

Alexander S. Estes

Industrial Postdoctoral Fellow
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Alexander Estes is current an Industrial Postdoctoral Fellow at the Institute of Mathematics and its Applications, University of Minnesota. He will be joining the Department of Industrial and Systems Engineering at University of Minnesota as an assistant professor in the fall of 2020.

Education

2013 - 2018 University of Maryland-College Park

Ph.D. in Applied Mathematics & Statistics, and Scientific Computation

Advisor: Michael Ball

Dissertation: Problems Originating from the Planning of Air Traffic Management Initiatives

2009 - 2013 University of Nebraska-Lincoln

B.S. in Mathematics, Highest Honors

Minors in Computer Science and Economics

Research Areas

■ Optimization

Combinatorial optimization

Stochastic and data-driven optimization

■ Data Science & Statistics

Optimization methods in data science

Regression models that predict uncertain elements of optimization problems

■ Applications

Air traffic management

Distribution center operations

Academic Research Experience

Aug 2018 - Present University of Minnesota & Target Corporation

Industrial Postdoc - Institute for Mathematics and its Applications

Research topics included:

- Methods for fitting regression models to predict unknown values in optimization problems. These methods integrate the objective of the optimization problem into the fitting procedure.

June 2014 - Aug 2018 University of Maryland-College Park

Graduate Research Assistant

Research topics included:

- Scheduling air traffic management actions in response to severe weather.
- Summarization of air traffic management data through unsupervised learning.
- Machine learning models to predict performance of air traffic management actions.

Teaching Experience

Aug 2013 - University of Maryland-College Park

May 2014 *Graduate Teaching Assistant*

Courses taught included:

- Recitation sections of introductory calculus course for STEM majors (MATH140).
- Lecture sections for introductory statistics course (STAT100).

Industry Experience

Aug 2018 - University of Minnesota & Target Corporation

Present *Industrial Postdoc - Institute for Mathematics and its Applications*

Worked with the Artificial Intelligence team at Target to:

- Predict capacity utilization at distribution centers.
- Improve task scheduling at distribution centers.

Working Papers and Papers Under Review

- **Estes AS**, Richard J-PP. Objective-Aligned Regression for Two-Stage Linear Programs. Preprint available on SSRN, abstract no. 3469897.
- **Estes AS**, Ball MO. Facets of the Stochastic Network Flow Problem. Under review. Preprint available on SSRN, abstract no. 3449409.
- **Estes AS**, Ball MO, Lovell DJ. Data Exploration with Selection of Representative Regions: Formulation, Axioms, Methods, and Consistency. Under review. Preprint available on SSRN, abstract no. 3005997.

Journal Publications

- **Estes AS**, Ball MO. Monge Properties, Optimal Greedy Policies, and Policy Improvement for the Dynamic Stochastic Transportation Problem. To appear in *INFORMS Journal on Computing*. Preprint available on SSRN, abstract no. 3067130.
- **Estes AS**, Ball MO. Equity and Strength in Stochastic Integer Programming Models for the Dynamic Single Airport Ground-Holding Problem. To appear in *Transportation Science*. Preprint available on SSRN, abstract no. 3448801.
- Ball MO, **Estes AS**, Hansen M, Liu Y. Quantity-Contingent Auctions and Allocation of Airport Slots. To appear in *Transportation Science*. Preprint available on SSRN, abstract no. 3286732.
- **Estes AS**, Lovell DJ, Ball MO (2018) Unsupervised prototype reduction for data exploration and an application to air traffic management initiatives. *EURO Journal on Transportation and Logistics*. 2603(1):1-44.
- **Estes AS**, Ball MO (2017) Data-Driven Planning for Ground Delay Programs. *Transportation Research Record*. 2603(1):13-20.
- Deng B, **Estes AS**, Grieb B, Richard D, Hinds B, Hebets E (2014) A male spider's ornamentation polymorphism maintained by opposing selection with two niches. *Journal of Theoretical Biology*. 357:103-111
- **Estes AS** (2013) Discrete Calculus on Mixed Time Scales. *Panamerican Mathematical Journal*. 23(4):23-46.

Peer-Reviewed Conference Publications

- **Estes AS, Ball MO** (2019) Alternative resource allocation mechanisms for the Collaborative Trajectory Options Program (CTOP). *Proc. 13th USA/Europe Air Traffic Management R&D Seminar*, 2019, Vienna.
- **Estes AS, Ball MO, Lovell DJ** (2018) Selecting parameters in performance-based ground delay program planning. *Proc. 8th International Conference on Research in Air Traffic*, 2018, Barcelona.
- **Estes AS, Ball MO, Lovell DJ** (2017) Predicting performance of ground delay programs. *Proc. 12th USA/Europe Air Traffic Management R&D Seminar*, 2017, Seattle, WA.
- **Estes AS, Lovell DJ** (2016) Identifying representative traffic management initiatives. *Proc. 7th International Conference on Research in Air Traffic*, 2016, Philadelphia, PA.

Presentations

- “Objective-Aligned Regression for Two-Stage Linear Programs,” with J-PP Richard. Presented at:
 - INFORMS Annual Meeting, October 2019, Seattle, WA.
- “Alternative resource allocation mechanisms for the Collaborative Trajectory Options Program (CTOP),” with MO Ball. Presented at:
 - INFORMS Annual Meeting, October 2019, Seattle, WA.
 - 13th USA/Europe R&D Seminar, June 2019, Vienna, Austria.
- “A quantity-contingent auction for allocation of airport slots,” with MO Ball, MH Hansen and Y Liu. Presented at:
 - INFORMS Annual Meeting, October 2019, Seattle, WA.
 - INFORMS Annual Meeting, November 2018, Phoenix, AZ.
 - INFORMS Annual Meeting, November 2016, Nashville, TN.
- “Selecting parameters in performance-based ground delay program planning,” with DJ Lovell and MO Ball. Presented at:
 - 8th International Conference on Research in Air Traffic, June 2018, Barcelona.
- “Strong IP models for ground delay program planning,” with MO Ball. Presented at:
 - INFORMS Annual Meeting, October 2017, Houston, TX
- “Predicting performance of traffic management initiatives,” with MO Ball and DJ Lovell. Presented at:
 - INFORMS Annual Meeting, October 2017, Houston, TX
 - 12th ATM R&D Seminar, June 2017, Seattle, WA
- “Greedy optimal policies for dynamic transportation problems,” with MO Ball. Presented at:
 - INFORMS TSL Conference, July 2017, Chicago, IL
- “Data-driven ground delay program planning,” with MO Ball. Presented at:
 - Transportation Research Board 96th Annual Meeting, January 2017, Washington D.C. (poster presentation)
 - INFORMS Annual Meeting, November 2016, Nashville, TN
- “Representative traffic management initiatives,” with MO Ball and DJ Lovell. Presented at:
 - 7th International Conference on Research in Air Traffic, June 2016, Philadelphia, PA
 - 9th Triennial Symposium on Transportation Analysis, June 2016, Palm Beach, Aruba
 - INFORMS Annual Meeting, November 2015, Philadelphia, PA

- “An efficient stochastic integer program for the dynamic single airport ground holding problem,” with MO Ball. Presented at:
 - International Symposium on Mathematical Programming, July 2015, Pittsburgh, PA
 - CORS/INFORMS Joint International Meeting, June 2015, Montreal, Canada
 - NEXTOR II Workshop: Global Challenges to Improve Air Navigation Performance, February 2015, Pacific Grove, CA (poster presentation)
 - INFORMS Computing Society Conference, January 2015, Richmond, VA

Awards and Honors

- Best paper in track: network management, International Conference on Research in Air Traffic Management, 2018.
- Spotlight on Graduate Research Seymour Goldberg Memorial Reward, May 2017.
- Best paper in track: performance measurement, USA/Europe Air Traffic Management R&D Seminar, 2017.
- ACRP Graduate Research Award Recipient, 2015-2016

Academic Service

- **Reviewer**
Operations Research
Transportation Science
Transportation Research Part B
Transportation Research Part C
Transportation Research Part E
Journal of Air Transport Management
15th COTA International Conference of Transportation Professionals
- **Mentor - Directed Reading Program, University of Maryland**

Academic Affiliations

- **INFORMS**
Member
- **SIAM**
Member
- **MOS**
Member

Technology Skills

- **Programming Languages**
Python (scikit-learn, pandas, numpy, simpy, pyomo), Java, C, C++, Matlab
- **Commercial Optimization Tools**
Gurobi, CPLEX
- **Databases**
SQL, Hive, Spark
- **Parallel Programming**
MPI, OpenMP, CUDA
- **Miscellaneous**
Git, Unix/Linux