

# NEIL K. DHINGRA

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🌐 <http://www.neilkdh.com>

## EXPERTISE

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- Proven advanced research & development, program management, and business development acumen
- Expertise developing novel innovative end-to-end solutions using cutting-edge new technologies and research
- Skills to effectively communicate complicated technical material via presentations and written manuscripts
- U.S. Citizen; current security clearance

## WORK AND RESEARCH EXPERIENCE

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### Auria (formerly Orbit Logic)

Boulder, CO

Director — Optimization and Machine Learning

2020 – present

- Set and implement strategic vision for optimization algorithm and machine learning development providing intelligent automated planning and scheduling capabilities in core Auria products
- Lead efforts to develop and deploy planning and scheduling capabilities (e.g., satellite constellation collection planning) in centralized, distributed, and hybrid centralized-distributed satellite commanding architectures
- Lead algorithm development for space situational/domain awareness (SSA/SDA) sensor scheduling using a multi-antenna radar with multiple subarray options in consideration of differing object priorities, dwell time requirements, slew times between tasks, track accuracy, resource constraints, and other complex factors
- Lead development of an automated closed-loop Tasking, Collection, Processing, Exploitation, and Dissemination (TCPED) pipeline that integrates optimized satellite collection planning with ML data analysis
- Led research effort to implement a flexible autonomous fault management system onboard space assets leveraging machine learning tools, model-based approaches, and other technologies
- Technical and business development to transition SBIR/STTR technology to commercial products
- Initiate, develop, and manage commercial and teaming relationships with customers and partners

### Numerica Corporation

Fort Collins, CO

Program Manager (2019 – 2020), Research Scientist (2017 – 2019)

2017 – 2020

- Led a team of 5 research scientists for advanced algorithm design, deployment, and refinement
- Developed algorithms for scheduling ground- and space-based sensor platforms, satellite constellation control, advanced sensor fusion/filtering, hypothesis-based intelligence, image processing for dim object detection, adversarial planning for missile defense scenarios, and interceptor guidance for missile defense
- Incorporated state-of-the-art techniques from continuous/discrete/multiobjective optimization, machine learning, control theory, game theory, expectation propagation, and other fields into team's projects
- Wrote proposals for and manage execution of government and industry contracts, both as principal investigator (PI) as well as in a supporting role (won over \$2m worth of SBIR contracts as PI)
- Served as technical lead in commercial negotiations to license Numerica algorithms for external use

### University of Minnesota, Control and Dynamical Systems Group

Minneapolis, MN

Research Assistant with Professor Mihailo R. Jovanović

2010 – 2017

- Developed efficient, scalable, and distributable algorithms for solving regularized optimization problems
- Applied algorithms to diverse structured control problems such as distributed control and sensor placement
- Supervised 3 undergraduate and 4 graduate students leading to publications and successful theses
- Developed machine learning-based Automated Target Recognition (ATR) in internship at NASA JPL
- Applied optimal sensor selection research to X-56 in fellowship at NASA Armstrong Flight Research Center

## EDUCATION

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### PhD in Electrical Engineering

2010 – 2017

University of Minnesota, Twin Cities, MN

Thesis: Optimization and control of large-scale networked systems,

Advisor: Professor Mihailo R. Jovanović

### BSE in Electrical Engineering, Minor in Mathematics

2006 – 2010

University of Michigan, Ann Arbor, MI, Magna Cum Laude

## OUTREACH ACTIVITIES

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**Teaching Science, Math and Research Technology** Minneapolis, MN  
 School Coordinator and Session Leader 2013 - 2016

- Led groups of volunteers to increase STEM interest in elementary/middle school kids via interactive lessons, e.g., circuits/soldering for making a small robot and elementary probability and winning at Monopoly
- Arranged the use of university outreach grants to fund lessons for schools in low-income areas

**MnDRIVE Graduate Scholars Program Fellowship Outreach** Minneapolis, MN  
 Graduate Fellow 2014 - 2016

- Initiated, coordinated, and volunteered with outreach programs: FIRST Lego League Team Mentor, Tech Camp leader, Minnesota Academy of Science State Science Fair Judge
- Organized partnership with Abamath robotics to fund low-income students in a robotics league

## TEACHING EXPERIENCE

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**Electrical and Computer Engineering, University of Minnesota**

Guest lecturer,	(EE 8215) <i>Nonlinear Systems</i> ,	Spring 2016
Recitation instructor,	(EE 3015) <i>Signals and Systems</i> ,	Spring 2016, Fall 2016
Teaching assistant,	(EE 3006) <i>Fundamentals of Electrical Engineering Laboratory</i> ,	Fall 2010, Spring 2011

## SELECTED HONORS AND AWARDS

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DOCTORAL DISSERTATION FELLOWSHIP, University of Minnesota	2015 - 2016
MnDRIVE GRADUATE SCHOLARS FELLOWSHIP, MnDRIVE Initiative	2014 - 2016
HARRIET G. JENKINS PREDOCTORAL FELLOWSHIP, NASA	2011 - 2014
ECE DEPARTMENTAL FELLOWSHIP, University of Minnesota	2010 - 2011
BEST PRESENTATION IN SESSION, American Control Conference	2016
STUDENT TRAVEL GRANTS, American Control Conference and Doctoral Dissertation Fellowship	2016
SPACE GRANT AWARD RECIPIENT, Michigan Space Grant Consortium	2010

## SELECTED PUBLICATIONS

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### JOURNAL PAPERS

1. N. K. Dhingra, S. Z. Khong, and M. R. Jovanović. *A second-order primal-dual algorithm for nonsmooth composite minimization*. IEEE Trans. Automat. Control, 2022. note: *Doi:10.1109/TAC.2021.3115449; also arXiv:1709.01610*.
2. A. Zare, H. Mohammadi, N. K. Dhingra, and M. R. Jovanović. *Proximal algorithms for large-scale statistical modeling and sensor/actuator selection*. IEEE Trans. Automat. Control, 2019, 65(8):3441-3456, 2020.
3. N. K. Dhingra, M. Colombino, and M. R. Jovanović. *Structured decentralized control of positive systems with applications to combination drug therapy and leader selection in directed networks*. IEEE Trans. Control Netw. Syst., 6(1):352-362, 2019.
4. N. K. Dhingra, S. Z. Khong, and M. R. Jovanović. *The proximal augmented Lagrangian and for nonsmooth composite optimization*. IEEE Trans. Automat. Control, 64(7):2861-2868, 2019.
5. M. R. Jovanović and N. K. Dhingra. *Controller architectures: tradeoffs between performance and structure*. Eur. J. Control, 30:76-91, 2016.

### SELECTED CONFERENCE PAPERS

6. J. Muesing, N. K. Dhingra, and K. Center. *Tradeoff Analysis of Space-Based Imaging Algorithms for Distributed Area Collection*. In Proc. 2024 IEEE Aerospace Conference, Big Sky, MT, 2024. Note: To appear.
7. N. K. Dhingra, C. DeJac, A. Herz, and R. Green. *Space Domain Awareness Sensor Scheduling with Optimality Certificates*. In Proc. 2023 Advanced Maui Optical and Space Surveillance Technologies Conference, Wailea, HI, 2023.

8. N. K. Dhingra, C. DeJac, J. Neel, A. Herz, T. Wolf, and B. Jones. *The Impact of Orbit Accuracy-based Tasking on Sensor Network Efficiency*. In Proc. 2022 Advanced Maui Optical and Space Surveillance Technologies Conference, Wailea, HI, 2022.
9. E. Herz, K. Callis, M. Ferguson, N. Gokhale, and N. K. Dhingra. *Master Activity Planning for Landsat 8 and 9*. In Proc. 73rd International Astronautical Congress (IAC), Paris, France, pages IAC-22,B6,IP,x72873, 2022.
10. N. K. Dhingra, C. DeJac, A. Herz, T. Wolf, and B. Jones. *Maximizing the Utility of Non-Traditional Sensor Network Data for SDA*. In Proc. 2021 Advanced Maui Optical and Space Surveillance Technologies Conference, Wailea, HI, 2021.
11. N.K. Dhingra, K. Center, E. Herz, E. Sneath, and S. Gagnard. *APS: Multi-Domain Decentralized Planning for Responsive Multi-Asset Collaborative Autonomy*. In Proc. 16th International Conference on Space Operations, Cape Town, South Africa, 2021. Note: SpaceOps-2021,6,x,1634.
12. J. Aristoff, N. K. Dhingra, A. Ferris, A. Hariri, J. Horwood, A. Larson, T. Lyons, J. Shaddix, N. Singh, and K. Wilson. *Non-Traditional Data Collection and Exploitation for Improved GEO SSA via a Global Network of Heterogeneous Sensors*. In Proc. 2018 Advanced Maui Optical and Space Surveillance Technologies Conference, Wailea, HI, 2018.
13. N. K. Dhingra, M. Colombino, and M. R. Jovanović. *Leader selection in directed networks*. In Proc. 55th IEEE Conference on Decision and Control, Las Vegas, NV, pp. 2715-2720, 2016.
14. M. Colombino, N. K. Dhingra, M. R. Jovanović, and Roy S. Smith. *Convex Reformulation of a Robust Optimal Control Problem for a Class of Positive Systems*. In Proc. 55th IEEE Conference on Decision and Control, Las Vegas, NV, pp. 5263-5268, 2016.
15. S. Hassan-Moghaddam, N. K. Dhingra, and M. R. Jovanović. *Topology identification of undirected consensus networks via sparse inverse covariance estimation*. In Proc. 55th IEEE Conference on Decision and Control, Las Vegas, NV, pp. 4624-4629, 2016.
16. N. K. Dhingra, Xiaofan Wu, and M. R. Jovanović, *Sparsity-promoting optimal control of systems with invariances and symmetries*, in Proc. 10th IFAC Symposium on Nonlinear Control Systems, Monterey, CA, pp. 648-653, 2016.
17. M. Colombino, N.K. Dhingra, M.R. Jovanović, A. Rantzer, and R.S. Smith. *On the optimal control problem for a class of monotone bilinear systems*. In Proc. 22nd International Symposium on Mathematical Theory of Networks and Systems, Minneapolis, MN, pp. 411-413, 2016.
18. N. K. Dhingra, M. Colombino and M. R. Jovanović, *On the convexity of a class of structured optimal control problems for positive systems*. In Proc. 2016 European Control Conference, Aalborg, Denmark, pp. 825-830, 2016.
19. N. K. Dhingra, and M. R. Jovanović, *A method of multipliers algorithm for sparsity-promoting optimal control*. In Proc. 2016 American Control Conference, Boston, MA, pp. 1942-1947, 2016.
20. N. K. Dhingra, and M. R. Jovanović, *Convex synthesis of symmetric modifications to linear systems*. In Proc. 2015 American Control Conference, Chicago, IL, pp. 3583-3588, 2015.
21. N. K. Dhingra, M. R. Jovanović, and Z. Q. Luo, *An ADMM algorithm for optimal sensor and actuator selection*. In Proc. 53rd IEEE Conference on Decision and Control, Los Angeles, CA, pp. 4039-4044, 2014.
22. David Zoltowski, N. K. Dhingra, F. Lin, and M. R. Jovanović, *Sparsity-promoting optimal control of spatially-invariant systems*. In Proc. 2014 American Control Conference, Portland, OR, pp. 1261-1266, 2014.
23. N. K. Dhingra, F. Lin, M. Fardad and M. R. Jovanović, *On identifying sparse representations of consensus networks*. In Proc. 3rd IFAC Workshop on Distributed Estimation and Control in Networked Systems, Santa Barbara, CA, pp. 305-310, 2012.
24. M. Scholten, N. K. Dhingra, T.T. Lu and T.H. Chao, *Optimization of support vector machine (SVM) for object classification*. In SPIE Defense, Security, and Sensing, pp. 839806-1–839806-9, International Society for Optics and Photonics, 2012.