Volume Editors

Alexei Buzmakov,
Department of Information Technologies in Business & Laboratory of Interdisciplinary Empirical Studies, Faculty of Economics, Management, and Business Informatics
National Research University Higher School of Economics, Moscow, Russia

Kai Heinrich,
Business Intelligence Research, Faculty of Business and Economics
Technische Universität Dresden, Germany

Dmitry I. Ignatov,
Department of Data Analysis and AI & Laboratory of Models and Methods of Computational Pragmatics, Faculty of Computer Science
National Research University Higher School of Economics, Moscow, Russia

Rustam Tagiew,
ONTONOVAITION, Dresden, Germany

Dmitry Potapov,
School of Economics and Finance, Faculty of Economics, Management, and Business Informatics
National Research University Higher School of Economics, Perm, Russia

The proceedings are published online on the CEUR Workshop Proceedings web site, Vol. 2479, in a series with ISSN 1613-0073.

Copyright © 2019 for the individual papers by the papers’ authors.
Copyright © 2019 for the volume as a collection by its editors.
This volume and its papers are published under the Creative Commons License Attribution 4.0 International (CC BY 4.0).
Preface

This volume contains the papers presented at the Fifth International Workshop on Experimental Economics and Machine Learning held on September 26, 2019 at the National Research University Higher School of Economics in Perm, Russia.

This proceedings concentrates on interdisciplinary approaches to modelling human behaviour incorporating data mining and behaviour sciences. Data analysis results extracted from clean data of laboratory experiments are of advantage if compared with noisy industrial datasets from the web and other sources. In their turn, insights from behaviour sciences help data scientists. Similarly, behaviour scientists see new inspirations to research from industrial data science. Market leaders in Big Data, such as Microsoft, Facebook, and Google, have already realized the importance of Experimental Economics know-how for their business.

Due to the importance of such problems as global poverty, it is not surprising that the Royal Swedish Academy of Sciences has decided to award the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2019 to Abhijit Banerjee and Esther Duflo (Massachusetts Institute of Technology, Cambridge, USA), and Michael Kremer (Harvard University, Cambridge, USA) “for their experimental approach to alleviating global poverty”. For example, they have shown how powerful this approach can be, using field experiments to test a range of interventions that could improve school results in western Kenya.

In Experimental Economics, although financial rewards restrict subjects preferences in experiments, the exclusive application of analytical game theory is not enough to explain the data. Accordingly, the development and evaluation of ancillary models are of high importance. The more data is used for evaluation, the higher statistical significance can be achieved. Proven regularities from one dataset can help to understand another datasets. Since large amounts of behavioural data are required to scan for regularities, Machine Learning is the tool of choice for research in Experimental Economics. In some works, automated agents are needed to simulate and intervene in human interactions. This proceeding aims to create a forum, where researchers from both Data Analysis and Economics are brought together in order to achieve mutually-beneficial results.

This year the workshop has hosted five regular papers and five research proposals on a variety of topics related to different aspects of human behaviour, for example reinforcement learning in games, demography, social and monetary interactions, demand prediction, auction design, scientific publication activity, medical treatment etc. Each paper has been reviewed by three PC members on average; all these papers rely on different data analysis techniques and the presented results are supported by data.

The keynote talk on Field Experimentation in Marketing Research was presented by Dr. Ayelet Gneezy, Associate Professor of Behavioral Sciences & Marketing at Rady School of Management, University of California (San Diego, US).
The industry-oriented invited talk on Recommender Systems for Online Classified Advertisements was presented by Dr. Vasily A. Leksin, Unit Leader in Recommender Systems from AVITO.ru company (Moscow, Russia).

Another speaker from industry, Nikita Benkovich (Kaspersky Lab, Moscow, Russia) presented his co-authored work on a new Deep Learning based solution for detection of suspicious email.

We would like to thank all the authors of submitted papers and the Program Committee members for their commitment. We are grateful to local organisers and our sponsor: National Research University Higher School of Economics. We also would like to thank Machine Learning in Perm for active participation in the lively discussion during the workshop and informal communication as well. Finally, we would like to acknowledge the EasyChair system which helped us to manage the reviewing process and CEUR-ws publisher representatives for tactful negotiation.

September 26, 2019

Alexey Buzmakov
Kai Heinrich
Dmitry I. Ignatov
Rustam Tagiew
Dmitry Potapov
Organisation

Program Committee

Laurent Beaudou
Université Blaise Pascal, Clermont-Ferrand 2, France

Anastasia Bezzubtseva
Yandex, Russia

Aleksey Buzmakov
National Research University Higher School of Economics, Perm, Russia

Danil Fedorovykh
National Research University Higher School of Economics, Moscow, Russia

Kai Heinrich
Technische Universität Dresden, Germany

Dmitry Ignatov
National Research University Higher School of Economics, Moscow, Russia

Dmitry Ilvosky
National Research University Higher School of Economics, Moscow, Russia

Tatiana Khavenson
National Research University Higher School of Economics, Moscow, Russia

Edward S. Klyshinsky
Moscow State Institute of Electronics and Mathematics (HSE MIEM), Moscow, Russia

Sergei Koltcov
National Research University Higher School of Economics, St.Petersburg, Russia

Leonard Kwuida
Bern University of Applied Sciences, Switzerland

Xenia Naidenova
Military Medical Academy, St.Petersburg, Russia

Evgeniy M. Ozhegov
National Research University Higher School of Economics, Perm, Russia

Alina Ozhegova
National Research University Higher School of Economics, Perm, Russia

Sofia Paklina
National Research University Higher School of Economics, Perm, Russia

Maxim Panov
Skolkovo Institute of Science and Technology (Skoltech), Russia

Henry Penikas
National Research University Higher School of Economics, Moscow, Russia

Dmitriy Potapov
National Research University Higher School of Economics, Perm, Russia

Oleg Prokopyev
University of Pittsburgh, US

Cyril Pshenichny
National Research University of Information Technologies, Mechanics and Optics (ITMO), St.Petersburg, Russia

Delhibabu Radhakrishnan
Vellore Institute of Technology, India

Grigory Sapunov
Intento Inc, US
Andrey Savchenko National Research University Higher School of Economics, Nizhniy Novgorod, Russia
Alexander Semenov National Research University Higher School of Economics, Moscow, Russia
Bariş Sertkaya Frankfurt University of Applied Sciences, Germany
Andrey Shestakov Mail.ru and National Research University Higher School of Economics, Moscow, Russia
Alexandra Suvorikova Weierstrass Institute for Applied Analysis and Stochastics, Germany
Rustam Tagiew Institut für Informatik TU Freiberg, Germany
Evgenii Tsymbalov Skolkovo Institute of Science and Technology (Skoltech), Russia
Elena Tutubalina Kazan Federal University, Russia
Bruce Watson Stellenbosch University, South Africa
Karl Erich Wolff Ernst-Schroeder-Center for Conceptual Knowledge Processing, Germany
Rostislav Yavorskiy Surgut State University, Russia
Marina Zavertiaeva National Research University Higher School of Economics, Perm, Russia
Nataly Zhukova SPIIRAS, St.Petersburg, Russia

Additional Reviewers

Ilya Makarov National Research University Higher School of Economics, Moscow, Russia

Organising Committee

Aleksey Buzmakov National Research University Higher School of Economics, Perm, Russia
Dmitriy Potapov National Research University Higher School of Economics, Perm, Russia
Alexander Artemov National Research University Higher School of Economics, Perm, Russia
Daria Semenova National Research University Higher School of Economics, Perm, Russia
Anna Shtennikova National Research University Higher School of Economics, Perm, Russia
Tatiana Vozian National Research University Higher School of Economics, Perm, Russia
# Table of Contents

## Keynote Talk
Field Experimentation in Marketing Research .............................. 1  
*Ayelet Gneezy*

## Invited Industry Talk
Online Classified Advertisements ............................................. 2  
*Vasily A. Leksin*

## Regular Papers
Deep Reinforcement Learning with VizDoom First-Person Shooter ...... 3  
*Dmitry Akimov and Ilya Makarov*

Searching for Interpretable Demographic Patterns ....................... 18  
*Anna Muratova, Robiul Islam, Ekaterina Mitrofanova and Dmitry I. Ignatov*

Fundamental Factors Affecting the MOEX Russia Index: Retrospective Analysis ......................................................... 32  
*Anastasiia Saltykova and Agata Lozinskaia*

The Comparison of Methods for Individual Treatment Effect Detection .. 46  
*Daria Semenova and Maria Temirkayeva*

Effective Algorithms for Constructing Multiplex Networks Embedding ... 57  
*Pavel Zolnikov, Maxim Zubov, Nikita Nikitinsky and Ilya Makarov*

## Industry Research Paper
Deep Quarantine for Suspicious Mail ........................................... 68  
*Nikita Benkovich, Roman Dedenok and Dmitry Golubev*

## Project Proposals
Attribution of Customers Actions Based on Machine Learning Approach . 77  
*Timur Kadyrov and Dmitry I. Ignatov*

General Game Playing B-to-B Price Negotiations .......................... 89  
*Friedrich Michael and Dmitry I. Ignatov*
Neural Network Associative Forecasting of Demand for Goods  .......... 100
    Vasiliy Osipov, Nataly Zhukova and Dmitriy Miloserdov

Glioblastoma Multiforme Classification On High Resolution Histology
Image Using Deep Spatial Fusion Network  ......................... 109
    Sobana Sumi and Radhakrishnan Delhibabu

Deception Detection in Online Media  ............................... 121
    Alsu Zaynudinova, Dina Pisarevskaya, Maxim Zubov and Ilya Makarov