

# Austin Buchanan

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## AFFILIATION

- 2021–Present Associate Professor, Industrial Engineering & Management  
Oklahoma State University, Stillwater, OK
- 2015–2021 Assistant Professor, Industrial Engineering & Management  
Oklahoma State University, Stillwater, OK

## EDUCATION

- 2011–2015 Doctor of Philosophy, Industrial and Systems Engineering  
Texas A&M University, College Station, TX
- 2007–2011 Bachelor of Science, Industrial Engineering & Management  
Oklahoma State University, Stillwater, OK

## PUBLICATIONS

### REFEREED JOURNAL ARTICLES

1. A. Buchanan, S. Ezazipour, M. Shahmizad. A widespread belief about county splits in political districting plans is wrong. *Election Law Journal*, to appear.
2. M. Shahmizad, A. Buchanan. Political districting to minimize county splits. *Operations Research*, to appear.
3. J. Zhang, H. Validi, A. Buchanan, I.V. Hicks. Linear-size formulations for connected planar graph partitioning and political districting. *Optimization Letters*, 18(1): 19–31, 2024.
4. Y. Lu, H. Salemi, B. Balasundaram, A. Buchanan. On fault-tolerant low-diameter clusters in graphs. *INFORMS Journal on Computing*, 34(6): 3181–3199, 2022.
5. H. Validi, A. Buchanan. Political districting to minimize cut edges. *Mathematical Programming Computation*, 14, 623–672, 2022.
6. M.J. Naderi, A. Buchanan, J.L. Walteros. Worst-case analysis of clique MIPs. *Mathematical Programming*, 195: 517–551, 2022.
7. H. Salemi, A. Buchanan. Solving the distance-based critical node problem. *INFORMS Journal on Computing*, 34(3): 1309–1326, 2022.
8. H. Validi, A. Buchanan, E. Lykhovyd. Imposing contiguity constraints in political districting models. *Operations Research*, 70(2): 867–892, 2022.
9. V. Stozhkov, A. Buchanan, S. Butenko, V. Boginski. Continuous cubic formulations for cluster detection problems in networks. *Mathematical Programming*, 196: 279–307, 2022.
10. B. Farmanesh, A. Pourhabib, B. Balasundaram, A. Buchanan. A Bayesian framework for local calibration of expensive computational models through non-isometric matching. *IIE Transactions*, 53(3): 352–364, 2021.
11. H. Validi, A. Buchanan. The optimal design of low-latency virtual backbones. *INFORMS Journal on Computing*, 32(4): 952–967, 2020.
12. J.L. Walteros, A. Buchanan. Why is maximum clique often easy in practice? *Operations Research*, 68(6): 1866–1895, 2020.

13. H. Salemi, A. Buchanan. Parsimonious formulations for low-diameter clusters. *Mathematical Programming Computation*, 12(3): 493–528, 2020.
14. H. Validi, A. Buchanan. A Note on “A linear-size zero-one programming model for the minimum spanning tree problem in planar graphs”. *Networks*, 73(1): 135–142, 2019.
15. A. Buchanan, Y. Wang, S. Butenko. Algorithms for node-weighted Steiner tree and maximum-weight connected subgraph. *Networks*, 72(2): 238–248, 2018.
16. Y. Wang, A. Buchanan, S. Butenko. On imposing connectivity constraints in integer programs. *Mathematical Programming*, 166(1): 241–271, 2017.
17. A. Buchanan. Extended formulations for vertex cover. *Operations Research Letters*, 44(3): 374–378, 2016.
18. S. Kahruman-Anderoglu, A. Buchanan, S. Butenko, O.A. Prokopyev. On provably best construction heuristics for hard combinatorial optimization problems. *Networks*, 67(3): 238–245, 2016.
19. A. Buchanan, J.S. Sung, S. Butenko, E.L. Pasiliao. An integer programming approach for fault-tolerant connected dominating sets. *INFORMS Journal on Computing*, 27(1):178–188, 2015.
20. A. Verma, A. Buchanan, S. Butenko. Solving the maximum clique and vertex coloring problems on very large sparse networks. *INFORMS Journal on Computing*, 27(1):164–177, 2015.
21. A. Buchanan, J.S. Sung, V. Boginski, S. Butenko. On connected dominating sets of restricted diameter. *European Journal of Operational Research*, 236(2):410–418, 2014.
22. A. Buchanan, J.L. Walteros, S. Butenko, P.M. Pardalos. Solving maximum clique in sparse graphs: an  $O(nm + n2^{d/4})$  algorithm for  $d$ -degenerate graphs. *Optimization Letters*, 8(5):1611–1617, 2014.

#### SUBMITTED PAPERS

23. E. Vercesi, A. Buchanan. The Dantzig-Fulkerson-Johnson TSP formulation is easy to solve for few subtour constraints. Submitted in September 2024.
24. J. Zhang, L. Silveira, H. Validi, L. Smith, A. Buchanan, I.V. Hicks. Partitioning a graph into low-diameter clusters. Submitted in September 2024.
25. P. Belotti, A. Buchanan, S. Ezazipour. Political districting to optimize the Polsby-Popper compactness score with application to voting rights. Major revision submitted to *Operations Research* in June 2024.

#### OTHER

26. A. Buchanan. A brief tutorial on Benders decomposition. *IFORS News*, pages 6-7, March 2024.
27. A. Buchanan. Using optimization to support minority representation in Voting Rights Act cases. *ORMS Today*, 50(4): 32–35, 2023.
28. A. Buchanan. Political districting. In *Encyclopedia of Optimization* (3rd edition). Ed. by P.M. Pardalos and O.A. Prokopyev. Springer, 2023.
29. A. Buchanan. New congressional districts for Alabama: SCOTUS rules on race v. geography. *Montgomery Advertiser*, June 19, 2023. (Link1) (Link2)
30. A. Buchanan, M.J. Naderi. A brief tutorial on Gomory cuts. *IFORS News*, pages 7-9, March 2020.
31. A. Buchanan, S. Butenko. Tight extended formulations for independent set. Unpublished, 2015.
32. A. Buchanan, N. Chen, X. Ma. Using GRASP for the cover by  $s$ -defective independent sets problem. In *Examining Robustness and Vulnerability of Critical Infrastructure Networks*. Ed. by S. Butenko, E.L. Pasiliao, and V. Shylo. Amsterdam: IOS Press, 2014, pp. 17–25.

#### GRANTS (Total: \$1.17 million)

- ◇ A. Buchanan (PI). “CAREER: Parsimonious Models for Redistricting,” *National Science Foundation* (CMMI-1942065), \$508,000, 6/1/2020–5/31/2025.
- ◇ B. Balasundaram (PI), A. Buchanan (coPI), and S. Heragu (coPI). “FLAT: Freight Lane Assignment Tool,” *TreeHouse Foods Inc*, \$163,730, 1/13/2020–1/16/2021.

- ◇ A. Buchanan (PI). “Imposing Connectivity Constraints in Large-Scale Network Problems,” *National Science Foundation* (CMMI-1662757), \$258,586, 6/15/2017–5/31/2021.
- ◇ B. Balasundaram (PI), A. Buchanan (coPI), and S. Heragu (coPI). “Optimization-Based Aggregate Master Planning Tools for Bay Valley Foods, LLC,” *Bay Valley Foods, LLC*, \$250,599, 10/1/2017–1/31/2020.

### SELECTED AWARDS AND HONORS

- ◇ INFORMS Senior Member, 2024.
- ◇ Honorable Mention Best Poster, IPCO 2023, for the poster “Political districting to minimize county splits” presented by coauthor Maral Shahmizad, 2023.
- ◇ Harvey J Greenberg Research Award, INFORMS Computing Society, for the paper “Imposing contiguity constraints in political districting models” coauthored with Hamidreza Validi and Eugene Lykhovyd, 2021.
- ◇ IEM Faculty Award, for “sustained and significant contributions in the areas of teaching and service in the School of Industrial Engineering and Management,” 2021.
- ◇ Honorable Mention, INFORMS JFIG Paper Competition, for the paper “Why is maximum clique often easy in practice?” coauthored with Jose L. Walteros, 2019.
- ◇ Santa Gift Matching Challenge, 3rd place (\$1,000 prize), Kaggle, 2018.
- ◇ Invited Speaker for Workshop on Mixed Integer Programming MIP 2017 at HEC Montréal.
- ◇ The paper “Solving the maximum clique and vertex coloring problems on very large sparse networks” was selected by INFORMS President L. Robin Keller as the May 2015 President’s Pick Article.
- ◇ National Merit Scholar, National Merit Scholarship Corporation, 2007. (Accepted College-Sponsored Merit Scholarship Award from OSU, 2007–2011.)

### TEACHING

- ◇ Graduate
  - Integer and Combinatorial Optimization, University of Pavia, Italy (Summer 2022)
  - IEM 6053, Integer and Combinatorial Optimization (F24, F22, S20, F18, S17, F16)
  - IEM 5203, Facility Location, Warehousing, and Transportation (S22)
  - IEM 5063, Network Flows and Combinatorial Optimization (S16)
- ◇ Undergraduate
  - IEM 4203, Facilities and Material Handling System Design (F24, F23, F22, F21, F20, F19, F18, F17)
  - IEM 4013, Introduction to Operations Research (F23, S23, S22, S21, S20, S18, F15)
  - IEM 3503, Engineering Economic Analysis (S21, S19, S18)
  - ISEN 302 (at TAMU), Engineering Economy (S15, F14, S14)

### STUDENTS

- ◇ Doctoral Students
  - Xiaocong Zhen, Fall 2023 – present.
  - Soraya Ezazipour, Fall 2021 – present.
  - Maral Shahmizad, Summer 2021 – present.
  - Mohammad Javad Naderi, Fall 2017 – Fall 2021. Current: OR Scientist at Delta Air Lines.
  - Hosseinali Salemi, Fall 2016 – Summer 2020. Current: OR Scientist at FedEx Freight.
  - Hamidreza Validi, Fall 2016 – Summer 2020. Current: Assistant Professor, Texas Tech University.
- ◇ Undergraduate Students

- Aaron Mckinstry, IEM URA (Fall 2024)
- Grace Hendrix, IEM URA (Fall 2023) and CEAT URS (Fall 2023 – Spring 2024).
- Ryne Garrison, NSF REU (Summer 2021).
- Elizabeth Bunting, NSF REU (Summer 2018) and Wentz Researcher (Fall 2018 – Spring 2019).

## PROFESSIONAL SERVICE

### EDITORIAL SERVICE

- ◊ Associate Editor, *Networks*, 2016–present.
- ◊ Associate Editor, *Optimization Letters*, 2019–present.
- ◊ Referee: *Operations Research*, *Mathematical Programming*, *Management Science*, *INFORMS Journal on Computing*, *INFORMS Journal on Optimization*, *Manufacturing & Service Operations Management*, *SIAM Journal on Optimization*, *Election Law Journal*, *Networks*, *European Journal of Operational Research*, *Discrete Optimization*, *Discrete & Computational Geometry*, *Algorithmica*, *Electronic Journal of Combinatorics*, *IIE Transactions*, *Naval Research Logistics*, *Optimization Letters*, *Journal of Global Optimization*, *Journal of Combinatorial Optimization*, *ESA 2023*, *ALENEX21*, *FAW 2015*.

### CONFERENCES

- ◊ Cluster Chair, *Network Applications*: ICS 2022.
- ◊ Cluster Chair, *Telecommunications & Network Analytics*: INFORMS (2021, 2020, 2019).
- ◊ Cluster Chair, *Network Optimization*: IOS 2018, INFORMS (2017, 2016).
- ◊ Session Chair: INFORMS (2021, 2019, 2017, 2014), IOS 2018, ISMP 2015.

### OTHER PROFESSIONAL SERVICE

- ◊ NSF proposal review panelist (2x).
- ◊ Co-Chair, INFORMS New Faculty Colloquium (2024, 2025)
- ◊ Committee Member, INFORMS Computing Society Student Paper Prize (2023, 2024).
- ◊ Member of Council, INFORMS Section on Telecommunications and Network Analytics (2018–2022).
- ◊ Representative of INFORMS Optimization Society, INFORMS Subdivisions Council (2017–2018).
- ◊ Judge, INFORMS George Nicholson Student Paper Competition (2017, 2024, 2025).
- ◊ Vice Chair for Network Optimization, INFORMS Optimization Society (2015–2017).

### INVITED RESEARCH SEMINARS

- ◊ Georgia Tech (online)
- ◊ Oklahoma State University
- ◊ Southern Methodist University
- ◊ Texas A&M University
- ◊ Tufts University (MGGG Redistricting Lab, online)
- ◊ University of Illinois Urbana-Champaign (online)
- ◊ University of Oklahoma
- ◊ University of Pavia (Italy)
- ◊ University of Pittsburgh
- ◊ Virginia Tech