

Alexey Bochkarev

Researcher in Mathematical Optimization / Operations Research
PhD in Industrial Engineering from Clemson University

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Research interests

Mathematical optimization, theory and applications, especially:

- Combinatorial optimization,
- Decision diagrams and dynamic programming,
- Network optimization and interdiction,
- 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.

Dissertation: “Selected Topics in Network Optimization: Aligning Binary Decision Diagrams for a Facility Location Problem and a Search Method for Dynamic Shortest Path Interdiction.”

(Online: https://tigerprints.clemson.edu/all_dissertations/2915.)

Research supervisor: [Dr. J. Cole Smith](#).

Working papers

- [A. A. Bochkarev](#), J.C. Smith, On Aligning Non-Order-Associated Binary Decision Diagrams, under review in *INFORMS Journal on Computing*. Preprint: <https://optimization-online.org/2022/08/on-aligning-non-order-associated-binary-decision-diagrams/>
- [A. A. Bochkarev](#), J.C. Smith, A Monte Carlo Tree Search for Dynamic Shortest-Path Interdiction, in preparation (targeting “Networks”).

Talks

- On Aligning Non-Order-Associated Binary Decision Diagrams, *INFORMS Annual Meeting, 2020* (virtual), BDD section.
- A Monte Carlo Tree Search for Dynamic Shortest-Path Interdiction, *International Network Optimization Conference, 2022*, Aachen, Germany ([INOC-2022](#)).

Grants and awards

- Clemson University Doctoral Dissertation Completion grant (support for Fall 2021)
- The Seth Bonder Foundation 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)
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 (\sim 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 three 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), mostly in English (sometimes in Russian as well):
 - “Practical Introduction to Probability Theory,” ZPSH-2021, SMTB-2021
 - “A Glimpse into Algorithms,” SMTB-2020 (workshop); SMTB-2021, SMTB-2022 (course)
 - “How to teach machines: simple examples on ML,” SMTB-2022 (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

Electric energy / The Federal Grid (FGC UES) (2013–2017)
Electricity transmission. Moscow, Russia

Role: Team deputy head \rightarrow head; modeling and analytics

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

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

Role: Intern \rightarrow Junior Consultant \rightarrow Consultant

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