Alexey Bochkarev

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Research interests

Mathematical optimization, theory and applications, especially:

- Combinatorial optimization,
- Network optimization and interdiction,
- Decision diagrams and dynamic programming,
- Applications of reinforcement learning techniques.

Applications: So far my research has been driven more by methodological questions, but I do have some experience of implementing applied models in industry. Also, due to my background I have a special interest in optimization related to electricity markets: pricing / OPF / economic dispatch / infrastructure planning, etc.

Research experience / current projects

(more)

- **Align-BDD:** seeking to obtain computational benefits and sensitivity information by representing a combinatorial problem as a collection of Binary Decision Diagrams (BDDs). The project involves creating a heuristic to enforce a certain structural property for a pair of BDDs and building a related "computational pipeline" for a specific, hard optimization problem: a variant of the facility location.
- **DSPI:** applying game-playing and reinforcement learning techniques to the Dynamic Shortest-path Interdiction problem, in a framework of a Monte-Carlo Search Tree based algorithm.

Both projects involve design and implementation of an algorithm and the related computational experiments.

Research supervisor: Dr. J. Cole Smith.

Working papers and conference presentations

- **Working paper:** A. A. Bochkarev, J.C. Smith, On Aligning Non-Order-Associated Binary Decision Diagrams, revision submitted to *INFORMS Journal on Computing*. (First submission: 2020/08/22)
- **Presentation:** INFORMS Annual Meeting, 2020 (virtual), BDD section.

Grants and awards

- Clemson University Doctoral Disseration Completion Grant (support for Fall 2021)
- Graduate Travel Grant (to participate in INFORMS Annual Meeting 2021)
- International Teaching Fellowship from Clemson University (partial support in 2020, training in teaching)

Education

PhD Industrial Engineering (2018–2021 exp)
Clemson University, US
Operations Research track

MSc/BSc Appl. Math and Physics (2004–2010)
Moscow Institute of Physics
and Technology, Russia

M.A. Economics (2008–2010)
New Economic School, Russia

(Human) Languages

English (fluent), Russian (native), German (A1).

Technical skills

(more)

Main programming stack:

- Python (gurobi, CBC, numpy/pandas, etc.)
- R (ggplot, dplyr, tidyverse),
- Julia (JuMP/gurobi, LightGraphs),
- C++ (gurobi, armadillo/BLAS, boost).

Basic knowledge: PyTorch, Java, Matlab/Octave.

Other technical skills: PBS (comp cluster), GNU/Linux, bash; make, git, LaTeX, Emacs, basic GIS (QGIS), Inkscape, beamer / PPT / reveal.js, Jupyter.

Teaching experience

(more)

- Designed and delivered two 4-days mini-courses aimed at gifted high-school students and early undergrads for School for Molecular and Theoretical Biology (SMTB) and Puschino Winter School (ZPSh), both Russian and English track:
  - "Practical Introduction to Probability Theory", ZPSh-2021, SMTB-2021
  - "A Glimpse into Algorithms", SMTB-2020 (workshop), SMTB-2021 (course)
- TA in "Intro probability" undergrad course at Clemson University (IE3600), Summer 2021

Service and volunteering / Community

Besides teaching at summer and winter schools (above), I have been doing some work under the umbrella of Clemson University INFORMS Student Chapter:

- serving on the Executive Board: as a Secretary (2020) and President (2021),
- organized a "Journal club on Network optimization and interdiction" (2021),
- designed and delivered "OR Tech Seminar" – a series of four workshops on "research toolbox" (2021).

Industry experience

The Federal Grid (FGC UES) (2013–2017)
Electricity transmission, Moscow, Russia

Role: Team head, modeling and analytics
Focus: Performance benchmarking (branches), operational efficiency improvement. Internal regulations/KPI, strategy, analytics / modeling, and presentations.

Ministry of Energy of Russia (2013)
Public service: energy (electricity), Moscow, Russia

Role: Deputy team head
Focus: Electricity transmission and distribution grids, benchmarking, economic efficiency. Analytics, presentations.

Roland Berger Strategy Consultants GmbH (2010–2013)
Strategic consulting, Moscow, Russia

Role: Intern → Junior Consultant → Consultant
Focus: Infrastructure and construction. Strategy and performance: market entry, supply/demand modeling, growth strategy, efficiency improvement. Internal knowledge sharing, modeling, presentations.