Alexander S. Estes

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

Reseach 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 -   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.

- **Estes AS**, Ball MO. "Monge Properties, Optimal Greedy Policies, and Policy Improvement for the Dynamic Stochastic Transportation Problem." Under review. Preprint available on SSRN, abstract no. 3067130.

Journal Publications

- **Estes AS**, Ball MO. Equity and Strength in "Stochastic Integer Programming Models for the Dynamic Single Aiport 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