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**Bismark Singh**

Lecturer B.

IEEE Senior Member.

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Operational Research, School of Mathematical Sciences,  
University of Southampton, UK.<https://www.southampton.ac.uk/people/628nx8/><https://sites.google.com/site/bismarksingh/>

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**Academic Appointments**

- 2022 - Lecturer B, School of Mathematical Sciences, University of Southampton, UK.
- 2019-22 E14 Researcher, Department of Mathematics, University of Erlangen-Nuremberg, Germany.
- 2016-19 Postdoctoral Appointee, Discrete Math & Optimization, Sandia National Laboratories, USA.
- 2017 E13 Researcher, Institute of Operations Research, Karlsruhe Institute of Technology, Germany.
- 2011-16 Research/Teaching assistant, Mechanical Engineering and Integrative Biology, The University of Texas at Austin, USA.

**Education**

- 2023 Habilitation, Mathematics, University of Erlangen-Nuremberg, Germany.
- 2016 PhD, Operations Research & Industrial Engineering, The University of Texas at Austin, USA.
- 2013 Master of Science, Operations Research & Industrial Engineering, The University of Texas at Austin, USA.
- 2011 Bachelor of Technology, Chemical Engineering, Indian Institute of Technology IIT Delhi, India.

**Third-party Funding** (selection)

- 2022-25 PI: German Research Foundation DFG (€115,310).
- 2021 PI: Bavarian State Ministry for Science and Art (€10,000).
- 2020-21 PI: Bavarian-Czech Academic Agency (€14,893).
- 2020 co-PI: European Open Science Cloud, Horizon 2020 (€44,160).
- 2018 Laboratory Directed Research and Development, Sandia National Laboratories (\$80,000).

**Awards** (selection)

- 2016 Utility Variable-Generation Integration Group Academic Award.
- 2016 Warren & Alice Meyer Endowed Scholarship in Engineering, The University of Texas at Austin, USA.
- 2011- Competitive travel grants over \$20,000.  
[Full award list](#)

**Publication Honors**

- 2019 IISE Health Systems Best Track Paper Award (2nd place)
- 2014 INFORMS Doing Good with Good OR Paper Award (Finalist)
- 2013 INFORMS Interactive Sessions Competition (Semi-Finalist).

**Selected Publications**

\* my supervised student

1. B. Singh, L. Oberfichtner\*, and S. Ivliev. “Heuristics for a cash-collection routing problem with a cluster-first route-second approach”. In: *Annals of Operations Research* (2022). DOI: [10.1007/s10479-022-04883-1](https://doi.org/10.1007/s10479-022-04883-1)
2. B. Singh and B. Knueven. “Lagrangian relaxation based heuristics for a chance-constrained optimization model of a hybrid solar-battery storage system”. In: *Journal of Global Optimization* (2021). DOI: [10.1007/s10898-021-01041-y](https://doi.org/10.1007/s10898-021-01041-y)
3. D. Duque, D. P. Morton, B. Singh, Z. Du, R. Pasco, and L. A. Meyers. “Timing social distancing to avert unmanageable COVID-19 hospital surges”. In: *Proceedings of the National Academy of Sciences* (2020). DOI: [10.1073/pnas.2009033117](https://doi.org/10.1073/pnas.2009033117)
4. B. Singh and J.-P. Watson. “Approximating two-stage chance-constrained programs with classical probability bounds”. In: *Optimization Letters* (2019). DOI: [10.1007/s11590-019-01387-z](https://doi.org/10.1007/s11590-019-01387-z)
5. S. Rebennack, O. A. Prokopyev, and B. Singh. “Two-stage stochastic minimum  $s-t$  cut problems: Formulations, complexity and decomposition algorithms”. In: *Networks* (2019). DOI: [10.1002/net.21922](https://doi.org/10.1002/net.21922)

36 invited seminars, 9 chaired conference sessions, 21 conference talks. Full publication lists:  

## Description of the research group

### Bismark Singh

*Keywords:* mathematical optimization, stochastic programming, chance constraints, discrete optimization, public health, energy management, waste management.

**About me:** Since 2022, I am a so-called Lecturer-B (Assistant Professor) within the Operational Research group at the School of Mathematical Sciences at the University of Southampton, UK.

Before my move to the UK, I was in the Department of Mathematics and the newly-founded Department of Data Science at the Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany. Here, I led the chair's efforts in the multi-institute "METIS" research collaboration with the Institute of Energy and Climate Research, Techno-economic Systems Analysis (IEK-3) at the Jülich Forschungszentrum (Jülich Research Center). This project seeks to develop open-source tools for optimizing large scale energy system models. See more about the project, [here](#), and technical details, [here](#). I also received my habilitation qualification here (in mathematics).

Before Germany, I was in the Discrete Math & Optimization division at Sandia National Laboratories (SNL) — one of the three research and development laboratories under the US Department of Energy's National Nuclear Security Administration — from 2016-19 working on large-scale stochastic optimization models with data from the US electrical grid. I received my PhD in operations research from The University of Texas at Austin, US with a focus on stochastic optimization.

**Team:** My group is a young team that is spread internationally. Currently, I have one PhD student working with me at our university and one more PhD student is expected to join in Fall 2023. Further, my team includes one Masters student from TU Delft (Netherlands) and one Bachelors student from IIT Delhi (India) actively working with me remotely. My students work with me on a range of topics, including chance-constraints and discrete optimization, with application to waste management, healthcare, and renewable energy. In addition I continue collaborations with my colleagues in Germany, Latvia, Turkey, and the US. The chosen candidate for the SPECIES scholarship would directly work under my supervision.

**Research activities:** My research focuses on development of algorithms and heuristics for large-scale stochastic and deterministic optimization models. Often, but not always, my research is motivated by applications, including (i) critical infrastructure resiliency, (ii) renewable energy management, and (iii) pandemic response. In this regard, I first work on formulating diverse and relevant societal problems as mathematical models, and second, on developing novel algorithmic methods towards their solution. An example of this is our work on the question of relaxing and reinstating lock-downs for COVID-19, at the interface of optimization and epidemiology, published in the *Proceedings of the National Academy of Sciences*. The chosen candidate would also have an opportunity, but is not obliged to, to collaborate on other existing works within his/her capacity.

Please feel free to contact me directly for any questions.

## Description of the work to be carried out by the student

The selected candidate has a choice to work on one or several of the topics detailed in the attachments available at the following weblinks:

1. [Estimating Individual Data from Aggregated Data](#)
2. [Stochastic Optimization Models for Energy Systems](#)
3. [Computational Experiments using Aggregated Scenarios in Stochastic Optimization Models](#)
4. [Estimating Worried-well Populations in a Pandemic.](#)

**Required qualifications:** Good knowledge of a modeling language such as (at least one of) Pyomo, GAMS, Gurobi, etc. is required. Programming skills (in any language) are also required. Depending on the project chosen, some existing code is available. A background in discrete optimization is preferred. Candidates with good knowledge of at least one of classical probability theory, combinatorics, theoretical computer science are especially encouraged. An extensive background in energy management or healthcare is *not* required.

**What we offer:** We offer an opportunity to form part of a young, self-motivated, and performance-driven research group, with an active interest in high-quality publications. The chosen candidate would be actively supervised by me at Southampton, and has the opportunity to develop a long-term collaboration plus early-career stage publications. The candidate would be a co-author or lead-author on any publications resulting from the project.

## Other information

Assistance in finding accommodation within Southampton can be arranged.

At the University of Southampton, students have access to a wide range of professional development and skills training for them to become the next generation of research leaders tackling critical projects for the future. We leverage these opportunities to maximize the impact of our research. Our impact track record is exemplary, with more than 30 years of experience in impact activities whilst leveraging a research group with more than 120 industrial partners, including defense (DSTL, Boeing Defense UK), aerospace (European Space Agency, Airbus, Rolls Royce), and infrastructure (Heathrow, BT, National Health Service). We are the largest operations research (OR) group in the country. Our QS ranking in 2021 was 7th in the UK, and 33rd world-wide for OR. 98% of all mathematical research in OR was rated internationally excellent or world-leading by the latest government research assessment exercise.

Additional funding within the student-assistant remuneration policies of the University, and depending on the scope of the project, can be offered (about £300 a month).