

# Alexander S. Estes

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Industrial Postdoctoral Fellow  
Institute for Mathematics and its Applications  
University of Minnesota

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## 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 - May 2014** University of Maryland-College Park  
*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 - Present** University of Minnesota & Target Corporation  
*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.

## Preprints, Papers Under Review, and Manuscripts

- **Estes AS**, Richard J-PP. “Objective-Aligned Regression for Two-Stage Linear Programs.” Working Paper. Draft available on request.
- **Estes AS**, Ball MO. “Facets of the Stochastic Network Flow Problem.” 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 at *Mathematics of Operations Research* (first revision; major revision). Preprint available on SSRN, abstract no. 3005997.
- **Estes AS**, Ball MO. “Monge Properties, Optimal Greedy Policies, and Policy Improvement for the Dynamic Stochastic Transportation Problem.” Under review at *INFORMS Journal on Computing* (second revision; major revision). 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.” Under review at *Transportation Science* (first revision; major revision). Preprint available on SSRN, abstract no. 3448810.
- Ball MO, **Estes AS**, Hansen M, Liu Y. “Quantity-Contingent Auctions and Allocation of Airport Slots.” Under review at *Transportation Science* (first revision; major revision). Preprint available on SSRN, abstract no. 3286732.

## Journal Publications

- **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**

- “Alternative resource allocation mechanisms for the Collaborative Trajectory Options Program (CTOP),” with MO Ball. Presented at:
  - 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, 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 C*

*Journal of Air Transport Management*

*15<sup>th</sup> 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*