Deep Learning and Formal Languages: Building Bridges

Proceedings of the Workshop

August 2, 2019
Florence, Italy
Introduction

While deep learning and neural networks have revolutionized the field of natural language processing, changed the habits of its practitioners and opened up new research directions, many aspects of the inner workings of deep neural networks remain unknown.

At the same time, we have access to many decades of accumulated knowledge on formal languages, grammar, and transductions, both weighted and unweighted and for strings as well as trees: closure properties, computational complexity of various operations, relationships between various classes of them, and many empirical and theoretical results on their learnability.

The goal of this workshop is to bring researchers together who are interested in how our understanding of formal languages can contribute to the understanding and design of neural network architectures for natural language processing.

All 7 accepted papers and non-archival extended abstracts explore those connections. They do this either by using results from formal languages to improve neural methods or by trying to understand better neural methods through well-studied characteristics from formal languages. Finding such bridges is also the main point of the 6 invited talks.

We would like to thank the authors and specially the programme committee for the timely and insightful reviews. We are looking forward of seeing you in Florence!

The workshop organizers:

Jason Eisner, Matthias Gallé, Jeffrey Heinz, Ariadna Quattoni, Guillaume Rabusseau
Organizers:

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John Hale, University of Georgia
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Franco Luque, University of Córdoba
Chihiro Shibata, Tokyo University of Technology
Adina Williams, FAIR

Invited Speaker:

Rémi Eyraud, Aix-Marseille University
Robert Frank, Yale University
John Kelleher, Technological University Dublin
Kevin Knight, Didi
Ariadna Quattoni, dMetrics
Noah Smith, University of Washington / Allen Institute for Artificial Intelligence
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Conference Program

Friday, August 2nd 2019

9:00-9:05  Opening Remarks
          Kevin Knight
9:45-9:51  Poster Spotlights:
          Sequential Neural Networks as Automata
          William Merrill
          Grammatical Sequence Prediction for Real-Time Neural Semantic Parsing
          Chunyang Xiao, Christoph Teichmann and Konstantine Arkoudas
          Siamese recurrent networks can learn first-order logic reasoning and exhibit zero-shot generalization
          Mathijs Mul and Willem Zuidema
9:51-10:30 Invited Talk: A story about weighted automata (WFAs), RNNs and low-rank Hankel Matrices
          Ariadna Quattoni
10:30-11:00 Break
11:00-11:40 Invited Talk: Distilling computational models from Recurrent Neural Networks
          Remi Eyraud
11:40-11:45 Poster Spotlights:
          CYK Parsing over Distributed Representations
          Fabio Massimo Zanzotto, Giordano Cristini and Giorgio Satta
          Relating RNN layers with the spectral WFA ranks in sequence modelling
          Farhana Ferdousi Liza and Marek Grzes
11:45-12:25 Invited Talk: Using formal grammars to test ability of recurrent neural networks to model long-distance dependencies in sequential data
          John Kelleher
12:25-13:30 Poster Spotlights:
          Using SPk Languages to Explore the Characteristics of Long-Distance Dependencies
          Abhijit Mahalunkar and John Kelleher
          LSTM Networks Can Perform Dynamic Counting
          Mirac Suzgun, Yonatan Belinkov, Stuart Shieber and Sebastian Gehrmann
12:30-14:00 Lunch
14:00-15:30 Poster Session
15:30-16:00 Break
16:00-16:40 Invited Talk: Beyond testing and acceptance: On the study of formal and natural languages in neural networks
          Robert Frank
16:40-17:20 Invited Talk: Rational Recurrences for Empirical Natural Language Processing
          Noah Smith
17:20-17:30 Closing Discussion