

# Chase C. Murray

Assistant Professor  
Department of Industrial & Systems Engineering  
University at Buffalo

Phone: 716-645-4716  
E-mail: cmurray3@buffalo.edu  
Web: www.chasemurray.com

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## EDUCATION

- Ph.D., Industrial & Systems Engineering,  
University at Buffalo, The State University of New York, Buffalo, New York, 2010.
- M.E., Industrial Engineering,  
Texas A&M University, College Station, Texas, 2000.
- B.S., Industrial Engineering,  
Texas A&M University, College Station, Texas, 1998.

## RESEARCH INTERESTS

Optimization of complex systems, generally requiring the development of heuristics to solve combinatorial problems. Of particular interest are dynamic vehicle routing problems involving the coordination of unmanned aerial vehicles (UAVs) and problems motivated by vehicle platoons. Other research areas include logistics networks and facility layout.

## EMPLOYMENT HISTORY

- University at Buffalo – Assistant Professor, Industrial & Systems Engineering.  
Buffalo, NY. 2015 – present.
- Auburn University – Assistant Professor, Industrial & Systems Engineering.  
Auburn, AL. 2010 – 2015.
- University at Buffalo – Research Assistant. Buffalo, NY. 2007 – 2010.
- University at Buffalo – Teaching Assistant/Instructor. Buffalo, NY. 2005 – 2007.
- Intel Corporation – Industrial Engineer. Hillsboro, OR. 2001 – 2005.
- Dallas Semiconductor – Industrial Engineer. Dallas, TX. 2000 – 2001.

## PUBLICATIONS

(\* indicates student co-author)

### Published and Accepted:

1. X.Q. Zuo, **C. Murray**, A.E. Smith, “A Hybrid Multi-objective Genetic Algorithm with Linear Programming for the Double-bay Layout Problem.” To appear in *IEEE Transactions on Semiconductor Manufacturing*.
2. N. Al Theeb\*, **C. Murray** (2016), “Vehicle Routing and Resource Distribution in Post-disaster Humanitarian Relief Operations.” To appear in *International Transactions in Operational Research*. <http://dx.doi.org/10.1111/itor.12308>
3. X.Q. Zuo, **C. Murray**, A.E. Smith (2016), “Sharing Clearances to Improve Machine Layout.” *International Journal of Production Research*, 54 (14), 4272–4285. <http://dx.doi.org/10.1080/00207543.2016.1142134>
4. D. Bevly, X. Cao, M. Gordon, G. Ozbilgin, D. Kari, B. Nelson, J. Woodruff\*, M. Barth, **C. Murray**, A. Kurt, K. Redmill, U. Ozguner (2016) “Lane Change and Merge Maneuvers for Connected and Automated Vehicles: A Survey.” *IEEE Transactions on Intelligent Vehicles*, 1 (1), 105–120. <http://dx.doi.org/10.1109/TIV.2015.2503342>

5. **C. Murray**, A.G. Chu\* (2015), “The Flying Sidekick Traveling Salesman Problem: Optimization of Drone-assisted Parcel Delivery.” *Transportation Research Part C: Emerging Technologies*, 54, 86–109. <http://dx.doi.org/10.1016/j.trc.2015.03.005>
6. X.Q. Zuo, **C. Murray**, A.E. Smith (2014), “Solving an Extended Double Row Layout Problem using Multi-objective Tabu Search and Linear Programming.” *IEEE Transactions on Automation Science and Engineering*, 11 (4), 1122–1132. [dx.doi.org/10.1109/TASE.2014.2304471](http://dx.doi.org/10.1109/TASE.2014.2304471)
7. **C. Murray**, A.E. Smith, Z. Zhang (2013), “An Efficient Local Search Heuristic for the Double Row Layout Problem with Asymmetric Material Flow.” *International Journal of Production Research*, 51 (20), 6129–6139. [dx.doi.org/10.1080/00207543.2013.803168](http://dx.doi.org/10.1080/00207543.2013.803168)
8. **C. Murray**, W. Park (2013), “Incorporating Human Factors Considerations in Unmanned Aerial Vehicle Routing.” *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, 43 (4), 860–874. [dx.doi.org/10.1109/TSMCA.2012.2216871](http://dx.doi.org/10.1109/TSMCA.2012.2216871)
9. **C. Murray**, M.H. Karwan (2013), “A Branch-and-Bound-Based Solution Approach for Dynamic Rerouting of Airborne Platforms.” *Naval Research Logistics*, 60 (2), 141–159. [dx.doi.org/10.1002/nav.21526](http://dx.doi.org/10.1002/nav.21526)
10. **C. Murray**, A. Gosavi, D. Talukdar (2012), “The Multi-Product Price-Setting Newsvendor with Resource Capacity Constraints.” *International Journal of Production Economics*, 138, 148–158. [dx.doi.org/10.1016/j.ijpe.2012.03.014](http://dx.doi.org/10.1016/j.ijpe.2012.03.014)
11. Z. Zhang and **C. Murray** (2012), “A Corrected Formulation for the Double Row Layout Problem,” *International Journal of Production Research*, 50 (15), 4220–4223. [dx.doi.org/10.1080/00207543.2011.603371](http://dx.doi.org/10.1080/00207543.2011.603371)
12. **C. Murray**, M.H. Karwan (2010), “An Extensible Modeling Framework for Dynamic Reassignment and Rerouting in Cooperative Airborne Operations.” *Naval Research Logistics*, 57 (7), 634–652. [dx.doi.org/10.1002/nav.20427](http://dx.doi.org/10.1002/nav.20427)
13. **C. Murray**, D. Talukdar, A. Gosavi (2010), “Joint Optimization of Product Price, Display Orientation and Shelf-Space Allocation in Retail Category Management,” *Journal of Retailing*, 86 (2), 125–136. [dx.doi.org/10.1016/j.jretai.2010.02.008](http://dx.doi.org/10.1016/j.jretai.2010.02.008)

#### Refereed Conference Proceedings:

1. M. Yu, X.Q. Zuo, **C. Murray** (2014), “A Tabu Search Heuristic for the Single Row Layout Problem with Shared Clearances.” *2014 IEEE Congress on Evolutionary Computation (CEC)*, 819–825, July 6-11, 2014. [dx.doi.org/10.1109/CEC.2014.6900353](http://dx.doi.org/10.1109/CEC.2014.6900353)
2. **C. Murray**, X. Zuo, A.E. Smith, “An Extended Double Row Layout Problem.” 12th International Material Handling Research Colloquium (IMHRC), Gardanne, France. Appears in *Progress in Material Handling Research: 2012*, edited by B. Montreuil, A. Carrano, M.M.R. de Kostner, K.R. Gue, M. Ogle, and J. Smith, Material Handling Institute, 554–569.

## FUNDING

#### Awarded (\$1,084,635):

1. “Optimizing and securing the communications of a team of autonomous Unmanned Vehicles,” Office of Naval Research (through CUBRC, Inc.), 10/15/15 – 6/30/17
2. “Lane Change/Merge Fundamental Research: Phase 1,” U.S. Federal Highway Administration (FHWA), PI: D. Bevly, Co-PI: C. Murray, 10/1/14 – 12/31/15
3. “Human-Machine Task Allocation Problems,” Air Force Research Laboratory (AFRL) Munitions Directorate, PI: C. Murray, 8/27/14 – 8/26/16
4. “Information and Decision Recommender (SBIR Phase I),” U.S. Navy (through Archarithms, Inc.), PI: C. Murray, 8/4/14 – 3/2/15

5. “Multi-UAV Simulation,” Defense Advanced Research Projects Agency (DARPA, through IS4S Inc.), PI: C. Murray, 5/20/14 – 8/1/14
6. “Heavy Truck Cooperative Adaptive Cruise Control: Evaluation, Testing, and Stakeholder Engagement for Near Term Deployment,” U.S. Federal Highway Administration (FHWA), PI: D. Bevly, 10/1/13 – 9/30/15.
7. “Optimization of Warehouse Material Handling Strategies to Reduce Worker Injuries,” Deep South Center for Occupational Health & Safety, PI: C. Murray, 7/1/13 – 6/30/14.
8. “Realizing Information Gain through Optimization of Reconnaissance and Surveillance (RIGORS),” Office of Naval Research (through CUBRC, Inc.), PI: C. Murray, 6/1/13 – 9/9/17
9. “REU Site on Smart Unmanned Aerial Vehicles (UAVs),” National Science Foundation, 5/15/12 – 4/30/15, Co-PI with S. Biaz.
10. “Improving Air Traffic: A Graph Theory Approach,” NASA Graduate Student Researchers Program (GSRP), Grantee: C. Williams; PI: C. Murray, 8/1/11 – 7/31/13.

## GRADUATE STUDENTS

- Chair – Graduated:
  - Nader Al Theeb – Ph.D., 2014. “An Integrated Logistics System for Effective Resource Distribution in Post-disaster Humanitarian Relief Operations.” Assistant Professor at Jordan University of Science and Technology.
  - Arun Kumar Ranganathan Jagannathan – M.S., 2011. “Vehicle Routing with Cross Docks, Split Deliveries, and Multiple Use of Vehicles.”
- Chair – In Progress:
  - Hung-Yu (Jack) Lee – Ph.D., expected dissertation proposal Fall 2015
- Committee Member – Graduated:
  - Erdem Çeven – Ph.D. (Kevin Gue, Chair), 2013
  - Jacob Conaway – M.S. CSSE (Richard Chapman, Chair), 2015
  - Mikhail Gordon – M.S. Civil Engr. (Rod Turochy, Chair), 2015
  - Masood Jabarnejad – Ph.D. (Jorge Valenzuela, Chair), 2015
  - David Jones – M.S. CSSE (Saad Biaz, Chair), 2015
  - Ozgur Kabadurmus – Ph.D. (Alice E. Smith, Chair), 2013
  - Seyedamirabbas Mousavian – Ph.D. (Jorge Valenzuela, Chair), 2014
  - Elif Ozgormus – Ph.D. (Alice E. Smith, Chair), 2015
  - William Swaim – M.S. (John Evans, Chair), 2011
- Committee Member – In Progress:
  - Shahab Derhami – Ph.D. (Kevin Gue & Jeff Smith, Co-chairs)
  - Yashar Khayati – Ph.D. (Jamie Kang & Mark Karwan, Co-chairs)
  - Ashkan Negahban – Ph.D. (Jeff Smith, Chair)
  - Anastasia Nikolaeva – Ph.D. (Mark Karwan, Chair)
  - Sabahattin Gokhan Ozden – Ph.D. (Alice E. Smith, Chair)
  - Alejandro Teran-Somohano – Ph.D. (Alice E. Smith, Chair)

## TEACHING EXPERIENCE

- COMP 4960 – *Special Problems – Quadcopter Design*. Auburn University, Spring 2013.
- EAS 305 – *Applied Probability*. University at Buffalo, Fall 2006.
- INSY 3410 – *Deterministic Operations Research*. Auburn University, Fall 2010 – 2014.

- INSY 4960 – *Special Problems – Algorithms for Autonomous Navigation*. Auburn University, Spring 2013.
- INSY 4970/7970 – *Vehicle Routing & Logistics*. Auburn University, Spring 2014.
- INSY 5250/6250/6256 – *Scheduling & Project Management*. Auburn University, Fall 2011.
- INSY 7420/7426 – *Linear Programming & Network Flows*. Auburn University, Spring 2011 – 2015.
- INSY 7430 – *Integer & Nonlinear Programming*. Auburn University, Fall 2012.
- INSY 7940 – *Special Problems – Supply Chain Engineering*. Auburn University, Co-taught with Kevin Gue, Spring 2014.
- IE 326 – *Planning for Production and Service Enterprises*. University at Buffalo, Fall 2015.
- IE 459/500 – *Special Topics: Supply Chain Engineering*. University at Buffalo, Spring 2016.
- IE 374 – *Introduction to Operations Research: Probabilistic Models*. University at Buffalo, Spring 2006.

## CONFERENCE PRESENTATIONS

1. “Impacts of warehouse layout parameters under new autonomous warehousing systems.” IIE Annual Meeting, Anaheim, CA. May, 2016.
2. “Space Utilization Aspects in Facility Layout Designs for Semiconductor Manufacturing Systems.” IIE Annual Meeting, Nashville, TN. May, 2015.
3. “The Flying Sidekicks Traveling Salesman Problem: Drone-assisted Parcel Delivery Optimization.” IIE Annual Meeting, Nashville, TN. June, 2015. Presented by Amanda Chu.
4. “Optimal Truck Sequencing for Equitable Platooning Operations.” IIE Annual Meeting, Nashville, TN. June, 2015.
5. “Optimization of Warehouse Material Handling Strategies to Reduce Worker Injuries.” Deep South Center for Occupational Health and Safety, Emerging Issues and Research Symposium, Opelika, AL. April, 2015.
6. “Sensor Tasking for Unmanned Aerial Vehicles with Limited Communications Bandwidth.” INFORMS Annual Conference, San Francisco, CA. November, 2014.
7. “Routing of Autonomous UAVs in Unmapped Environments.” IIE Annual Meeting, Montreal, Canada. May, 2014.
8. “Routing of Autonomous UAVs in Unmapped Environments.” INFORMS Annual Conference, Minneapolis, MN. October, 2013.
9. “Pareto Optimal Solutions for a Double Row Layout Problem.” INFORMS Annual Conference, Phoenix, AZ. October, 2012.
10. “Incorporating Human-Factors Considerations in Unmanned Aircraft Routing.” 80th MORS Symposium, Colorado Springs, CO. June, 2012.
11. “Vehicle Routing with Cross Docks.” IIE Annual Meeting, Orlando, FL. May, 2012.
12. “Incorporating Human-Factors Considerations in Unmanned Aircraft Routing.” Session Chair, INFORMS Annual Conference, Charlotte, NC. November, 2011.
13. “Incorporating Human-Factors Considerations in Unmanned Aircraft Routing.” Invited Session, IIE Annual Meeting, Reno, NV. May, 2011.
14. “Dynamic Rerouting of Unmanned Aerial Vehicles.” Session Chair, INFORMS Annual Conference, Austin, TX. November, 2010.
15. “Dynamic Airborne Resource Reassignment with Anticipatory Targets.” INFORMS Annual Conference, San Diego, CA. October, 2009.
16. “A General Model and Solution Approaches for Dynamic Vehicle Re-routing.” CORS-INFORMS International Meeting. Toronto, Canada. June, 2009.
17. “Cooperative ISR Utilizing Airborne Reconnaissance Platforms and Unmanned Aircraft Systems.” Invited Session, INFORMS Annual Conference. Washington, DC. October, 2008.

18. "A Comparison of Optimal Pricing Strategies under Various Risk Considerations." INFORMS Annual Conference. Washington, DC. October, 2008.
19. "A General Modeling Framework for Course of Action in UAV Routing." 8th International Conference on Cooperative Control and Optimization. Gainesville, FL. January, 2008.
20. "Joint Optimization of Retail Price and Shelf-Space Allocation with Stochastic Demands." INFORMS Annual Conference. Seattle, WA. November, 2007.
21. "Joint Optimization of Retail Price and Shelf-Space Allocation with Stochastic Demands." POMS Annual Conference. Dallas, TX. May, 2007.

## INVITED TALKS

1. "Drones in logistics: Optimal routing and scheduling of flying robots for small parcel delivery." University of Houston, Houston, TX. October 21, 2016.
2. "Drones in Logistics: From the Battlefield to your Front Door." University at Buffalo, Buffalo, NY. February, 2015.
3. "Drones in Logistics: From the Battlefield to your Front Door." Logistics and Distribution Institute, University of Louisville, Louisville, KY. November, 2014.
4. "Optimization Approaches for Routing and Scheduling Unmanned Aircraft." Transportation Working Group, Mississippi State University, Starkville, MS. January, 2014.
5. "Tips for Surviving the Academic Job-Search Process." INFORMS Student Chapter, Mississippi State University, Starkville, MS. January, 2014.
6. "Optimization for UAS Mission Planning and Dynamic Asset Allocation." Auburn Engineering Day, Huntsville, AL. September, 2013.
7. "Dynamic Reassignment and Rerouting in Cooperative Airborne Operations." Seminar Series, Department of Industrial & Systems Engineering, University at Buffalo. April, 2010.
8. "Dynamic Reassignment and Rerouting in Cooperative Airborne Operations." Faculty Interview, Auburn University. December, 2009.

## IN THE NEWS

- "Disruptive Technology: Will Driverless Trucks and Drones Change Delivery Systems?", MHI Solutions, Volume 3, Issue 2, March 17, 2015, Mary Lou Joy, pp. 22–26. <http://www.nxtbook.com/naylor/MHIQ/MHIQ0215/index.php#/22>
- "Drone incidents near airports raise concerns", WLKY Louisville News, Steve Burgin, Nov. 20, 2014. <http://www.wlky.com/news/drone-incident-near-airports-raise-concerns/29846808>
- "Drones: Delivering the future", The Louisville Cardinal, Kylie Noltemeyer, Nov. 20, 2014. <http://www.louisvillecardinal.com/2014/11/drones-delivering-the-future/>
- "A revolution hits warehousing", Material Handling Wholesaler, Mary Glindinning, Oct. 20, 2014. <http://www.mhwmag.com/article.cfm?id=86171>
- "Professor gives glimpse into future with drones", The Auburn Plainsman, Ben Ruffin, July 10, 2014. [http://www.theplainsman.com/view/full\\_story/25422149/article](http://www.theplainsman.com/view/full_story/25422149/article)

## AWARDS & HONORS

- Graduate Research Assistantship, University at Buffalo, 2007 – 2010
- Presidential Fellowship, University at Buffalo, 2005 – 2009
- Graduate Teaching Assistantship, University at Buffalo, 2005 – 2007
- Intel DIC Divisional Award, 2005
- Graduate Teaching/Research Assistantship, Texas A&M University, 1999 – 2000
- Graduated Cum Laude, Texas A&M University, 1999

- Passed the Fundamentals of Engineering Exam (EIT), 1998
- College of Engineering Distinguished Student Award, Texas A&M University, 1997
- Member of Alpha Pi Mu Honor Society for Industrial Engineers since 1997

## **SERVICE ACTIVITIES**

### **University Service**

- Faculty advisor for University at Buffalo INFORMS Student Chapter, 2016 to present
- Co-chair for Praxair Seminar Series, Department of Industrial & Systems Engineering, 2015 to present
- University Reader, Brad Dennis dissertation (CSSE), 2014
- Founder and faculty advisor for Auburn University INFORMS Student Chapter, 2013 to 2015
- Faculty mentor for Computer Science and Software Engineering (CSSE) Senior Design projects, Fall 2013 & Spring 2014
- Faculty mentor for Electrical and Computer Engineering (ECE) Senior Design project, Spring 2014
- Judge for Auburn University College of Engineering Graduate Research Showcase, 2012 – 2014
- Department Representative, Auburn University United Way, 2013
- Department Representative, Auburn University Faculty & Staff Giving Campaign, 2013
- Member of Curriculum Committee for Department of Industrial & Systems Engineering, 2012 to 2015
- Member of Undergraduate Enrollment Committee for Department of Industrial & Systems Engineering, 2012 to 2015
- Judge for Auburn University Research Forum, 2012
- University Reader, Emily Doucette dissertation (Aerospace), 2012
- Departmental representative for Engineering Departmental Research Working Group, 2011 to 2015

### **Professional Service – National Organizations**

- Board Member, IIE Logistics and Supply Chain (LSC) Division, 2014–2016
- Council Member, INFORMS Military Applications Society, 2012 to present
- Member of Institute for Operations Research and the Management Sciences (INFORMS)
- Member of Military Operations Research Society (MORS)
- Member of Institute of Industrial Engineers (IIE)
- Member of Association of Military Industrial Engineers (AMIE)
- Member of Institute of Electrical and Electronics Engineers (IEEE)

### **Professional Service – Conference Participation**

- Organizer for two sessions on “Mission Planning” at INFORMS Annual Conference, 2014
- Session Moderator for two panels in the Supply Chain track of the IIE Annual Meeting, 2014
- Session Chair for INFORMS Annual Conference, Operations Research in Military Applications, 2014
- Cluster Chair for INFORMS Annual Conference, Homeland Security & Defense, 2013
- Organizer for three sessions on “Military Vehicle Routing Problems” at INFORMS Annual Conference, 2012
- Judge for IIE Regional Student Conference, hosted by Auburn University, 2012
- Panelist for Student Reception at INFORMS Annual Conference, 2011

- Organizer for three sessions on “Military Vehicle Routing Problems” at INFORMS Annual Conference, 2011
- Session Chair, IIE Annual Meeting, 2011
- Organizer for two sessions on “Military Vehicle Routing Problems” at INFORMS Annual Conference, 2010