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Analysis of Images, Social Networks and Texts

7th International Conference, AIST 2018
Moscow, Russia, July 5–7, 2018
Revised Selected Papers

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Preface

This volume contains the refereed proceedings of the 7th International Conference on Analysis of Images, Social Networks, and Texts (AIST 2018)[1]. The previous conferences during 2012–2017 attracted a significant number of data scientists – students, researchers, academics, and engineers working on interdisciplinary data analysis of images, texts, and social networks.

The broad scope of AIST made it an event where researchers from different domains, such as image and text processing, exploiting various data analysis techniques, can meet and exchange ideas. We strongly believe that this may lead to the cross-fertilisation of ideas between researchers relying on modern data analysis machinery.

Therefore, AIST brought together all kinds of applications of data mining and machine learning techniques. The conference allowed specialists from different fields to meet each other, present their work, and discuss both theoretical and practical aspects of their data analysis problems. Another important aim of the conference was to stimulate scientists and people from industry to benefit from the knowledge exchange and identify possible grounds for fruitful collaboration.

The conference was held during July 5–7, 2018. The conference was organised in Moscow, the capital of Russia, on the campus of Moscow Polytechnic University (MPU)[2].

This year, the key topics of AIST were grouped into six tracks:

1. General Topics of Data Analysis chaired by Sergei Kuznetsov (Higher School of Economics, Russia) and Amedeo Napoli (LORIA, France)
2. Natural Language Processing chaired by Natalia Loukachevitch (Lomonosov Moscow State University, Russia) and Goran Glavaš (University of Mannheim, Mannheim, Germany)
3. Social Network Analysis chaired by Vladimir Batagelj (University of Ljubljana, Slovenia) and Olessia Koltsova (Higher School of Economics, Russia)
4. Analysis of Images and Video chaired by Marcello Pelillo (University of Venice, Italy) and Andrey Savchenko (Higher School of Economics, Russia)
5. Optimization Problems on Graphs and Network Structures chaired by Panos Pardalos (University of Florida, USA) and Michael Khachay (IMM UB RAS and Ural Federal University, Russia)
6. Analysis of Dynamic Behavior Through Event Data chaired by Wil van der Aalst (RWTH Aachen University, Germany) and Irina Lomazova (Higher School of Economics, Russia)

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[1] http://aistconf.org/.
[2] http://mospolytech.ru/?eng.

The Program Committee and the reviewers of the conference included 154 well-known experts in data mining and machine learning, natural language processing, image processing, social network analysis, and related areas from leading institutions of 32 countries including Argentina, Australia, Austria, Bangladesh, Canada, China, Croatia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, India, Italy, Kazakhstan, Lithuania, Norway, Qatar, Romania, Russia, Slovenia, Spain, Switzerland, Vietnam, Taiwan, Turkey, Ukraine, The Netherlands, UK, and USA. This year we received 107 submissions mostly from Russia but also from Austria, Bangladesh, Finland, Germany, Norway, Switzerland, Taiwan, Turkey, Ukraine, USA, and Vietnam.

Out of 107 submissions, only 29 papers were accepted as regular oral papers. Thus, the acceptance rate of this volume was around 36% (not taking into account 26 automatically rejected papers). In order to encourage young practitioners and researchers, we included 28 papers in the supplementary proceedings after their poster presentation at the conference. Each submission was reviewed by at least three reviewers, experts in their fields, in order to supply detailed and helpful comments.

The conference featured several invited talks and an industry session dedicated to current trends and challenges.

The topical opening talk was presented by Rostislav Yavorskiy on "Visualization of Data Science Community in Russia."

The invited talks were:

– Anne Rozinat (Fluxicon), "Process Mining: Discovering Process Maps from Data"
– Goran Glavaš (University of Mannheim), "Cars, Drivers, Vehicles, and Wheels: Specializing Distributional Word Vectors for Lexico-Semantic Relations"
– Gleb Gusev (Yandex and Moscow Institute of Physics and Technology), "Machine Learning Research in Yandex and CatBoost"
– Ekaterina Chernyak of HSE and Sberbank presented a tutorial on "Supervised Methods in Natural Language Processing"

The business speakers also covered a wide variety of topics:

– Iosif Itkin (Exactpro Systems), "The World's Most Valuable Commodity"
– Maksim Balashevich (Santiment), "Crypto Assets Valuation"
– Ilya Utekhin (European University at St. Petersburg), "On Understanding Users for Human-Centered Design"
– Denis Stepanov (JetBrains), "Workshop: Data Visualization with Datalore.plot in Research, Education, and Just for Fun"
– Eugeny Malyutin (OK.ru), "Trend Detection at OK"
– Oleg Klepikov (Center for Applied Neuroeconomics), "Psychometric Behavorial Classification of Banking Clients – A Case Study"
– Dmitriy Skougarevskiy (European University at St. Petersburg), "Semantic Representation of Accident Reports to Understand the Dark Figure of Crime"

Under a special agreement between the responsible program co-chairs and the proceedings chair, due to its interdisciplinary nature, one paper was assigned to a special section on Innovative Systems (outside of the main tracks).

We would like to thank the authors for submitting their papers and the members of the Program Committee for their efforts in providing exhaustive reviews.

According to the program chairs, and taking into account the reviews and presentation quality, the best paper awards were granted to the following papers:

Track 1. General Topics of Data Analysis: "Lookup Lateration: Mapping of Received Signal Strength to Position for Geo-Localization in Outdoor Urban Areas" by Andrey Shestakov, Attila Kertesz-Farkas, Dmitri Shmelkin, and Danila Doroshin

Track 2. Natural Language Processing: "Learning Representations for Soft Skill Matching" by Luiza Sayfullina, Eric Malmi, and Juho Kannala

Track 3. Social Network Analysis: "Organizational Networks Revisited: Predictors of Headquarters–Subsidiary Relationship Perception" by Antonina Milekhina, Valentina Kuskova, and Elena Artyukhova

Track 4. Analysis of Images and Video: "Application of Fully Convolutional Neural Networks to Mapping Industrial Oil Palm Plantations" by Artem Baklanov, Mikhail Khachay, and Maxim Pasynkov

Track 5. Optimization Problems on Graphs and Network Structures: "Efficient PTAS for the Euclidean CVRP with Time Windows" by Michael Khachay and Yuri Ogorodnikov

Track 6. Analysis of Dynamic Behavior Through Event Data: "Neural Approach to the Discovery Problem in Process Mining" by Timofey Shunin, Natalia Zubkova, and Sergey Shershakov

We would also like to express our special gratitude to all the invited speakers and industry representatives.

We deeply thank all the partners and sponsors. Our golden sponsor was Exactpro.

Exactpro, a fully owned subsidiary of the London Stock Exchange Group, specialises in quality assurance for exchanges, investment banks, brokers, and other financial sector organisations. Our special thanks go to Springer for their help, starting from the first conference call to the final version of the proceedings. JetBrains covered important conference expenses while Springer sponsored the best paper awards. Last but not least, we are grateful to the dean of Information Technologies Faculty of MPU, Andrey Phillipovich, and all the organisers, especially to Andrey Novikov and Marina Danshina, and the volunteers, whose endless energy saved us at the most critical stages of the conference preparation.

Here, we would like to mention the Russian word "aist" is more than just a simple abbreviation (in Cyrillic) – it means a "stork." Since it is a wonderful free bird, a symbol of happiness and peace, this stork gave us the inspiration to organise the AIST

conference. So we believe that this young and rapidly growing conference will likewise be bringing inspiration to data scientists around the world!

October 2018

Wil van der Aalst
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Invited Talks and Tutorials

Process Mining: Discovering Process Maps From Data

Anne Rozinat

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Abstract. Data scientists deftly move through a whole range of technologies. They know that 80% of the work consists of the processing and cleaning of data. They know how to work with SQL, NoSQL, ETL tools, statistics, scripting languages such as Python, data mining tools, and R. But for many of them Process Mining is not yet part of the data science toolbox.

We explain what Process Mining is, how it works, and what data science teams will be able to do with it.

Tutorial: Supervised Methods in Natural Language Processing

Ekaterina Chernyak

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Abstract. In this talk we are going to address several aspects of applying supervised methods to natural language processing tasks. We will start by describing several types and tools for text annotation and evaluation of annotation quality. Next we will approach a few supervised tasks, specially, text classification and sequence labelling, describe them formally and discuss both traditional machine learning approaches as well as deep learning approaches to them.

Keywords: Natural language processing · Text annotation · Text classification Sequence labelling

Cars, Drivers, Vehicles, and Wheels: Specializing Distributional Word Vectors for Lexico-Semantic Relations

Goran Glavaš

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Abstract. In recent years, prediction-based distributional word vectors (i.e., word embeddings) have become ubiqiutous in natural language processing. While word embeddings robustly capture existence of semantic associations between words, they fail to reflect – due to the distributional nature of embedding models – the exact type of the semantic link that holds between the words, that is, the exact semantic relation (e.g., synonymy, antonymy, hypernymy). This talk presents an overview of recent models that fine-tune distributional word spaces for specific lexico-semantic relations, using external knowledge from lexico-semantic resources (e.g., WordNet) for supervision. I will analyze models for specializing embeddings for semantic similarity (vs. other types of semantic association) as well as models that specialize word vectors for detecting particular relations, both symmetric (e.g., synonymy, antonymy) and asymmetric (e.g., hypernymy, meronymy). The talk will also examine evaluation procedures and downstream tasks that benefit from specializing embedding spaces. Finally, I will demonstrate how to transfer embedding specializations to resource-lean languages, for which no external lexico-semantic resources exist.

Contents

Analysis of Images and Video

General Topics of Data Analysis