

SemSpace 2021

**Workshop on Semantic Spaces at the Intersection of
NLP, Physics, and Cognitive Science**

Proceedings of the 2021 Workshop

June 16th, 2021

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Preface

Semantic Spaces at the Intersection of NLP, Physics, and Cognitive Science (SemSpace2021) is the latest edition of a series of workshops that brings together research at the intersection of NLP, Physics, and Cognitive Science. Using the common ground of vector spaces, the workshop offers researchers in these areas an appropriate forum for presenting their uniquely motivated work and ideas. The interplay between the three disciplines fosters theoretically motivated approaches to understanding how meanings of words interact with each other in sentences and discourse via grammatical types, how they are determined by input from the world, and how word and sentence meanings interact logically.

We received 20 submissions of both extended abstracts and long papers, of which we accepted 7 extended abstracts and 8 long papers. Each paper was reviewed by at least two members of the programme committee. The submissions explored a range of topics, including the dynamics of language, grammar and parsing, quantum algorithms and phenomena in NLP, and compositional approaches for words and concepts.

Papers exploring the dynamics of language looked at how word meanings adapt in the context of a sentence (Aguirre-Celis and Miikkulainen) and at universalities in language (De las Cuevas and Sole). In the area of grammar and parsing, papers investigated various topics in pregroup grammar: efficient algorithms for pregroup parsing (Rizzo), a functorial passage from pregroup grammar to combinatory categorial grammar (Yeung and Kartsaklis), and equations within a pregroup grammar setting (Coecke and Wang).

Within the area of quantum algorithms and phenomena in NLP, papers looked at contextual phenomena in language use (Wang et al.), a functorial approach to language models (Toumi and Koziell-Pipe), quantum algorithms for wh- questions (Correia et al.), and a talk on quantum NLP - the first NLP algorithm to be run on a quantum computer (Meichanetzidis et al.)

A range of approaches to composing words and concepts were proposed. Phenomena such as conjunction (Duneau), conversational negation (Rodatz et al.), and noun phrase plausibility (McPheat et al.) have been investigated. The composition of fuzzy concepts was examined in Tull, and Hughes and Pavlovic look at the formal relation between syntax and semantics. Widdows et al provide a comprehensive survey of compositional approaches in vector space semantics, in particular looking at the link to quantum approaches.

As well as submitted talks, we have two invited talks from Ellie Pavlick (Brown University) and Haim Dubossarsky (Cambridge University).

We would like to thank everyone who submitted a paper or a talk to the workshop, all of the authors for their contributions, the programme committee for all their hard work, our invited speakers and (in advance) all the attendees. We hope for fruitful discussions and sharing of perspectives!

Workshop co-chairs

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Table of Contents

<i>Understanding the Semantic Space: How Word Meanings Dynamically Adapt in the Context of a Sentence</i>	
Nora Aguirre-Celis and Risto Miikkulainen	1
<i>LinPP: a Python-friendly algorithm for Linear Pregroup Parsing</i>	
Irene Rizzo	12
<i>A CCG-Based Version of the DisCoCat Framework</i>	
Richie Yeung and Dimitri Kartsaklis	20
<i>Grammar equations</i>	
Bob Coecke and Vincent Wang	32
<i>On the Quantum-like Contextuality of Ambiguous Phrases</i>	
Daphne Wang, Mehrnoosh Sadrzadeh, Samson Abramsky and Victor Cervantes	42
<i>Conversational Negation using Worldly Context in Compositional Distributional Semantics</i>	
Benjamin Rodatz, Razin Shaikh and Lia Yeh	53
<i>Parsing conjunctions in DisCoCirc</i>	
Tiffany Duneau	66
<i>Should Semantic Vector Composition be Explicit? Can it be Linear?</i>	
Dominic Widdows, Kristen Howell and Trevor Cohen	76

Conference Programme

16th June 2021

14:00–14:05 *Opening remarks*
Workshop Chairs

14:05–15:05 *Invited talk: Haim Dubossarsky*

15:05–15:20 *Understanding the Semantic Space: How Word Meanings Dynamically Adapt in the Context of a Sentence*
Nora Aguirre-Celis and Risto Miikkulainen

15:20–15:30 *Universalities in natural languages*
Gemma De las Cuevas and Ricard Sole

15:30–15:40 *Break*

15:40–15:55 *LinPP: a Python-friendly algorithm for Linear Pregroup Parsing*
Irene Rizzo

15:55–16:10 *A CCG-Based Version of the DisCoCat Framework*
Richie Yeung and Dimitri Kartsaklis

16:10–16:25 *Grammar equations*
Bob Coecke and Vincent Wang

16:25–16:35 *Functorial Language Models*
Alexis Toumi and Alex Koziell-Pipe

16:35–16:45 *Break*

16:45–17:00 *On the Quantum-like Contextuality of Ambiguous Phrases*
Daphne Wang, Mehrnoosh Sadrzadeh, Samson Abramsky and Victor Cervantes

17:00–17:10 *QNLP: Compositional Models of Meaning on a Quantum Computer*
Konstantinos Meichanetzidis, Robin Lorenz, Anna Pearson, Alexis Toumi, Giovanni de Felice, Dimitri Kartsaklis and Bob Coecke

16th June 2021 (continued)

17:10–17:20 *Q-SAWh: a Quantum Search Algorithm to find out Whodunnit*
Adriana Correia, Michael Moortgat and H. Stoof

17:20–17:30 *Break*

17:30–18:30 *Invited Talk: Ellie Pavlick*

18:30–18:45 *Conversational Negation using Worldly Context in Compositional Distributional Semantics*
Benjamin Rodatz, Razin Shaikh and Lia Yeh

18:45–19:00 *Parsing conjunctions in DisCoCirc*
Tiffany Duneau

19:00–19:10 *Compositional Distributional Noun Phrase Plausibility (Abstract)*
Lachlan McPheat, Mehrnoosh Sadrzadeh and Hadi Wazni

19:10–19:20 *Break*

19:20–19:35 *Should Semantic Vector Composition be Explicit? Can it be Linear?*
Dominic Widdows, Kristen Howell and Trevor Cohen

19:35–19:45 *Composing Fuzzy Concepts in Conceptual Spaces*
Sean Tull

19:45–19:55 *Sign as an adjunction*
Dominic Hughes and Dusko Pavlovic

19:55–20:00 *Closing remarks*
Workshop Chairs