

# Nicholas D. Kullman

Ph.D. Student  
Operations Research, Scheduling & Transportation Team  
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## Education

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**Ph.D., University of Tours**, Tours, France, December 2019

Computer Science, emphasis in Operations Research

Dissertation: *Stochastic Dynamic Optimization in Electric Vehicle Logistics*

Advisors: Jorge E. Mendoza, Justin C. Goodson, and Jean-Charles Billaut

**M.S., University of Washington**, Seattle, WA, December 2016

Quantitative Ecology and Resource Management

Thesis: *Measuring Conflict Among Objective Functions in Multi-objective Optimization*

Committee: Sándor F. Tóth (chair), David E. Butman, Zelda B. Zabinsky

**B.S., University of Missouri**, Columbia, MO, May 2011

Physics, minor in Mathematics

Phi Beta Kappa; Summa Cum Laude; Departmental Honors; 3.98/4.0 GPA

## Research & Teaching Experience

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**Doctoral Research Assistant** (September 2016 - Present)

University of Tours, Department of Computer Science

- Formulate and solve stochastic dynamic programming models in electric vehicle logistics and autonomous vehicle fleet operations
- Design and implement heuristic policies and exact optimization methods to solve Markov decision processes
- Create web-based visualization tools for vehicle routing problem instances
- Develop and maintain project's Java codebase on GitHub

**Graduate Research Assistant** (September 2013 - December 2016)

University of Washington, Quantitative Ecology and Resource Management

- Quantify risk of climate change destabilizing relationships between forest ecosystem services using multi-objective mixed-integer mathematical programs
- Develop interactive web-based visualization tools
- Manage and manipulate large datasets for use in the construction of optimization models

**Research Intern** (January 2016 - September 2016)

University of Tours, Department of Computer Science

- Improve routing of electric vehicles in logistics operations under uncertainty through development of exact and heuristic optimization methods
- Formulate stochastic dynamic program to model Markov decision process
- Develop and maintain Java codebase

**Graduate Teaching Assistant** (Spring 2016)

University of Washington, Quantitative Ecology and Resource Management

- *Optimization Techniques for Natural Resources*: Prepare and teach labs for solving resource management optimization problems
- *Forest Management & Economics*: Hold office hours, grade homeworks and exams

**Undergraduate Research Assistant** (September 2008 - May 2011)

University of Missouri, Department of Physics

- Lab and research experience in condensed matter physics (alternative fuel storage) and optics (digital holography)

**Undergraduate Teaching Assistant** (August 2009 - December 2010)

University of Missouri, Department of Physics

- *College Physics I & II*: Lead problem solving and discussion sections

**Research Experience for Undergraduates (REU) Research Assistant** (Summer 2010)

University of California-Davis, Department of Physics

- Analyze stellar imagery and perform differential photometry in search of exoplanets

## Honors & Awards

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- Eiffel Excellence Scholarship (2018)
- SPFFA Dufrenoy Fellowship (2018)
- CNRS GdR RO Doctoral Travel Grant (2017)
- Hall Ammerer Fellowship (2013)
- Phi Beta Kappa (2011)

- Bright Flight Scholar (2007, 2008, 2009, 2010)
- Curators Scholar (2007, 2008, 2009, 2010)
- E W & Dr. Kenneth Mares Scholarship (2010)
- Helen Barrett Mathematics Scholarship (2008, 2009, 2010)
- Paul E. Basye Physics Scholarship (2010)
- Phyllis Ann Heyssel Scholarship (2010)
- Ralph K & Maxine J Hibbs Scholarship (2010)

## Presentations

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1. "Measuring Conflict behind Competing Objective Functions in Multi-objective Mathematical Programming." CLAIO, Lima , Peru. September 2018.
2. "Dynamic Electric Vehicle Routing with Mid-route Recharging and Uncertain Availability." Odysseus, Cagliari, Italy. June 2018.
3. "Electric Vehicle Routing with Uncertain Charging Station Availability & Dynamic Decision-Making." University of Brescia, Brescia, Italy. December 2017.
4. "Dynamic Electric Vehicle Routing with Uncertain Availability: Heuristics and Lower Bounds." University of Tours, Tours, France. October 2017.
5. "Quantifying the Conflict among Competing Forest Ecosystem Services under Alternative Climate Scenarios." Symposium on Systems Analysis in Forest Resources, Suquamish, WA. August 2017.
6. "Dynamic Electric Vehicle Routing with Uncertain Availability: Heuristics and Lower Bounds." INFORMS Transportation Science and Logistics Society Conference, Chicago, IL. July 2017.
7. "An Update on VRP-REP: the Vehicle Routing Problem Repository." Sixth Annual Workshop of the EURO Working Group on Vehicle Routing and Logistics Optimization, Amsterdam, Netherlands. July 2017.
8. "Electric Vehicle Routing with Mid-route Recharging and Uncertain Charging Station Availability." INFORMS Annual Meeting, Nashville, TN. November 2016.
9. "Quantifying Conflict Between Competing Forest Ecosystem Services Under Alternative Climate Scenarios." INFORMS Annual Meeting, Nashville, TN. November 2016.
10. "Impacts of climate change on conflict among forest ecosystem services." Precision Forestry Cooperative Annual Board Meeting, Seattle, WA. October 2016.
11. "Measuring conflict: Computing the hypervolume of a pareto frontier." Invited lecture for Optimization Techniques for Natural Resources, University of Washington, Seattle, WA. May 2016.
12. "Modeling Non-Timber Objectives in Harvest Scheduling with Linear Programming." Lecture for Forest Management & Economics, University of Washington, Seattle, WA. May 2016.
13. "Multi-Objective Optimization and the Impacts of Climate Change on the Joint Provision of Forest Ecosystem Services." INFORMS Annual Meeting, Philadelphia, PA. November 2015.

14. "Analysis of Hydrogen Adsorption in Engineered Carbon Nanospaces." American Physical Society, 2009 APS March Meeting, Pittsburgh, PA. March 2009.

## Publications

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### Published

1. "SieveSifter: A Web-based Tool for Visualizing the Sieve Analyses of HIV-1 Vaccine Efficacy Trials," with Andrew Fiore-Gartland, Allan deCamp, Graham Clenaghan, Wayne Yang, Craig Magaret, Paul Edlefsen, and Peter Gilbert. *Bioinformatics*. 2017.

### Works In Progress

1. "Dynamic Electric Vehicle Routing: Heuristics and Dual Bounds," with Justin Goodson and Jorge Mendoza. Targeted for submission to *Transportation Science*.
2. "Measuring Conflict Among Objective Functions in Multi-objective Optimization," with Sándor Tóth. Targeted for submission to *European Journal of Operations Research*.

## Visualizations

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1. VRP-REP Mapper: Web-based mapping utility for vehicle routing problem instances. <https://vrp-rep.github.io/mapper/>
2. SieveSifter: Web-based interactive explorer of vaccine efficacy. <http://sieve.fredhutch.org/viz>
3. MOOViz: Web-based visualization for multi-objective optimization results. <https://nkullman.github.io/mooViz/>

## Patents

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1. "Adaptive convolution method in long term evolution networks," with Rajveen Narendran, Sreekar Marupaduga, and Andrew Wurtenberger. U.S. Patent 9,844,063. December 2017.
2. "Communications-Tower Antenna Mount," with Andrew Wurtenberger. U.S. Patent 9,698,465. July 2017.
3. "Controllable Transformer Tap to Dynamically Adjust Power Distribution Levels in Wireless Networks," with Sreekar Marupaduga, Eugene Mitchell Jr., and Andrew Wurtenberger. U.S. Patent 9,635,617. April 2017.

4. "Communications-Tower Antenna Mount," with Andrew Wurtenberger. U.S. Patent 9,608,306. March 2017.
5. "Methods, Systems, and Computer Readable Media for Selecting Wireless Channel Bandwidth Based on Data-usage Tendency of User Equipment," with Rajveen Narendran, Sreekar Marupaduga, and Andrew Wurtenberger. U.S. Patent 9,544,902. January 2017.
6. "Optimization of Neighbor Information Transfer in a Long Term Evolution Network," with Sreekar Marupaduga and Andrew Wurtenberger. U.S. Patent 9,462,518. October 2016.
7. "Utilization of Relay Nodes with Beamformed Communications," with Sreekar Marupaduga. U.S. Patent 9,445,389. September 2016.
8. "Staged Signal Modification," with Eugene Mitchell Jr. and Sreekar Marupaduga. U.S. Patent 9,397,935. July 2016.
9. "Dynamically Adjusting Power Settings Based on a Gain Mapping File," with Andrew Wurtenberger, Joshua Koenig, Sreekar Marupaduga, and Patrick Schmidt. U.S. Patent 9,319,991. April 2016.
10. "Adaptive Convolution Method in Long Term Evolution Networks," with Sreekar Marupaduga, Rajveen Narendran, and Andrew Wurtenberger. U.S. Patent 9,301,159. March 2016.
11. "Systems and Methods for Dynamically Adjusting Drop-timer Thresholds Based on Loading," with Sreekar Marupaduga and Andrew Wurtenberger. U.S. Patent 9,288,711. March 2016.
12. "Dynamic Adjustment of the Number of Uplink Grants per Random Access Response Message," with Sreekar Marupaduga and Andrew Wurtenberger. U.S. Patent 9,144,079. September 2015.
13. "Dynamic Adjustment of Preambles for a Random Access Channel," with Sreekar Marupaduga and Andrew Wurtenberger. U.S. Patent 9,137,827. September 2015.
14. "Roaming Control System and Method for a Roaming Wireless Communication Device," with Sreekar Marupaduga. U.S. Patent 9,107,038. August 2015.
15. "Provision of Relay Operation Information to a Wireless Communication Network," with Sreekar Marupaduga and Andrew Wurtenberger. U.S. Patent 9,094,814. July 2015.
16. "Dynamic Assignment of MIMO Modes for a Wireless Communication Device," with Sreekar Marupaduga, Muralidhar Malreddy, and Andrew Wurtenberger. U.S. Patent 9,065,498. June 2015.
17. "Method and System of Activating a Global Beam in a Coverage Area," with Sreekar Marupaduga, Andrew Wurtenberger, and Matt Masters. U.S. Patent 9,042,323. May 2015.
18. "Optimizing Voice Services," with Sreekar Marupaduga. U.S. Patent 9,019,820. April 2015.
19. "System and Method for Avoiding the Transmission of Unsupported Messages," with Sreekar Marupaduga and Andrew Wurtenberger. U.S. Patent 9,019,987. April 2015.
20. "Dynamic Qrxlevmin and Sintrasearch Values to Optimize Intra-and Inter-Frequency Handovers in LTE," with Sreekar Marupaduga, Rajveen Narendran, and Andrew Wurtenberger. U.S. Patent 9,020,509. April 2015.
21. "Adaptive CoMP Schemes in LTE Networks Based on Battery Life," with Sreekar Marupaduga, Rajveen Narendran, and Andrew Wurtenberger. U.S. Patent 8,989,125. March 2015.
22. "Methods, Systems, and Computer Readable Media for Dynamic Toggling of Synchronization Signaling to Provide Access Control and Free Up Resources," with Sreekar Marupaduga, Andrew Wurtenberger, and Rajveen Narendran. U.S. Patent 8,965,391. February 2015.

23. "Dynamic Gain Adjustment via Mechanical Transducers Involving Active Combiners in Wireless Networks," with Sreekar Marupaduga, Eugene Mitchell Jr., and Andrew Wurtenberger. U.S. Patent 8,942,755. January 2015.
24. "Dynamic Allocation of Backhaul Bearer Services Based on Loading Conditions," with Sreekar Marupaduga, Rajveen Narendran, and Andrew Wurtenberger. U.S. Patent 8,913,494. December 2014.
25. "Enhanced Multipath Environments for MIMO Wireless Networks," with Sreekar Marupaduga. U.S. Patent 8,897,383. November 2014.
26. "Communications-Tower Antenna Mount," with Andrew Wurtenberger. U.S. Patent 8,896,497. November 2014.
27. "Wireless Communication System with Multiple Device-to-Device (D2D) Communication Configurations," with Sreekar Marupaduga and Andrew Wurtenberger. U.S. Patent 20,140,321,367. October 2014.

## Activities & Service

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### Professional

- Lead developer of Mapper utility, Vehicle Routing Problem Repository (2017)
- Session chair, INFORMS Annual Meeting (2015, 2016)
- Member, INFORMS Transportation Science and Logistics Society (2016)

### Community

- Website content and development assistant, Vasculitis Foundation (2017)
- Visualization developer, Fred Hutch Cancer Research Center (2016)
- Member, Uptown Alliance Transportation Committee (2014)

### University of Washington

- Senator, Graduate and Professional Student Senate (2016)
- Student-faculty liaison for hiring of quantitative wildlife faculty member, School of Environmental and Forest Sciences (2015)

### University of Missouri

- Co-founder, University of Missouri Math Club (2009)

# Industry Experience

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## **Telecom Design Engineer** (June 2011 - August 2013)

Sprint Corporation, Radiofrequency Extension & Antenna Development Team

- Design and lead experiments for telecom equipment; analyze and deliver results
- Analyze and report on potential threats from intermodulation distortion