

# Multi3Generation: Multitask, Multilingual, Multimodal Language Generation

Anabela Barreiro<sup>1</sup> José GC de Souza<sup>2</sup> Albert Gatt<sup>3,4</sup> Mehul Bhatt<sup>5</sup> Elena Lloret<sup>6</sup>  
Aykut Erdem<sup>7</sup> Dimitra Gkatzia<sup>8</sup> Helena Moniz<sup>9,1</sup> Irene Russo<sup>10</sup> Fabio Kepler<sup>2</sup>  
Iacer Calixto<sup>11</sup> Marcin Paprzycki<sup>12</sup> François Portet<sup>13</sup> Isabelle Augenstein<sup>14</sup>  
Mirela Alhasani<sup>15</sup>

<sup>1</sup>INESC-ID, Portugal <sup>2</sup>Unbabel, Portugal <sup>3</sup>University of Malta, Malta

<sup>4</sup>Utrecht University, The Netherlands <sup>5</sup>Örebro University, Sweden

<sup>6</sup>University of Alicante, Spain <sup>7</sup>Koç University, Turkey

<sup>8</sup>Edinburgh Napier University, United Kingdom <sup>9</sup>University of Lisbon, Portugal

<sup>10</sup>National Research Council, Italy <sup>11</sup>Amsterdam University Medical Centers, The Netherlands

<sup>12</sup>Polish Academy of Sciences, Poland <sup>13</sup>Grenoble Alpes University, France

<sup>14</sup>University of Copenhagen, Denmark <sup>15</sup>Epoka University, Albania

anabela.barreiro@inesc-id.pt

## Abstract

This paper presents the Multitask, Multilingual, Multimodal Language Generation COST Action – Multi3Generation (CA18231), an interdisciplinary network of research groups working on different aspects of language generation. This "meta-paper" will serve as reference for citations of the Action in future publications. It presents the objectives, challenges and the links for the achieved outcomes.

## 1 Introduction

Multi3Generation<sup>1</sup> fosters the development of a network of researchers and technologists across interdisciplinary fields working on topics related to language generation (LG). We frame LG broadly as the set of tasks where the ultimate goal involves generating language. In contrast to the more classical definition of natural language generation (NLG), this also includes tasks not concerned with LG in an immediate sense, but that can inform or improve LG models. The action focuses on four core challenges: (a) data and information representation challenges, such as those involving inputs of different sources: images, videos, knowledge bases (KBs) and graphs; (b) machine learning (ML) challenges of modern approaches, such as mapping of inputs to different correct outputs, e.g. structured prediction and representation learning; (c) interaction in applications of LG, such as

dialogue systems, conversational search interfaces and human-robot interaction due to the uncertainty derived from the changing environment and the non-deterministic fashion of interaction; (d) KB exploitation: structured knowledge is key to natural language processing (NLP) tasks, including NLG, supporting ML methods that require expansion, filtering, disambiguation or user adaptation of generated content. The Action addresses these challenges by answering the following questions:

1. How can we efficiently exploit common-sense, world knowledge and multimodal information from various inputs such as KBs, images and videos to address LG tasks such as multimodal machine translation (MT), video description and summarisation?
2. How can ML methods such as multi-task learning (MTL), representation learning and structured prediction be leveraged for LG?
3. How can the models from (1) and (2) be exploited to develop dialogue-based, conversational human-computer and human-robot interaction methods?

## 2 Objectives

Multi3Generation created an interdisciplinary European LG research network targeting scientific advances and societal benefits in the following four focus themes: (T1) grounded multimodal reasoning and generation; (T2) efficient ML algorithms, methods, and applications to LG; (T3) dialogue, interaction and conversational LG applications; and (T4) exploiting large KBs and graphs. The following are the **research coordination** objectives:

© 2022 The authors. This article is licensed under a Creative Commons 3.0 licence, no derivative works, attribution, CC-BY-ND.

<sup>1</sup><https://www.cost.eu/actions/CA18231/>. The Action is funded by the European Commission and is running from June 2019 till September 2023.

- Foster knowledge exchange by sharing of resources including semantic annotation guidelines, benchmarking corpora, ML and alignment tools.
- Create multimodal and multilingual benchmarks for NLG involves experimenting with automatic mapping between existing resources, crawling of web data, definition of annotation guidelines and launching of crowdsourcing campaigns for bigger datasets, also as games-with-a-purpose).
- Facilitate interactions, collaborations, knowledge building and dissemination between the Action’s participants via online tools, as website, blogs, downloadable publications.
- Promote the generation of novel ideas and introduce the new joint Multi3Generation discipline to other researchers.
- Provide opportunities for joint research projects by the Action’s members on multi-task, multilingual and multimodal processing during exchange visits of Early Career Investigators (ECIs), and other activities that encourage young researchers to establish links with industry and senior academics.
- Disseminate the results of the Action through conferences, scientific and industrial gatherings, which will have substantial impact in the participating countries and beyond.
- Create synergies between participants via joint publications in books, journals and conferences; reports from working group meetings and training materials from training schools.

The overall expected impact of the Action is to bring about a significant change in progress towards effective solutions for computational challenges involving LG with respect to multitask, multilingual and multimodal aspects. In particular, Multi3Generation is focusing on the integration of these three aspects and how they can benefit LG solutions. The Action’s specific objectives for **capacity building** are:

- Strengthen European research on theory, methodology and real-world technology in LG, particularly in the four Multi3Generation focus research themes (T1–T4);

- Facilitate collaboration, networking and interdisciplinary community building by yearly conferences and workshops and biannual international training schools;
- Drive scientific progress by liaising extensively with industry and end-users, and by increasing joint collaboration and knowledge transfer by the end of the Action;
- To coordinate the development of benchmark data resources for tasks relating to the focus themes above and to organise corresponding shared-task competitions.

In order to accomplish the objectives of the Action, its members are encouraged to produce novel outcomes and establish critical mass, as well as to engage in joint applications for European and national funding for research projects within the fields covered by the Action.

### 3 Outcomes

Since its inception, the action fostered collaborations that has produced more than 24 publications<sup>2</sup>, ranging from surveys to approaches to specific LG problems. Among the collaborations are the short term missions (STMs), visits among researchers that take part in the Action<sup>3</sup>. Furthermore, a series of datasets<sup>4</sup> have been developed and made available for diverse number of LG-related problems. Another important outcome of the Action is the organization of training schools in 2022, one on the topic of “representation mediated multimodality”<sup>5</sup> and another one on the topic of “automatically creating text from data”<sup>6</sup>.

### 4 Acknowledgements

This publication is based upon work from COST Action Multi3Generation - Multitask, Multilingual, Multimodal Language Generation (CA18231), supported by COST (European Cooperation in Science and Technology).

<sup>2</sup><https://multi3generation.eu/outcomes/publications/>

<sup>3</sup><https://multi3generation.eu/funding-opportunities/short-term-scientific-missions/>

<sup>4</sup><https://multi3generation.eu/outcomes/data/>

<sup>5</sup><https://codesign-lab.org/school2022/index.html>

<sup>6</sup><https://multi3generation.eu/category/events/training-schools/>