

# Alexey Bochkarev

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

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## Research interests

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

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

## Working papers

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- [A. A. Bochkarev](#), J.C. Smith, On Aligning Non-Order-Associated Binary Decision Diagrams, under review in *INFORMS Journal on Computing*.
- [A. A. Bochkarev](#), J.C. Smith, A Monte Carlo Tree Search for Dynamic Shortest-Path Interdiction, in preparation (targeting “Networks”).

## Talks

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- 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

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- 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, L<sup>A</sup>T<sub>E</sub>X, 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.