel.Q493898)
Robert_Holt_Carpenter	ne was a neutenant cokonet commanding me srd statistion or the 502nd variantie intrintry Regiment on June 6, 1944, the date of his init's finst combah jump . Robert Holt Carpenter Robert Holt Carpenter was a New Zealand bookbinder, local politician, bookseller and character	(Robert Holt Carpenter, was, A New Zealand Bookbinder) → (robert_holt_carpenter.Q7345593, coa
Robert_Van_Boxel	He joined amateur side FC Lisse in summer 2015 from Sparta .	(where non-completence, was related by a seminar distantial) $\rightarrow$ (where $p_{int}(p_{int}) = p_{int}(p_{int}(p_{int}))$ ), control $p_{int}(p_{int}) = p_{int}(p_{int}(p_{int}))$ , control $p_{int}(p_{int}) = p_{int}(p_{int}(p_{int}))$ .
Rolf_Maurer	Rolf Maurer Rolf Maurer was a Swiss road racing cyclist who competed professionally between 1960 and 1969 .	(Rolf Maurer, was, A Swiss Road Racing Cyclist) → (rolf_maurer_Q870132, country_of_ctitzenship.P2 switzerland.Q39); (Rolf Maurer, was, A Swiss Road Racing Cyclist) → (rolf_maurer_Q870132, sport.P64 road_bicycle_racing.Q3609)
Ron_Maudsley Safa Al-Safi	Mauddey was born in Lostock Gralam, Cheshire, and educated at Malvern College and Birmingham University, then served in the Royal Army Service Corps during World War II. Safa al - Safi Safa al - Din Mohammed al - Safi is an Iraji politician and former Justice Minister who is currently	(Maudeley, was born in, Lostock Gralam) → (ron_maudsley.0160096633, place_of_birth.P19, 1 stock_gralam.Q4640202) (Mohammed AlSafi, is, An Iraqi Politician) → (safa_al-safi.Q7398343, occupation.P106, politician.Q82955)
alvador_Luria	Said at - Sait Said at - San solubilities at - Sait is an main pointsain and routier product summer who is currently Minister of Sait for the Council of Representative Massachusetts Institute of Technology . In 1959, he became chair of Microbiology at the Massachusetts Institute of Technology . He now plays for US Carcassone .	(Romannez A-Sari, S., An Ing. Founkau) → (Sar, ar-Sar(2)58-8-5, Sceptimone vol. pointeau (26:25)) (He, became chair of, Microbiology) → (salvador, Juría, Q205667, field, of_work.P101, microbiology,Q7193) (He, now plays, US Caracsacone) → (salvador, Lune, tuilagi Q347218), member of sports (seam.P5)
Sanele_Vavae_Tuilagi Seth_Plum	He now plays for US Carcassonne	us_carcassonne.Q3550526) (Seth Lewis Plum was An English International Footballer) → (seth plum 07456581 sport P641 associ
		tion_football.Q2736); (Seth Lewis Plum, was, An English International Footballer) — (seth_plum.Q7456581, mer ber_of_sports, team.P54, england_national_football_team.Q47762) (Sofity Korkutyte, was, A. Lithanian Rower) — (sofia_korkutyte.Q16014909, sport.P641, rowing_(sport).Q159354
Sofija_Korkutytė	Sofija Korkutytë Sofija Korkutytë was a Lithuanian rower who won three European titles in the eights event in 1963 , 1965 and 1967 : she finished second in 1964 and 1966	
Thomas_Rogne	1965 and 1967; she finished second in 1964 and 1966. He made his first start for Cellic at home against Dandee United in a 1 – 0 victory on 20 February 2010, he played very wall and improved the occels Tony Meenbergy.	(He, at, Celtic) → (thomas_rogne.Q609801, member_of_sports_team.P54, celtic_f.c.Q19593)
Thomas_Rogne	1965 and 1967; she finished second in 1964 and 1966. He made his first start for Celtic at home against Dundee United in a 1 - 0 victory on 20 February 2010, he played very	(Westphalia, in, Beckum) → (uri_avnery.Q325679, place_of_birth.P19, beckum_germany.Q2707) (She, of, The Christian Democratic Union) → (ursula_lehr.Q290708, member_of_political_pury.P102, chri
Sofija, Korkutyte Thomas, Kogne Uri, Annery Urivula, Lehr Valdivia, [Brazilian, Footballer) Viotor-Francois. 204d Dac De Broelie	1963 and 1967; the finithed second in 1964 and 1966. He made his first start for Celtic at home against Dundee United in a 1 – 0 victory on 20 February 2010, he played very well and impressed the coach Yony Mowkray. Avnery was horn in Beckum, near Minster in Westphalia, as Helmut Ostermann, the youngest of four children, to a well - established Greman Jewish fmulty, his findtre being arytize hauker in the town.	

Figure 7:  $\text{BERT}_{\mathrm{LARGE}}$  on Wikidata-OIE.

ID Appropriate_Rural_Technology_Institute	Sentence Appropriate Rural Technology Institute Appropriate Rural Technology Institute is an Indian non-governmental organi- zation founded by a group of about 20 scientists and technologists to develop innovative and environmentally friendly	Triples to gold triples (Appropriate Rural Technology Institute, is, An Indian Non-Governmental Organization) $\rightarrow$ (approximate restriction) (Approximate Rural Technology Institute) (Approximate Rural
Ayatollah_(Record_Producer)	rural technologies based on modern scientific knowledge in 1996. Avatollah Lamont Dorrell, known as Avatollah, is a hip-hop record producer from Oueens. New York who has produced	ate_rural_technology_institute.Q16245764, country.P17, india.Q668) (Avatollah, is, A Hip-Hop Record Producer) → (avatollah (record producer).Q4830984, occupation.P
Benjamin_Darbelet	for predominantly New York-based rappers including Mos Def, Talib Kweli, R.A. The Rugged Man, Tragedy Khadafi, Wordsworth, Vast Aire, Afu-Ra, Guru, M.O.P., Inspectah Deck, Cormega, Ghostface Killah as well as many others. Beniamin Darblet Its nämin Darbetei si as Trench iudoka.	record_producer.Q183945)
Bharat_Khawas	He plays for club Tribhuvan Army in Martyr's Memorial A-Division League as a striker.	france.Q142); (Benjamin Darbelet, is, A French Judoka) → (benjamin_darbelet.Q2456207, sport.P641, judo.Q114 (He. plays for, Club Tribhuyan Army) → (bharat khawas.O4901128, member of sports team.)
Bill_White_(Shortstop)	White was born on May 1, 1860 in Bridgeport, Ohio, and he began his professional baseball career in 1883 with the	nepal_army_club.Q6994327); (He, plays for, Club Tribhuvan Army) → (bharat_khawas.Q4901128, sport.P association_football.Q2736)
Bob_Dylan.Q392	winite was born on way 1, 1800 in Bridgeport, Onio, and ne began nis protessional dasebai career in 1883 with the Pottsville Antharcites of the International Association. Dylan married Sara Lownds , who had worked as a model and a secretary to Drew Associates , on November 22, 1965	(White, in, Bridgeport) → (bill_white_(shortstop),Q4911357, place_of_birth.P19, bridgeport_ohio.Q2062947) (Dylan, married, Sara Lownds) → (Bob_Dylan,Q392, spouse.P26, Sara_Lownds.Q457433)
Bob_Dylan.Q392	In 1991 , Dylan received a Grammy Lifetime Achievement Award from American actor Jack Nicholson .	(Dvlan, received, A Grammy Lifetime Achievement Award) → (Bob Dvlan,O392, award received P
Boog_Powell	He also played for the Cleveland Indians and the Los Angeles Dodgers.	Grammy_Lifetime_Achievement_Award.Q935843) (He, also played for, The Cleveland Indians) → (boog_powell.Q4942810, member_of_sports_team.P54, cl land_indians.0642553)
Boog_Powell	He played in Major League Baseball as a first baseman and left fielder from through , most notably as a member of the Baltimore Orioles dynasty that won four American League pennants and two World Series championships between	initial comparison of the second
Bouchraya_Hammoudi_Bayoun	1966 and 1971. He studied Economics at the University of Havana, Cuba.	(He, studied, University of Havana) → (bouchraya_hammoudi_bayoun.Q4949324, educated_at.P69, university)
Cezaro_Rossetti Chan_Sau_Ying	Of Italian-Swiss derivation, he was born in Glasgow and lived in Britain. Chan Sau Ying Chan Sau Ying is a retired athlete from Hong Kong who specialised in the 100 metres hurdles.	sity_of_havana_Q837320) (He, was born in, Glasgow) → (cczaro_rossetti Q2947206, place_of_bitth.P19, glasgow.Q4093) (Sau Ying, is, A Retired Athlete) → (chan_sau_ying Q21858345, sport_P641, sport_of_athletics.Q542)
Christian_Mcgrath Cliff_Michelmore	He was born in the Bronx in 1972 and became interested in art and illustration as a small child. He was a regular presenter on BBC1's "Holiday" programme from 1969 to 1986, and presented other shows for BBC	(Sau ring, s, A Retmer Annee) → (char_sau_mgQr18.05987, place_of_birthP91, spor_0_mmetex(942) (He, was bom in, The Brown → (christian_megrathQ510987, place_of_birthP19, the_brown.Q18426) (He, was, A Regular Presenter) → (cliff_michelmore.Q5132704, occupation.P106, television_presenter.Q947873)
Crooked_I	TV, ITV and BBC Radio. Crooked I Dominick Antron Wickliffe, better known by his stage name Crooked I or Kxng Crooked, is an American	(Crooked I, is, An American Rapper) → (crooked_i.Q253695, country_of_citizenship.P27, united_states.Q30)
Denise_Johns Diana_MFennell	rapper from Long Beach, California. She graduated in 2002, and moved to Atlanta, playing amateur beach volleyball on the east coast of America. Europall uses how in Emposity Versitiva and attended the mobile schools them.	(She, playing, Amateur Beach Volleyball) → (denise_johns.Q5257690, sport.P641, beach_volleyball.Q4543) (Esenall way born in Europein) → (diana m. fennell 0/20032239, place of birth P19, empering 0/17763
Diana_Rast	Fennell was born in Emporia, Virginia and attended the public schools there. She also competed at the 1996 Summer Olympics.	(Fennell, was born in, Emporia) → (diana_m_fennell.Q28037279, place_of_birth P19, emporia_virginia.Q17767 (She, also competed at, The 1996 Summer Olympics) → (diana_rast.Q2491787, participane_of.P1344, 1996_s mer_olympics.Q8531)
Eduard_Friedrich_Poeppig	Eduard Friedrich Poeppig Eduard Friedrich Poeppig was a German botanist, zoologist and explorer.	(Eduard Friedrich, was, A German Botanist) → (eduard_friedrich_poeppig.Q61501, field_of_work.P botany.Q441)
Edward_LRomero Endre_Tilli	After the Vietnam war, he became a county chairman of Democratic Party. Endre Tilli Endre Tilli was a Hungarian fencer.	(He, of, Democratic Party) → (edward_l_romero.Q5344025, member_of_political_party.P102, dc cratic_party_(united_states).Q29552)
Enrico_Porro	Porro competed at the 1908 Summer Olympics in London where he won the odd medal in Greco-Roman wrestling	(Endre Tilli, was, A Hungarian Fencer) → (endre, tilliQ1642140, country_of_citizenship.P27, hungary.Q28); (Ei Tilli, was, A Hungarian Fencer) → (endre, tilliQ1642140, sport.P641, fencing.Q12100) (Porro, competed at, The 1908 Summer Okympics) → (entrico_porroq.01343905, participant_of.P1344, 1908_s
Erfan_Zeneli	the lightweight class. Erfan Zeneli Erfan Zeneli is a Finnish footballer of Kosovar Albanian descent who currently plays for HJK Helsinki as	mer_olympics.Q8111) (Erfan Zeneli, is, A Finnish Footballer) → (erfan_zeneli.Q2053367, country_of_citizenship.P27, finland.Q33); (E
	a striker or left winger.	Zeneli, is, A Finnish Footballer) → (erfan_zeneli.Q2053367, sport.P641, association_football.Q2736); (Erfan Ze is, A Finnish Footballer) → (erfan zeneli.Q2053367, country for sport.P1532, finland.Q33)
Erminio_Favalli George_Dowty	He then moved to Mantova before to join Palermo, where he spent seven seasons as a "rosanero" mainstay. Dowty was born in Pershore, Worcestershire in 1901.	tova_1911_s.s.dQ430993) (Dowty, was born in, Pershore) → (george dowty,O1507239, place of birth,P19, pershore,O767858)
Harald_Fairhair	In the Saga of HanalA Fairhair in THeimskringla", which is the most elaborate although not the oldest or most reliable source to the life of Harald, it is written that HanalA succeeded, on the dutch of his father Halfalan the Black Chardradsnon, to the sovereignty of several small, and somewhat scattered kingdoms in Vestfold, which had come into his father's hands through compest and inheritance.	$(Harald, of his father, Halfdan the Black) \rightarrow (harald_fairhair.Q206123, father.P22, halfdan_the_black.Q504932)$
Hector_Dyer Henny_Magnussen	Born in Los Angeles, California, Hector Dyer enrolled at the Stanford University and won the IC4A championships in in 1930. Thanks to the support she received, she was able to practise in all the courts of Denmark from 1909, becoming the first	(Hector Dyer, at, The Stanford University) → (hector_dyer.Q1364518, educated_at.P69, stanford_university.Q41!) (She, , she, Denmark) → (henny_magnussen.Q56577333, country_of_citizenship.P27, denmark.Q35)
ienny_Magnussen Iina_Pervaiz_Butt	Inanas to the support she received, she was able to practise in all the courts of Denmark from 1909, becoming the first woman to do so. Hina Pervaiz Butt Hina Pervaiz Butt is a Pakistani politician who was a Member of the Provincial Assembly of the	(Sne,, sne, Denmark) → (nenny_magnussen.Q50577355, country_of_citizensnip.P27, denmark.Q55) (Hina Pervaiz Butt, is, A Pakistani Politician) → (hina_pervaiz_butt.Q47918210, occupation.P106, politician.Q82
sabella_Of_Valois_Duchess_Of_Bourbon	Punjab, since May 2013. She was the wife of Peter I, Duke of Bourbon.	(She, was the wife of, Peter I) → (isabella_of_valois_duchess_of_bourbon.Q2363495, spouse.P26,
ahir_Butrón	Then from 1995, he played for Peruvian Second Division side Guardia Republicana.	ter_i_duke_of_bourbon.Q444668) (He, played for, Peruvian Second Division Side Guardia Republicana) → (jahir_butrón.Q6123259, r
ahir_Butrón	Jahir Butrón Jahir Butrón Gotuzzo is a Peruvian footballer who plays as a center back.	ber_of_sports_team.P54, guardia_republicana.Q5614012) (Jahir Butrón Gotuzzo, is, A Peruvian Footballer) → (jahir_butrón.Q6123259, country_of_citizenship, peru.Q419); (Jahir Butrón Gotuzzo, is, A Peruvian Footballer) → (jahir_butrón.Q6123259, sport.P641, ass
anina_Altman	In 1950, Hescheles emigrated to Israel, where she eventually earned a doctorate in chemistry at Technion .	tion_football.Q2736)
loan_Of_France,_Duchess_Of_Berry	She was the second daughter of King Louis XI of France and of his second wife Charlotte of Savoy; her surviving	(see, earned a doctorate in, technicon) → (janina_aimmaRQ223)47/94, educated at P09, to inonisrael_institute_of_technology(3333705) (She, was the second daughter of, King Louis Xi) → (joan_of_france_duchess_of_berry,Q236220, father.)
John_Ogilvie_(Footballer)	siblings were King Charles VIII of France and Anne of France. He played for Hibs in their most successful era renowned for their front five known as The Famous Five.	louis_xi_of_france.Q8058) (He, played for, Hibs) → (john_ogilvie_(footballer).Q6251147, member_of_sports_team.P54, h nian_f.c.Q192597)
Johnedel_Cardel Joseph_WNega	He moved to Sta. Joseph W. Nega Joseph W. Nega is a Judge of the United States Tax Court. José Alejandro Aguilar López José Alejandro Aguilar López is a Mexican politician from the National Action Party.	(He, moved to, Sta) → (johnedel_cardel.Q56599981, member_of_sports_team.P54, sta_lucia_realtors.Q3547751 (Joseph W. Nega, is, A Judge) → (joseph w. nega.Q16733242, occupation.P106, judge.Q16533)
José_Alejandro_Aguilar_López Juan_Bautista_Azopardo	José Algiandro Aguilar López José Algiandro Aguilar López is a Mexican politician from the National Action Pary, Juan Banrista Azopardo was bort in Senglez, Malla, the son of Rosina and Salvatore Azopardo.	(José Adejiados Agaliat Lápez, is a Mexican politicaia, The National Ac Purty) → (io, al.ajadas, adagiatu [Ageze (J188387)], member of, golitical, party P1(2), itional, actions, party, (mexico), Q651(807); Uosé Adajianto Agaliar Lápez, is, A Mexican Politician) (iojo, al.ajadas, galanta), Jopez, Q1883879, contri, ord, (aircandir P27, mexico, Q69); (iojo Adajiados Day Lápez, is, A Mexican Politician) → (iojo, al.ajadarda nagiatu), [iojoz 2183889], (icos Adajiados Day (Jung), and Marcian Academican (Janabas), and anti-anti-anguatoria, Q1838891, locez, quintarily (icos), diagiados and particular, quintarily, quintaria, anguatoria, Q383867, placez, (Juhari P17), Quan Banitata, Anzupato, vas boras in, Scrigola → (juan, Juantas, anguatoria, Q383867, placez, (Juhari P17)).
Kevin_Kerr_(Scottish_Footballer)	He signed for AGOVV Apeldoorn of Netherlands' Eerste Divisie in January 2012 after his contract in Bielefeld had	(Joan Balando, viai schopando, viai schopa
Kevin_Kerr_(Scottish_Footballer)	expired the previous summer. Lachezar Kotev Lachezar Kotev is a Bulgarian footballer who plays as a midfielder for Vitosha Bistritsa.	agovv_apeldoom.Q292618) (Lachezar Kotev, is, A Bulgarian Footballer) → (lachezar kotev.O49560773, sport.P641, association football.O2)
Marc_Zeno	in 1966, Zeno was draned in the 7th found by the Pritsburgh Steelers.	(Zeno, by, The Pittsburgh Steelers) → (marc_zeno.Q16196353, member_of_sports_team.P54, purgh_steelers.Q191477)
Marcel_Dheere	Marcel Dheere Marcel Albert "Ching" Dheere was a Canadian professional ice hockey forward who played 11 games in the National Hockey League for the Montreal Canadiens.	(Marcel Albert "Ching, was, A Canadian Professional Ice Hockey) → (marcel_dheere.Q6756083, c try_of_citizenship.P27, canada.Q16); (Marcel Albert "Ching, was, A Canadian Professional Ice Hockey) → (
Mark_Schultz_(Wrestler)		cel_dheere.Q6756083, sport.P641, ice_hockey.Q41466); (Marcel Albert "Ching, for, The Montreal Canadiens) (marcel_dheere.Q6756083, member_of_sports_team.P54, montreal_canadiens.Q188143)
	Mark Schultz was born in 1960 in Palo Alto, California to Dorothy Jean St. Germain and Philip Gary Schultz.	(Mark Schultz, was born in 1960 in, Palo Alto) → (mark_schultz_(wrestler).Q3487332, place_of_birth. palo_alto_california.Q47265)
	Michael Jones Michael Jones is an English footballer, who plays for Cefn Druids.	(Mark Schultz, was born in 1960 in, Palo Alto) → (mark_schultz_(wrestler),Q3487332, place_of_birth. palo_alto_cafformi.Q47265) (Michael Jones, is, An English Footballer) → (michael_jones_(footballer),Q6831707, sport.P641, ass tion football.Q2736)
Diga_Semenova_Tyan-Shanskaya	Michael Jones Michael Jones is an English footballer, who plays for Cefn Dusids. She learned to play chexs at the age of 18; four years later she wone the Leningrad city women's checs championship. Owen Paterson Owen William Paterson is a British Conservative Party politician who was the Sceretary of State for Environment, Food and Rund Afrian from 2021 20: 2014.	(Mark Schultz, was bern in 1960 in, Palo Alko) $\rightarrow$ (mark,schultz,(wentler) (24873)2; place, of, Stuth Joho, althe,califormed (27265) (Markard 1968), in the start of the st
Uga_Semenova_Tyan-Shanskaya Dwen_Paterson Pan_Gongsheng	Michael Jones Michael Jones is an English footballer, who plays for Cefn Druids. She learned to play chess at the age of 18; four years later she won the Leningrad city women's chess championship. Owen Patreson Owen William Plateron is a British Concervative Patry politician who was the Secretary of State for	(Mark Schulz, was born in 1960 in, Palo Alao) $\rightarrow$ (mark, schulz, (wentler) Q48732), plaze, $d_c$ ) studi- liko, althe, additional Q2255) ison, football, Q2256) ison, football, Q2256) (Bock, Lenner, Chess) $\rightarrow$ (6)ga, sensences again shandaya Q202520, spor.Pd41, chess, Q1151 (Ower William Plazenso, is, A Bridd Conservaive Putty Politiciam) $\rightarrow$ (ower, patterns) Q19780, comparison publicing Q2255). (Dense Viewender) is for an advance of Q202000, sport Pd41, chession, PD7 (hear) (D1000000000000000000000000000000000000
Olga_Semenova_Tyan-Shanskaya Dwen_Paterson Pan_Gongsheng Paul Carrington (American Football)	Michael Jones Michael Jones is an English footballer, who plays for Crift Drusis. Bite Isome Michael and gang of 18, four years later due woot the Laningent city women's dises championship. Down Brannoo More William Paterons in Erifici Oscoreventy Puty political with was the Secretary of State for Environment, Frod and Read Affairs from 2012 to 2014. Pan Geosphere Pan Geosphere 1 as Charlow cocosmit, Baker, reformit and baresarch.	(Mark Schulz, was born in 1960 in, Palo Alao) ~ (mark,schulz,/wender)(248732, plaze,zd, Srhh, alab, allth, additorad (27265) (mark), alth, additorad (27265) (mark), alth, additorad (27265) (mark), and an additional (2726) (mark), and an additional (2707), appendixed, and and additional (2708), and an additional (2708) (mark), and and additional (2708), appendixed, accurational (2708), and and additional (2708) (mark), and additional (2708), and additional (2708), and additional (2708), and additional (2708), and additi
Mga_Semenova_Tyan-Shanskaya Wen_Paterson <u>Yan_Congsheng</u> Yaul Carrington (American Football) "eter_Jebsen	Michael Jones Michael Jones is an English footballer, who plays for Cefn Druids. SRF carned to play cleas at the gap of 1K four years have the Ae work the Leningrad city women's clease championship. Downe Paterson Over William Paterson is a Brillic Gonerveniev Party publician who was the Secretary of State for Environment, Frod and Reard Affairs from 202 lb 2014. Pan Gonghong par Affairs (Cons 202 lb 2014). Pan Gonghong par Affairs economist, backate, reformist and bureacrut. Paul Carrington Paul Carrington is a former American fordball defensive end. Peter Jebsen was a Norwegian businessperson and politician.	(Mark Schulz, was born in 1960 in, Palo Alao) ~ (mark_schulz_(wentler) (248732), place_d_shth, abs_aline_aline_adirectory (2785). (Markad (2785))
Mga_Semenova_Tyan-Shanskaya Jwen_Paterson Jan_Gongsheng Jual Carrington (American Football) Peter_Jebsen Jina_Piovani	Michael Jones Michael Jones in an English footballer, who plays for Cefn Dunis. Bite Learned to play clears at the age of 15: Ger years later due work the Learningent City women's clears championship. Dowen Paterono Dowen William Paterons in Britich Concervative Play policitation who was the Scortary of State: For Environment, Food and Raral Affairs from 30/2 to 2014. Plan Gengberg pri a Champion Score eccosmic, backwate, referming and breasenet Paul Carnington Paul Carnington is a former American Gosball defensive end. Peter Jehnes Peter Jehnes was a Nerwegian businesuperson and policitan. Pinn Powent Pina Powent Pina Indian stage and film acress. Pault Score Prese P	(Mark Schulz, was born in 1960 in, Palo Alko) ~ (mark, schulz, (zwenier) (248732), plaze, af, shith plas, alle, additorad (2225) (1960). The schulz and the schulz and the schulz and the schulz and the schulz and teor, forshall (225) (2060). The schulz and t
Mga, Semenova, Tyan Shanskaya Wen, Jatenson Yan, Gongberng Mall Carrington (American Football) Yeter, Jehsen Yan, Piovani Kokert, G., Cole	Michael Jones Michael Jones in an English footballer, who plays for Cefn Druids. SRF learned to play cleve at the gap of 1K four years have the t-metagent city women's cleves championship. Dwen Paterson Over William Paterson is a Brillia Concervative Pury publicitation who was the Scortary of State for Environment, Frod and Read Affairs from 2021 to 2014. Pata Geogheep par Affaire ecconomist, backaet, referming and because of the score	(Mark Schulz, was born in 1960 in, Palo Alao) – (mark_schulz_verseler) Q34732; plaze_d_shth, dis_alls_alls_alls_all_add_add_2255) [box], although and Q2255] [box], although and Q2255] [box], and Q2255][box], and Q225230; qose Pd41, closed, Q2052 [box], and Q2052 [box], and Q2052 [box], and Q205230; qose Pd41, closed, Q21515] (Owen William Paterson, in A finited Conservaire Patry Foldician) → (owen_patrons) Q19784], conception Pd41, closed Pd50, closed, Closed → (olg., scenerosci - justa, applexeq Q298000; construt, although Pd51, closed Pd50, closed, Closed → Closed → Closed D4100 [box], and Closed D4100 [box], and Closed D4100 [Q400] (Pd41 Christipane, in A Forreret American Footbull D46roive Ead) → (pd42, globane, Q171866, construty, although Q450) [Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Newergian Basinesperson) → (pd42, globane, Q171866, construty, although Q450) (Pd61; Pb600; was, A Leutenant Colonel) → (robert, g_, cold Q669944, milluny, rank, Pd110, lineitenant, colonel Q490888) (Pd6; was, A Lineitenant Colonel) → (robert, g_, cold Q669944, milluny, rank, Pd110, lineitenant, colonel Q4908888))
Mga, Semenova, Tyan Shanshaya Dwen, Pateron Pan, Gongheng Panl Carrington (American Football) Peter, Johona Pan, Piovani Bakber, G., Cole Robert, Hole, Carpenter	Michael Jones Michael Jones is an English footballer, who plays for Grfn Druish. She Isaneal to phys cleans at the age of 15. Four years have the two field constraints of the second probability of State for Druish Drues Development (PDF) and PMI Druis Druis Druish Dr	<ul> <li>(Mark Schultz, was born in 1960 in, Palo Alko) ~ (mark_schultz_verseler) Q34732; plaze_d_shth, alko_alko_alko_alko_alko_alko_alko_alko_</li></ul>
Nga, Semona, Tyan Shandayu Wati, Jinterona Yua Cangdang Wati Caringtao (Anetican Football) Peter, Jebsen Bakert, G., Cole Robert, J. Cole Robert, J. Cole Robert, J. Manuel	Michael Jones Michael Jones in an English footballer, who plays for Cefn Druids. SRF learned to play cleve at the gap of 1K four years have the t-metagent city women's cleves championship. Dwen Paterson Over William Paterson is a Brillia Concervative Pury publicitation who was the Scortary of State for Environment, Frod and Read Affairs from 2021 to 2014. Pata Geogheep par Affaire ecconomist, backaet, referming and because of the score	(Mark Schulz, vas bors in 1960 in, Palo Alao) – (mark_schulz_verseler) Q34732, plaze_q_shth hol_adb,_adb,_adb,_qdford(2255) (inter., forshall(2256) (inter., forshall(2256)) (inter., forshall(2256)
Mga, Semetova, Tyan Shanshaya Dwan, Jatasona Jian, Gongsheng Jian (Carrington (American Football) Peter, Jelsen Pint, Piovani Robert, G., Cole Robert, Holi, Carpentor Robert, Yan, Bosel Rolf, Maurer	Michael Jones Michael Jones in an English footballer, who plays for Cefn Dunis. Bite Learned to play clears at the age of 15: four years later due work the Learning clear women's clears championship. Dowen Paresroo Dowen William Paresron is Britick Oncerveinger Party politician who was the Secretary of State. For Part Complexe Party Development of the Secretary of State. For Environment, Food and Read Affairs from 2012 to 2014. Part Company Data Champion Barlies Constraints and Vereaceut Part Company Part Party Company. The Secretary of State. For Part Company Part Party Company. The Secretary Data Company Secretary Data Part Johen Part Johens was a Newegian businesuperson and polician. Part Johens Party Party Party Company. The Secretary Data Secretary Data Part Johens Party Party Party Company. The Secretary Data Secretary Data Party Party Party Party Party Party Company. The Secretary Data Party Party Party Party Party Party Party Party	(Mark Schulz, was born in 1960 in, Palo Alko) ~ (mark, schulz, zwenker) (248732), plaze, af, shth plaz, alko, addinou (22265) (inter. Jorden 102255) (Bork, Lenter, Clesso) + (olg), zwenceson, gans hankajsa, (2029280, tope Feld, 1-685, Control, Clesso) + (olg), zwenceson, gans hankajsa, (2029280, tope Feld, 1-685, Clesso) + (olg), zwenceson, gans hankajsa, (2029280, tope Feld, 1-685, Clesso) + (olg), zwenceson, gans hankajsa, (2029280, tope Feld, 1-685, Clesso) + (olg), zwenceson, gans hankajsa, (2029280, tope Feld, 1-685, Clesso) + (Olg), zwenceson, gans hankajsa, (2029280, tope Feld, 1-685, Clesso) + (Olg), zwenceson, gans hankajsa, (2029280, tope Feld, 1-685, Clesso) + (Olg), zwenceson, gans hankajsa, (2029980), county, z.d., trainship F2.7, tope Gangbang, Jack,
Nga, Samoora, Tyao Shanokaya Pron Jaterono Yun Zherono Yun Carrington (American Pootball) Iwar, Johon Man, Doronal Koher, G., Colo Koher, J. Kul, Carpostor Koher, Yan, Boxel Koher, Yan, Boxel Koher, Yan, Boxel Koher, Yan, Boxel	Michael Jones Michael Jones is an English footballer, who plays for Grfn Draink. Site Loanes Lipsdy, cleans at the age of 15. Four years later due work the Leaningent city women't cleans championship. Owner Baterono Owner William Paterones in Erific Concervation Purp policiani work was de Scentary of State for Draink Dear Conception Purp Purp Conception Purp Purp Conception Purp Purp Purp Purp Purp Purp Purp Purp	<ul> <li>(Mark Schultz, was born in 1960 in, Palo Alko) ~ (mark_schultz_verseler) (248732; plaze_sd_)shth, alko_alko_alko_addinod (27265)</li> <li>(Mark Schultz, Washer Schultz, Schul</li></ul>
Nga Simono, Tyao Shanshaya Wata, Pateroon Yuta Darioon Yuta Caripto (American Football) Wata Caripto (American Football) Wata Caripto (Cariptian Kohert, G.C.Cole Kohert, John, Carponier Coloret, Van, Bonel Kohert, Jan, Sanf Galada Jarria	Michael Jones Michael Jones in an English footballer, who plays for Cefn Druids. She Learned to play chees at the age of 18: four years later due work the Learningent city women's chees championship. Owen Brearcon New William Paterons in a Eritida Concervative Pure policitica Most work Secretary of State for Environment, Food and Road Athan From 2012 is 2014. Pater Learnington Patel Carrington is a Eritida Concervative Pure policitica Most work Secretary of State for Environment, Food and Road Athan From 2012 is 2014. Pater Learnington Patel Carrington is a former American Erobali defensive and Pater Learnington Patel Carrington is a former American Erobali defensive and Pater Learnington Pater Learnington is a former American Erobali defensive and Pater Learnington Pater Learnington is a former American Erobali defensive and Pater Learnington Pater Learnington is a former American Erobali defensive and Pater Learnington Pater Learnington is a former American Erobali defensive and Pater Learnington Pater Learnington is a former American Erobali Information. Phin Powari Pina Provani was an Realizan stage and Erit Erobali Erobali Erobali Erobali Information Phin Powari Pina Powari Pina Pinavati was an Realizan stage and Erobali Information Pinathone West exploration for exploring- Read High Americing Hornigh Team State From Forming and pathetican Horniga Paterolitican, biochaelfer and character. Read High Americing Hornigh Team State State Paterolitican Erobali Information Pinathone	<ul> <li>(Maf. Schultz, was born in 1960 in, Palo Alko) ~ (murk_schultz_venetler) (248732; plaze_d_shth, alko, alko</li></ul>
Nga, Semenova, Tyan Shandaya Dwan, Datomo Man, Gang Man, Gang Man, Man, Gang Man, Yan, Jonan Gang Man, Gang Man, Gang Man, Yan, Josen A. Sang Man, Gang Man, Gang Man, Gang Man, Koto, Man, Man, Man, Man, Man, Man, Man, Man	Michael Jones Michael Jones in an English footballer, who plays for Cefn Druids. Bie Learnet to play chers at the age of 18: fory years later abe work the Learning city women's chers championhip. Downer Bierston Owner William Paterons to a Ernika Chercevaria Pure policician who and the Socratary of State for Environment, Food and Read Atlan from 2012 is 2014. Part Geniphergi Par Cherropics is a former accounting bathware colonal difference and Part Cherropics Phene was A Neweglian businespersons and policician. Part Activity Phene was A Neweglian businespersons and policican. Part Activity Phene was A Neweglian businespersons and policican. Part Activity Phene was A Neweglian businespersons and policican. Part Activity Phene was A Neweglian businespersons and policican. Part Activity Phene was A Neweglian businespersons and policican. Part Activity Phene was A Neweglian businespersons and policican. Part Activity Phene was A Neweglian businespersons and policican. Part Activity Phene was A Neweglian businespersons and policican. Part Activity Phene Wesh New York Neweglian businespersons and policican. Part Activity Phene Wesh New York Neweglian businespersons and policican. Part Activity Phene Wesh New York Neweglian businespersons and policican. Part Activity Phene Wesh Tele Chargener was New Zealand bookhindre, lucal policican, bookseller and character. He joined annateer ride FC Lusse is summer 2015 from Sparta. Reif Maarter Roff Maarter was a Swiss read racing cyclist who competed professionally between 1960 and 1969. Mudaldys was hown in Latack Gadam, Cheakter, and exheated at Matern College and Birningham University, the arrest at the Reign Amy Swiss Corego Andrew Phene. He Joined annear Joine Agent Sparts Activity Phene Arrest and Reign Amy Swiss Corego Andrew Phene. He Joined Amstern Carl FormeNetter Hene Phene Phe	(Mark Schulz, was bern in 1960 in, Palo Alao) – (mark_schulz_verseler) Q48732, plaze_d_shift, McMarkan_Lones, A. 2000 (McMarkan_Lones, A. 2000) (McMarkan_Lones, McMarkan_Lones, McMarkan_Markan_Lones, McMarkan_Markan_L
Nga, Smanova, Tyan Shanshaya Nyan, Jharona Yun, Carrington (American Postshill) Yun, Forsani Share, G., Colo Kohert, Lol, Carpostor Kohert, Yan, Jihoxel Kohert, Yan, Jihoxel Kohert, Yan, Jihoxel Kohert, Yan, Jihoxel Koher, Yan, Sant Sandard, Jurin Sander, Javas	Michael Jones Michael Jones is an English footballer, who plays for Cefn Druids. She Jones Under Jones at the age of 18: for years later abe work the Lensinged city women's cleen championhip. Down Plaerono New William Placence and Enflict Allocarevial Pure policitical works and bescentary of State for Environment, Food and Rand Athan from 2012 is 2014. The Capital Pure Provide State Company in a Chamber accounting of the Company in the Secretary of State for Environment, Food and Rand Athan from 2012 is 2014. Place Capital Pure Placement State Company in a Chamber accounting and Placence and Place Camping on Place Campings in a Chamber American Cohenal defensive end Place Camping Place Placement State Capital Place Camping and Place Capital Place	(Mark Schulz, was bern in 1960 in, Palo Alho) → (mark_schulz_(wealer)(248732), place_d, Shih (Markan, Janes, A., Di Egildi, Fochaller) → (mickad_j.sec.(notshiler)(2683)707, sport.Fel41, ass form, fochallQ2760. (Bosk, Jennet, Cless) → (olg), zemenova, yan shankaya,QD9280, open.Fel1, does, Ort 1970. (Bosk, Jennet, Cless) → (olg), zemenova, yan shankaya,QD9280, open.Fel1, does, Ort 1970. (Desc., Jennet, Cless) → (olg), zemenova, yan shankaya,QD9280, open.Fel1, does, Jennet,
Nga, Semenora, Tyan Shanolaya Wen, Paterona Yun Carrington (American Football) Yun Carrington (American Football) Yun, Piorani Uohert, G., Code Kohert, Kau, Boned Koh, Mander Kon, Mandeley Safa, Al-Safa Kon, Mandeley Safa, Al-Safa Sarang, Vana, Tulagi	Michael Jones Michael Jones is an English footballer, who plays for Cefn Druids. Bie Learnet to play chers at the age of 15: fory years later abe work the Learning city women's chers championship. Overs Phereson Over William Paterons to a Erindia Concervative Play policican who and the Scortary of State for Environment, Nod and Read Atlan from 2012 is 2014. Part Gengingeing ya Cheros excosmice Under Kreitenstia and Istreascerat. Part Contingion Part Contrigons is a format American Coduli difference cat. Part Contingion Part Contrigons is a format American Coduli difference cat. Part Contingion Part Contingion to a format American Coduli difference cat. Part Costen Part Controls and scale at a first difference variat. Part Costen Part Controls and scale at a first difference variat. Part Costen Part Costen Varia New York New York Control (1994). Part Johon Part Johon Wass a New York Distance particular inflating that particular inflating the marks at Fort Berning as the particular inflating Regiment on Jame 6, 1944, Is a Johannes (1994). Robert Holf Carpenter Kohen Holf Carpenter variation of the S20ad Pranchute Inflating Regiment on Jame 6, 1944, Robert Holf Carpenter Kohen Holf Carpenter varia a New Zoalland bookhindre, Incluing Johannes and Carpenter Kohen Holf Carpenter Was a Swiss mad racing cyclist who competed professionally between 1960 and 1969. Mindelby varia horn in Lancet Goldam, Chenking and Holmann Charles Minister who is currently Minister of State English State Jabin Mathemated Jabin is an Karpenter Indian Minister Wass and Carpenter Kohen	<ul> <li>(Mark Schulz, was horn in 1906 in, Palo Alin) → (mark_schulz_verseler) (248732; place_d, Shith <i>Markappenetics</i>, 2008)</li> <li>(Markappenetics) (2487)</li> <li>(Ma</li></ul>
Nga, Semenova, Tyan Shanokaya Wen, Paterosa Yan, Congdong Yan, Congdong Yan, Paryani Osher, Ho, Color Color, Hou, Bowd Color, Van, Bowd Color, Van, Bowd Color, Van, Bowd Colf, Manerr Color, Manabalay Colf, Al-Safi Safu, Sarah Safu, Sunga Safu Safu Safu Safu, Safu	Michael Jones Michael Jones in an English footballer, who plays for Cefn Dunis. Bite Learned to play clears at the age of 15: four years later dae work the Learning cley women's clears championship. Downe Platerono Over Milliam Platerons in a Brinkl Concervative Play policitan who and the Scortary of State for Environment, Food and Rand Affairs from 2012 to 2014. Plan Genglong para Allanee consoning. Johan Kernethen Codell difference on the Scortary of State for Environment, Food and Rand Affairs from 2012 to 2014. Plan Genglong para Allanee consoning. Johan Kernethenia and Interascrit. Plan Complexity Plan Reveal Neurosci American Codell difference on Plant Development Plant Planters in a former American Codell difference on Plant Development Plant Planters and State Score and Policium. Plant Planter Planter Behren Reveal was a form Benning as the purchaster infinity butalions were expanded to regimeents, Is was a latenticant collead commanding the 3rd Battardon of the St2nd Pranchuse Infinity Regiment on June 6, 1944, the yaoa allaneat was a Toro Benning as the purchaster infinity butalions were expanded to regimeents, Is was a latenticant collead commanding the 3rd Battardon of the St2nd Pranchuse Infinity Regiment on June 6, 1944, the yaoa allaneat the C Lasse in namer 2015 from Spart. Roff Manter Roff Manter was a Swiss road racing cyclicit who competed professionally between 1960 and 1969. Mandelly was been in Lostock Gradam, Cheshter, and educated at Malvern College and Berningham University, the acress of the Royal Army Service Comp during Work W II. The Row Plays (C B Caracassonae. Steh Plants Sch-Learsonae and Engling international forobality was been in Lostock Gradam, Cheshter, and Planters Inter Jones Caracassonae. Steh Plants Sch-Lewic Plant was an English international forobality who flave European title in the regista event in 1960, 1064 and 1967. Schusping Schusping Her Roka a Lafunaktaria Institute of Technology - El Row Plays (C B Caracassonae. Steh Plant Sch-Lewic Plant was an English intern	<ul> <li>(Mark Schulz, was horn in 1960 in, Palo Alin) → (mark_schulz_(wesler) Q48732; place_d, Shift pragma, and Q2285)</li> <li>(Mark Schulz, Was Horn in 1960 in, Palo Alin) → (mick_schulz_(wesler)(Q48732; place_d, Shift Palo, P</li></ul>
Nga, Semenova, Tyan Shanokaya Wen, Paterosa Wan, Caringtone (American Football) Veter, Johon R. Coloret, G., Cole Kohert, Hol, Carpenter Gohert, Wan, Bouel Gohert, Wan, Bouel Goh, Manter Kon, Mandoley Safa, Al-Safi Sarkade, Venac, Tutlagi ende, Venac, Tutlagi ende, Venac, Futigi	Michael Jones Michael Annes is an English footballer, who plays for Cefn Druids. She Ioanes Unplay cleans at the age of 15: four yean later due wou the Leaningant city women't cleans championship. Owner Placerons Owner William Placerons in Erific Gones-regular Purp policians who and the Secretary of State for Paritoment, Food and Rauf Attinis from 2012 In 2014. Plan Lengtopus Purp Corrigin to Simon Plant Portugation and State St	<ul> <li>(Mark Schulz, was horn in 1960 in, Palo Alin) → (mark,schulz,verseler) (248732), place, d, Shift Boy, alin, additional (22265)</li> <li>(Mark Schulz, was horn in 1960 in, Palo Alin) → (michael_j-issee,(footballer)) (2683702, place, d, Shift Boy, Boy, Boy, Boy, Boy, Boy, Boy, Boy,</li></ul>
Nga, Smorou, Tyan Shandaya Dwan, Jitoron Kan, Gangkan Yan, Cangdong San, Goodhall J. Yan, Jenorgan Kang, San	Michael Jones Michael Annes is an English footballer, who play for Grfn Draids. Site Loaned to phy cleans at the age of 15. For years later due work the Leaninged city women't clean championship. Over Pleterson OverWilliam Pleterson is Firitd Concervative Phy polician who and the Secretary of State for Dear Concervation and Concervation and Concervation and Dear State (Concervation). Pleter Lobert Pleter Dear Mand And State 1 and Stat	<ul> <li>(Mark Schulz, was born in 1960 in, Palo Alao) – (mark_schulz_twenker) (248712), plaze_d_shtm. <i>distable</i>, <i>distable</i>, <i>distabl</i></li></ul>
Michael Jackae, [Footballer) Onen, Paterono Para, Gengeleng Para, Gengeleng Para, Jackael Para, Jackael Para, Jackael Para, Jackael Para, Jackael Para, Jackael Para, Jackael Para, Jackael Robert, Yan, Boxel Robert, Yan, Boxel Salvakov, Larita Salvakov, Larita Salvakov, Larita Stelja, Korkuryte Thomas, Rogne Uri, Avnery Urialu, Lehr Valovia, Thorpie, ZML, Duc, De, Brogle	Michael Jones Michael Jones is an English footballer, who plays for Cefn Druids. She Jones Michael Jones at the age of 18: for years later abe work the Lansinged city women's cleen championship. Owen Brearcon New William Pateries at a Erifical Concervation Pure policitical work as the Socratary of State for Environment, Food and Rand Athan From 2012 is 2014. Part Categories Dreim Pathones and New York and State State (State State) Pathones and Categories at Socrat Athan From 2012 is 2014. Pathones and Categories at Socrat Athan From 2012 is 2014. Pathones and Categories at Socrat Athan From 2012 is 2014. Pathones and Categories at Socrat Athan From 2012 is 2014. Pathones and Categories at Socrat Athan From 2012 is 2014. Pathones and Categories at Socrat Athan From 2012 is 2014. Pathones and Categories at Socrat Athan From 2012 is 2014. Pathones and Categories at Socrat Athan From 2014 is 2014 in 2	<ul> <li>(Mark Schulz, was bern in 1960 in, Palo Alao) – (mark_schulz_twenler) (248712), plaze_sd_shult_ National and Schulz (2285)</li> <li>(Mark Schulz, Schulz Schulz, Sc</li></ul>

Figure 8: GPT- $2_{\rm XL}$  on Wikidata-OIE.

ID	Sentence	BERT <sub>LARGE</sub> Triples to	gold triples GPT-2 <sub>XL</sub>
Andy_Hilbert	In the same season he was claimed off waivers by the Pittsburgh Penguins on March 9, 2006.		(He, by, The Pittsburgh Penguins) → (andy_hilbert.Q526158, mem her of sports team P54 nittsburgh penguins O193643)
Bob_Dylan.Q392	Dylan married his backup singer Carolyn Dennis on June 4, 1986.		(Dylan, married, Carolyn Dennis) → (Bob_Dylan,Q392, spouse.P26, Carolyn_Dennis,Q5045345)
Bones_Hillman	During the hiatus of Midnight Oil , Hillman returned to New Zealand , working as a studio and live musician with Dave Dobbyn and recorded the album " Available Light ".	(Hillman, returned, New Zealand) → (bones_hillman.Q2910026, country_of_citizenship.P27, new_zealand.Q664)	
Brent_Hinds	Hinds continues to concentrate on Mastodon, with the majority of his time spent touring or in the studio	•	(His Time, with, Mastodon) → (brent_hinds.Q909746, member_of.P463 mastodon_(band).Q548844)
Butch_Vig	Their debut album, "Garbage", was an unexpected smash, selling over 4 million copies and certified double platinum in the UK, United States and Australia.	*	<pre>(Over 4 Million Copies, in, United States) → (butch_vig.Q451084, cour try_of_citizenship.P27, united_states.Q30)</pre>
2-Kan	In addition to being known as a rapper, C-Kan is also known for supporting the free use of marijuana in México.	*	(Marijuana, in, México) → (c-kan.Q27734073, country_of_citizenship.P27, mexico.Q96)
Charles_Gratiot_Sr.	Gratiot died of a stroke in St. Louis .	(Gratiot, died, St. Louis) → (charles_gratiot_sr.Q2959257, place_of_death.P20, st_louis.Q38022)	-
Cheryl_Chan	Cheryl Chan Cheryl Chan Wei Ling , PBM , is a Singaporean politician .	sc_jours.Q58022) (Cheryl Chan Wei Ling, is, A Singaporean Politician) → (cheryl_chan.Q22003605, occupation.P106, politician.Q82955)	•
Cyba_Audi	Audi is an experienced moderator and presenter at local, regional, and international	occupation.P106, pointeian.Q82955)	(Audi, is, Presenter) → (cyba_audi.Q18921358, occupation.P106, televi
Douglas_Lenat	business events. He is a Fellow of the AAAS , AAAI , and Cognitive Science Society , and an editor	(He, is a Fellow, Aaai) → (douglas_lenat.Q559334, member_of.P463, associa-	sion_presenter.Q947873)
Douglas_Lenat	In the Section with eOots, PACA, and Cognitive science Sockey, and an extent of the J. Anometa Resenting, J. Learning Sciences, and J. Applied Ontology. While attending the University of Pennsylvania, Learni supported himself through p. 102. Nowy go, account of the section of the section of the section of the IOL Nowy, socket and the section of the section of the section of the based operations manual used on US aircraft carriers. In an early colling high based operations manual lated to base the record for longest serving manager in the bisistery of the Aches.	tion_for_the_advancement_of_artificial_intelligence.Q2739680) -	(Lenat, " The University of Pennsylvania) → (douglas_lenat.Q559334, edu cated_at.P69, university_of_pennsylvania.Q49117)
Fred_Stewart_(Football_Manager)	Despite managing for 39 years he only ever took charge of two clubs, Stockport County and Cardiff City, and he holds the record for longest serving manager in the history of both clubs.		(He, charge of, Stockport County) → (fred_stewart_(football_manager).Q5496345 member_of_sports_team.P54, stockport_county_f.cQ18526)
Félix_Tanco	Born Félix Manuel de Jesús Tanco y Bosmeniel in Bogotá Colombia he arrived	(Bogotá, ,, Cuba) → (félix_tanco.Q5511649, country_of_citizenship.P27, cuba Q241).	
Gary_Ablett_Jr.	in Cuba at a very young age . He also won his second Brownlow Medal , becoming the first Gold Coast player to win the award and the 14th player in VFL / AFL history to win it twice .	(Bogotá, _ Chu) → (člit, LuccoQS11669, country_of_nitrenship?27, cohaQ241) (He, Jako won, Hu Second Brownlow Medal) → (gary_ableti_gr-Q098509) and/, necived/B6k, iejdp, nathenies, rophy Q6310925, (He, Jako won, His Second Brownlow Medal) → (gary_ableti_gr-Q098509, awad_received/B6k, Db Morgonis News, The Third Result → (restrict monod D11324977) com-	
Geeto_Mongol	After meeting his would - be tag team partner, Bepo Mongol, Tattrie returned to the WWWF as Geto Mongol and The Mongols were brought to the United States in 1968.	try_of_citizenship.P27, united_states.Q30)	
Georgi_Plekhanov	Georgi Plekhanov Georgi Valentinovich Plekhanov was a Russian revolutionary , philosopher and a Marxist theoretician .	(Georgi Valentinovich Plekhanov, was, A Marxist Theoretician) → (georgi_plekhanov.Q182905, occupation.P106, philosopher.Q4964182)	•
Győző_Drozdy Horace_Rawlins	partosopare and a startos devectorian. Győző Drozdy Győző Drozdy was a Hungarian teacher , journalist , and politician . Rawlins died on 22 January 1935 in a nursing home in Reading , Berkshire .	(Georgi Valentinovich Plekhanov, was, A Marxist Theoretician) → (georgi_plekhanov.Q182005, occupation.P106, philosopher.Q4964182) (Gyözö Drudy, was, Politician) → (gyözö_drudy,9010001, occupation.P106, politician.Q22955) (Rawlins, diel, Reading) → (brance, rawlins,Q4436711, place. of, death.P20, read-	
Horace_Rawlins	He played in a professional event at Stanmore Golf Club in June 1894 but finished	(rearrant, etc., retaining) -> (nonce_arrant, etc.) -11, parce_o_deant, 20, rear- ing_berkshire.Q161491)	(He, played in, Stanmore Golf Club) → (horace_rawlins.Q4436711, sport.P64 golf.Q5377)
Hugo_Winterhalter	well out of the prizes. Winterhalter remained with RCA Victor until 1963, at which time he moved to Kappy that same year, he also penned the main title theme for the film, "Diamond Hard"		golf.QS377) (Winterhalter, to, Kapp) → (hugo_winterhalter.Q1635872, record_label.P26 kapp_records.Q1728690)
loannis_Talianos	He competed in the men 's 4 × 100 metres relay at the 1924 Summer Olympics .	(He, competed in the, The 1924 Summer Olympics) → (ioan- nis_talianos.Q35692847, participant_of.P1344, 1924_summer_olympics.Q8132)	*
loan_Of_France,_Duchess_Of_Berry	The nuns of the Order of the Annunciation of the Blessed Virgin Mary still maintain	nis_tananos.Q35092847, participant_of.P1344, 1924_summer_orympics.Q8132) -	(Their Way, in, France) → (joan_of_france_duchess_of_berry.Q236220, com
iohn_Maynard_Keynes	their way of life in monasteries in France, Belgium, Costa Rica and Poland. John Maynard Keynes John Maynard Keynes , Is Baron Keynes , was a British economist, whose ideas fundamentally changed the theory and practice of macroe- conomics and the economic policies of governments. Currently, he is Class of 1916 Professor of English and Comparative Literature at	(John Maynard Keynes, was, A British Economist) → (john_maynard_keynes.Q9317, occupation.P106, economist.Q188094)	try_of_citizenship.P27, france.Q142)
onathan_Culler	conomics and the economic policies of governments. Currently, he is Class of 1916 Professor of English and Comparative Literature at Comput University	(He, is, English) → (jonathan_culler.Q933332, lan- ment when writes as simed D1412 are lish language Q1860).	
ordi_Cañas_Pérez	Cornell University. In the regional elections of Catalonia in November 2010, he was chosen in the	(inc. Lagran) (Johnson et al. 1997) guages_spoken_writen_or_signed.P1412, english_language.(J1860) (The Province, of, Barcelona) → (jordi_caftas_pérez.Q557693, mem-	a
lules_Deligny	primary as number three for Ciutadans ' candidacy in the province of Barcelona . He competed in the freestyle lightweight event at the 1920 Summer Olympics .	ber_of_political_party.P102, citizens_(spanish_political_party).Q1393123) (He, competed in the, The 1920 Summer Olympics) → (jules_deligny.Q16207961, participant_of.P1344, 1920_summer_olympics.Q8128)	•
Liz_Mcgregor	Liz McGregor Liz McGregor is a South African author and a journalist who worked for leading South African newspapers such as the "Sunday Times " and the " Rand Daily Mail ".	participant_of.P1344, 1920_summer_olympics.Q8128) (Liz Mcgregor, is, A Journalist) → (liz_mcgregor.Q23541069, occupation.P106, journalist.Q1930187)	
Louise_Shropshire	The granddaughter of slaves, Louise Shropshire was born Louise Jarrett on February 15, 1913 in Coffee County, Alabama.		(Louise Shropshire, was, Coffee County, Alabama) — (louise_shropshire.Q15430857, place_of_birth.P19, co fee_county_alabama.Q485660)
Macit_Gürdal	He competed in the men's tournament at the 1952 Summer Olympics .	(He, competed in the, The 1952 Summer Olympics) → (macit_gürdal.Q57313835, participant of P1344, 1952, summar olympics O8407).	
Markus_Pröll	At the beginning of his career , Pröll became a target of some ridicule because his name " Pröll " literally means something like " lout " in German . Their Round Four match against the saw Hadebe score the first senior try of his	participant_of.P1344, 1952_summer_olympics.Q8407) ("Pröll," in, German) → (markus_pröll.Q704630, country_of_citizenship.P27, ger- many.Q183)	
Monde_Hadebe	career in a 27 – 10 victory, and the Sharks XV again finished top of the Southern	(His Carcer, , The Sharks Xv) → (monde_hadebe.Q6898677, mem- ber_of_sports_team.P54, sharks_(currie_cup).Q744636)	
Neville_Southall	Section log . He moved on to Everton for £150,000 in 1981 and established himself as the club's first-choice soalkeeper by the 1983-84 season.		(He, moved on to, Everton) → (neville_southall.Q436650, men
Olga_Semenova_Tyan-Shanskaya	first-choice goalkeeper by the 1983-84 season. She died in Leningrad .	(She, died, Leningrad) → (olga_semenova_tyan-shanskaya.Q2392240,	ber_of_sports_team.P54, everton_f.cQ5794)
Parvathy_Ratheesh	Parvathy Ratheesh made her film acting debut in 2015 similar to that of her younger brother, Padmaraj Ratheesh who also made his acting debut in the same year through "Fireman".	place_of_death.P20, saint_petersburg.Q656) (Her Film, that of her younger brother, Padmaraj Ratheesh) → (par- vathy_ratheesh.Q19895785, sibling.P3373, padmaraj_ratheesh.Q19895782)	•
Peter_Dalla_Riva	through "Fireman". In 1993, he was inducted into the Canadian Football Hall of Fame.		(He, was inducted into the, Fame) → (peter_dalla_riva.Q717352
Pierre_Duhem	Unlike many former historians , who denigrated the Middle Ages, he endeavored to show that the Roman Catholic Church had helped foster Western science in one of its most fruitful periods.	•	(rec. was insected into and intervention of the sector
Rafael_Arcadio_Bernal_Supelano	He then served as bishop of the Roman Catholic Diocese of Arauca, Colombia, from 1990 to 2003 and as bishop of the Roman Catholic Diocese of Libano-Honda.		(The Roman Catholic Diocese, ,, Colombia) – (rafael_arcadio_bernal_supelano.Q2126904, country_of_citizenship.P27, colon bia.Q739)
Rajeshwar_Dayal	Colombia, from 2003 to 2004. The Government of India awarded him the second highest civilian award of the Padma Vibhushan, in 1969.		bia.Q739) (Him, award, The Padma Vibhushan) → (rajeshwar_dayal.Q1544853 award_received.P166, padma_vibhushan.Q672392)
Ray_Johnson_(American_Football)	Ray Johnson Raymond Robert Johnson was an American football defensive back who played three caseons in the National Football League with the Cleveland Parms	(The National Football League, back who played, Raymond Robert Johnson) → (ray_johnson_(american_football),Q21077889, sport.P641, ameri-	
Sean_Hanish	who payso necessands in the value of the containt containt containt and Chicago with the Containals. Sean Hanish Sean Hanish is an American film writer , producer and director best known for " Saint Judy ", " Return to Zero " and " Sister Cities ".	can_football.Q41323) (Sean Hanish, is, An American Film Writer) → (sean_hanish.Q19867622, coun- try of citizenship.P27, united states.Q30): (Sean Hanish, is, An American Film	
Seth_Plum	Born in Edmonton, Plum played professionally for Charlton Athletic, Chelsea and	Writer) → (sean_hanish.Q19867622, occupation.P106, screenwriter.Q28389)	(Plum, played professionally for, Charlton Athletic) → (seth_plum.Q745658
Seth_Plum	Southend United. Plum received his only cap for England at age 23 while playing for Charlton Athletic , starting and playing the full 90 minutes in a 4 – 1 win over France on 10 May 1923	(His Only Cap, playing for, Charlton Athletic) $\rightarrow$ (seth_plum.Q7456581, member_of_sports_team.P54, charlton_athletic_f.cQ19462)	member_of_sports_team.PS4, charlton_athletic_f.cQ19462)
Stanislav_Nedkov	A two - time national champion in freestyle wrestling , he has also had first - place	(Turkey, , and, Bulgaria) → (stanislav_nedkov.Q4844375, coun-	
Stiliyan_Petrov	A two - time national champion in freestyle wrestling , he has also had first - place finishes in international tournaments in Russia , Moldova , Turkey , and Bulgaria . In addition he is Bulgaria's all-time most-capped player with 105 appearances for	try_of_citizenship.P27, bulgaria.Q219)	(He, is, Bulgaria'S All-Time Most-Capped Player) → (stiliyan_petrov.Q16626
Stiliyan_Petrov	the side. On 14 January 2010, it was announced that Petrov had come second in Bulgaria 's	(Petrov, in, Bulgaria'S Player) → (stiliyan_petrov.Q166263, coun-	country_of_citizenship.P27, bulgaria.Q219)
Thomas_ADunn	Player of the Year . He graduated from DePaul University College of Law in 1971.	try_of_citizenship.P27, bulgaria.Q219)	(He, graduated from, Depaul University College) → (thomas_a_dunn.Q3308299 educated_at.P69, depaul_university_college_of_law.Q5244034)
Thomas_Scott_(Commentator)	In 1803 , Scott left the Lock Hospital to become Rector of Aston Sandford in Buck- inghamshire where he remained until his death in 1821 .	(His Death, he remained until, Aston Sandford) → (thomas_cott_(commentator),07793831, place_of_death.P20, as- ter_unerfiel_020202000)	educated_at.P69, depaul_university_college_of_law.Q5244034)
Thor_Heyerdahl	Thor Heyerdahl Thor Heyerdahl was a Norwegian adventurer and ethnographer	ton_sandford.Q3088093)	(Thor Heyerdahl, was, A Norwegian Adventurer) → (thor_heyerdahl.Q13362
Venkatesh_Kulkarni	with a background in zoology, botany and geography. His first novel, " Naked in Deccan ", won the 1984 American Book Award of the	(His First Novel, , won, The 1984 American Book Award)	country_of_citizenship.P27, norway.Q20)
- Vitor_Castro_De_Souza	tink rejectuant trise rejectuant was a reoweguin accentre and cumpgingere with a background in noology, belowy and geography. His first novel, "Naked in Deccan", won the 1984 American Book Award of the Before Columbes Foundation and was listed among the top ien novels of the decade by the "Chicago Tribune". "Wher Castro de Sourz Vitor Castro de Sourz a, or simply Vitor Castro, is a Brazilian	(rits First Note, , won, ine 1964 American Book Award) → (venkatesh.jculkarniQ7920091, award_received.P166, ameri- can_book_awards.Q463606) -	(Vítor Castro De Souza, is, A Brazilian Striker) → (v tor_castro_de_souza_Q5604876, position_played_on_team_/_speciality.P41
	striker.		tor_castro_de_souza.Q5604876, position_played_on_team_/_speciality.P41 forward_(association_football).Q280658)
	He made his debut in the Soviet Top League in 1990 for FC Dynamo Moscow .	(He, for, Fc Dynamo Moscow) → (vyacheslav_tsaryov.Q4503307, mem-	
Vyacheslav_Tsaryov Zare_Markovski	Zare Markovski as player played in KK Rabotnički and MZT Skopje .	(iv., iv., iv. by main induction (c) (variant) carporterious (c), includent of ports, team P54, fc_dvpmon_moscw.Q17497) (Zare Markovski, played in, Kk Rabotnički) → (zare_markovski.Q4023877, member_of_sports_team.P54, kk_rabotnički.Q2603345)	

Figure 9: BERT $_{\rm LARGE}$  vs. GPT-2 $_{\rm XL}$  on Wikidata-OIE.