Abhishek Gupta

CONTACT INFORMATION

Associate Professor
ECE Department,
The Ohio State University,
2015 Neil Avenue, Room 464,
Columbus, OH – 43210

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Email: gupta.706@osu.edu
http://gupta706.github.io/

RESEARCH INTERESTS

Theory: Reinforcement learning, optimization, anomaly detection, multi-agent decision and game theory, adversarial learning theory, perturbation theory, market design

Applications: Energy markets, connected autonomous vehicle, cybersecurity

EMPLOYMENT

The Ohio State University, Columbus, OH
Associate Professor, Electrical and Computer Engineering May 2023 – current

- Co-Director, IIT Bombay-OSU Frontier Center, offering cotutelle PhD program (jointly advised) for PhD students at IIT Bombay and OSU
- On leave of absence between July 2023-Aug 2024
- Assistant Professor, Electrical and Computer Engineering, July 2015 – May 2023

Rewardwise Technologies Private Limited, Bengaluru, Karnataka, India
Founder & CEO April 2024 – current

- Conceptualized and built a loyalty program aggregation consumer app
- Built a team of product managers, UI UX designers, software developers, sales & marketing, content writers, and administrative assistant

Ensemble Control Inc., Columbus, OH
Founder & CEO Jan 2022 – current

- Consulted on data science projects and built custom algorithms for Dream11, Fynd, and Meesho
- Acting as an advisor to the CEO of Newton School of Technology, Bangalore

University of Southern California, Los Angeles, CA
Postdoctoral Researcher, Electrical Engineering August 2014 – June 2015

- Visiting Researcher: **Stanford University**, January 2015 – May 2015
- Visiting Researcher: **University of California, Berkeley**, August 2014 – December 2014

EDUCATION

University of Illinois at Urbana-Champaign, Urbana, USA

Ph.D., Aerospace Engineering, May 2011 – August 2014

- Thesis: *Dynamic Sequential Decision Problems with Asymmetric Information: Some Existence Results*

M.S., Applied Mathematics, May 2011 – December 2012

M.S., Aerospace Engineering, August 2009 – May 2011

- Thesis: *Control in the Presence of an Intelligent Jammer with Limited Actions*

Indian Institute of Technology Bombay, Mumbai, India

B.Tech., Aerospace Engineering, July 2005 – April 2009

- Thesis: *One-to-one Aerial Combat using Differential Game Theory*

Awards & Honors

- Lumley Research Award, College of Engineering, OSU 2019
- Kenneth Lee Herrick Memorial Award for outstanding academic and research performance in the Aerospace Engineering department at UIUC 2014
- Mavis Future Faculty Fellowship, College of Engineering, UIUC 2012-13
- Research Internship in Science and Engineering, Indo-US S&T Forum Summer 2012
- Narotam Sekhsaria Excellence in Undergraduate Award for excellence in academic and extra-curricular activities, India 2009
- Award for Excellence, Aerospace Department, IIT Bombay, India 2008, 2009
- IIT Bombay Heritage Fund Scholarship, IIT Bombay, India 2006-08

Teaching

ECE 6750: Linear Systems Theory (Spring 2026)
ECE 7202: Reinforcement Learning (Autumn 2025)
ECE 5500: Nonlinear Programming and Dynamic Optimization (Autumn 2024, 2025)
ECE 5759: Static and Dynamic Optimization (Autumn 2015-21)
ECE 5555: Securing Autonomous Systems (Autumn 2021, 2024)
ECE 3050: Signals and Systems (Spring 2017, 2021)
ECE 8851: Reinforcement Learning (Spring 2020)
ECE 3551: Feedback Control Systems (Spring 2016, Autumn 2019)
ECE 6194.04: Game Theory and Mechanism Design (Autumn 2017)

Online Professional Courses

Introduction to Machine Learning
Linear Algebra and Calculus for Machine Learning
Securing Autonomous Systems

Funded Projects

CISCO: Anomaly and Attack Detection in Complex Autonomous Systems
($ 116,400, May 2022-Dec 2023)

Ford Motor Company: Optimal charge scheduling for an aggregate of electric vehicles
($ 220,000, May 2020-Dec 2022)

Army Research Lab: Smart operation and fault diagnosis of next generation wide bandgap power electronics using machine learning (PI: Prof. Julia Zhang, co-PI: Prof. Anant Agarwal and Prof. Jin Wang)
($ 100,000, Aug 2019-June 2021)

Ford Motor Company: Cybersecurity and functional safety of smart cars (co-PIs: Prof. Emre Koksal and Prof. Giorgio Rizzoni)
($ 284,000, May 2019-May 2021)

Ford Motor Company: Uncovering the economic forces in multi-modal transportation
($ 200,000, May 2018-Dec 2020)

ARPA-E NEXTCAR: Fuel Economy Optimization with Dynamic Skip Fire in a Connected and Automated Vehicle (co-PI: Prof. Marcello Canova and Prof. Giorgio Rizzoni; Industry Partners: Delphi Automotive PLC, Tula Technology, and TRC Inc.)
($ 5,000,000 total, co-PI budget: $ 94,000, Aug 2017-Dec 2020)

NSF EPCN: Smarter Markets for a Smarter Grid: Pricing Randomness, Flexibility and Risk (PI: Prof. Rahul Jain, USC)
($ 225,000, Aug 2016-Aug 2020)

NSF CRII: Securing Smart Cyberphysical Systems against Man-in-the-Middle Attacks
($ 175,000, Aug 2016-Aug 2019)

JOURNAL PUBLICATIONS

[J1] S. Shao and **A. Gupta**, *"Robustness to Modeling Errors in Risk-Sensitive Markov Decision Problems with Markov Risk Measures"*, *IEEE Open Journal on System and Controls*, 2025.

[J2] J. Tang, J. Song, and **A. Gupta**, *"A Dynamic Watermarking Algorithm for Finite Markov Decision Problems"*, *IEEE Open Journal on Systems and Control*, 2025.

[J3] H. Chen, **A. Gupta**, Y. Sun, and N. Shroff. *"Model-Free Change Point Detection for Mixing Processes"*, *IEEE Open Journal on Control Systems*, vol. 3, pp. 202–213, 2024.

[J4] **A. Gupta**, R. Jain, and P. Glynn, *"Probabilistic contraction analysis of iterated random operators"*, *IEEE Transactions on Automatic Control*, vol. 69(9), 2024.

[J5] Z. Zhu, S. Gupta, **A. Gupta**, and M. Canova, *"A Deep Reinforcement Learning Framework for Eco-driving in Connected and Automated Hybrid Electric Vehicles"*, *IEEE Transactions on Vehicular Technology*, vol. 73(2), pp. 1713–1725, 2024.

[J6] J. Pi and **A. Gupta**, *"Discrete-Time Finite-Horizon Optimization of Singularly Perturbed Nonlinear Control Systems With State-Action Constraints"*. *IEEE Control Systems Letters*, vol. 7, pp. 1993–1998, 2023.

[J7] S. Shao, H. Sartipizadeh, and **A. Gupta**, *"Scheduling EV Charging Having Demand With Different Reliability Constraints"*, *IEEE Transactions on Intelligent Transportation Systems*, vol. 24(10), pp. 11018–11029, 2023.

[J8] S. Shao, F. Harirchi, D. Dave, and **A. Gupta**, *"Preemptive Scheduling of EV Charging for Providing Demand Response Services"*, *Sustainable Energy, Grids and Networks*, pp. 100986, 2023.

[J9] J. L. Heyman and **A. Gupta**, *"Rank Reduction in Bimatrix Games"*, *International Game Theory Review*, vol. 25, No. 1, pp. 2250017, 2023.

[J10] J. Tang, S. Shao, J. Song, and **A. Gupta**, *"Nash Equilibrium Control Policy against Bus-off Attacks in CAN Networks"*, *IEEE Transactions on Forensics & Security*, pp. 980-990, 2022.

[J11] S. Gupta, S. D'Alessandro, **A. Gupta**, S. Stockar, and M. Canova, *"A Computationally Efficient Algorithm for Perturbed Dynamic Programs (A-PDP)"*, *IEEE Control Systems Letters*, pp. 847-852, 2022.

[J12] Y. Deng, **A. Gupta**, and N. Shroff, *"Fleet Sizing and Charger Allocation in Electric Vehicle Sharing Systems"*, in *IFAC Journal of Systems and Control*, pp. 100210, 2022.

[J13] J. Regatti and **A. Gupta**, *"Finite Sample Analysis of Minmax Variant of Offline Reinforcement Learning for General MDPs"*, in *IEEE Open Journal on Control Systems*, vol. 1, pp. 152-163, 2022.

[J14] R. Singh, **A. Gupta**, and N. Shroff, *"Learning in Constrained Markov Decision Processes"*, in *IEEE Transactions on Control of Network Systems*, to appear, 2022.

[J15] Y. Deng, S. Shao, A. Mittal, R. Twumasi-Boakye, J. Fishelson, **A. Gupta**, and N. Shroff, *"Incentive Design and Profit Sharing in Multi-modal Transportation Network"*, in *Transportation Research Part B: Methodological*, vol. 163, pp. 1-21, 2022.

[J16] **A. Gupta**, S. D. Rajakumar, and M. Canova, *"An Algorithm to Warm Start Perturbed (WASP) Constrained Dynamic Programs"*, in *IEEE Open Journal on Control Systems*, vol. 1, pp. 1-14, 2022.

[J17] Z. Zhu, N. Pivaro, S. Gupta, **A. Gupta**, and M. Canova, *"Safe Model-based Off-policy Reinforcement Learning for Eco-Driving in Connected and Automated Hybrid Electric Vehicles"*, in *IEEE Transactions on Intelligent Vehicles*, vol. 7 (2), pp. 387-398, 2022.

[J18] Y. Deng, H. Chen, S. Shao, J. Tang, J. Pi, and **A. Gupta**, *"Multi-Objective Vehicle Rebalancing for Ridehailing System using a Reinforcement Learning Approach"*, *in Journal of Management Science and Engineering*, vol. 7(2), pp. 346-364, 2022.

[J19] S. D. Rajakumar, S. Gupta, **A. Gupta**, and M. Canova, *"Real-time Eco-Driving Control in Electrified Connected and Autonomous Vehicles using Approximate Dynamic Programming"*, *in ASME Journal of Dynamic Systems, Measurement and Controls*, vol. 144 (1), pp. 011111, 2022.

[J20] **A. Gupta** and W. B. Haskell, *"Convergence of recursive stochastic algorithms using Wasserstein divergence"*, *in SIAM Journal on Mathematics of Data Science*, vol. 3 (4), pp. 1141–1167, 2021.

[J21] J. Tang and **A. Gupta**, *"A Sketching Approach for Prioritizing Communication Links in Static Teams"*, *in IEEE Control Systems Letters*, vol. 6, pp. 1016–1021, 2021.

[J22] S. Shao and **A. Gupta**, *"Fair Pricing of Ridehailing Services with Asymmetric Demand and Travel Time"*, *in IEEE Transactions on Control of Networked Systems*, vol. 9(2), pp. 670-681, 2021.

[J23] H. Li, S. Shao, and **A. Gupta**, *"Fitted Value Iteration in Continuous Markov Decision Processes with State Dependent Action Sets"*, *in IEEE Control Systems Letters*, vol. 6, pp. 1310–1315, 2021.

[J24] **A. Gupta**, *"Existence of Team-Optimal Strategies in Teams with Countable Observation Spaces"*, *in IEEE Transactions on Automatic Control*, pp. 4792 – 4798, 2021.

[J25] **A. Gupta**, H. Chen, J. Pi, and G. Tendolkar, *"Some limit properties of Markov chains induced by recursive stochastic algorithms"*, *SIAM Journal on Math of Data Science*, vol. 2, no. 4, pp. 967–1003, 2020.

[J26] **A. Gupta**, *"Optimal solutions in static teams with common information: A topology of information approach."* *SIAM Journal on Control and Optimization*, vol. 58, no. 2, pp. 998–1021, 2020.

[J27] B. Dakhil and **A. Gupta**, *"Auctioning electricity under deep renewable integration using a penalty for shortfall"*, in *Sustainable Energy, Grids and Networks*, vol. 20, 2019.

[J28] **A. Gupta**, C. Langbort, and T. Başar, *"Dynamic games with asymmetric information and resource constrained players with applications to security of cyberphysical systems"*, in *IEEE Transactions on Control of Network Systems*, vol. 4, no. 1, pp. 71–81, 2017.

[J29] **A. Gupta**, S. Yüksel, T. Başar, and C. Langbort, *"On the existence of optimal policies for a class of static and sequential dynamic teams"*, in *SIAM Journal on Control and Optimization*, Volume 53, No. 3, pp. 1681–1712, June 2015.

[J30] **A. Gupta**, A. Nayyar, C. Langbort, and T. Başar, *"Common information based Markov perfect equilibria for linear-Gaussian games with asymmetric information"*, in *SIAM Journal on Control and Optimization*, Volume 52, Issue 5, pp. 3228–3260, November 2014.

[J31] M. Barbie and **A. Gupta**, *"The topology of information on the space of probability measures over Polish spaces"*, in *Journal of Mathematical Economics*, Volume 52, pp. 98–111, May 2014.

[J32] A. Nayyar, **A. Gupta**, C. Langbort, and T. Başar, *"Common Information based Markov perfect equilibria for stochastic games with asymmetric information: Finite games"*, in *IEEE Transactions of Automatic Control*, Volume 59, pp. 555–570, March 2014.

[J33] S. Bhattacharya, **A. Gupta**, and T. Başar, *"Jamming in mobile networks: A game-theoretic approach"*, in *Journal of Numerical Algebra, Control and Optimization*, Volume 3, Number 1, pp. 1-30, 2013.

[J34] A. Sarkar, **Abhishek**, and U. A. Yajnik, *"PeV scale Left-Right symmetry and Baryon asymmetry of the universe"*, in *Nuclear Physics B*, Volume 800, Issue 1-2, pp. 253-269, 2008.

Conference Proceedings

[C1] A. Chaudhary, A. Rai, and **A. Gupta**, *"Maximizing success rate of payment routing using non-stationary bandits"*. *Proceedings of the Third International Conference on AI-ML Systems*, pp. 1–7, 2023.

[C2] A. Vedula, **A. Gupta**, and S. B. Venkatakrishnan, *"Cobalt: Optimizing Mining Rewards in Proof-of-Work Network Games"*. *2023 IEEE International Conference on Blockchain and Cryptocurrency (ICBC)*, pp. 1–9, 2023.

[C3] J.R. Regatti, S. Lu, **A. Gupta**, and N. Shroff, *"Conditional moment alignment for improved generalization in federated learning"*. *In Workshop on Federated Learning: Recent Advances and New Challenges (in Conjunction with NeurIPS 2022)*, 2022.

[C4] H. Chen, J. Tang, and **A. Gupta**, *"Change Detection of Markov Kernels using Maximum Mean Discrepancy"*. *in IEEE Conference on Decision and Control*, pp. 4814–4820, 2022.

[C5] J. Regatti, H. Chen, and **A. Gupta**, *"Byzantine Resilience With Reputation Scores "*. *In Proc. Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, pp. 1-8, 2022.

[C6] Y. Deng, X. Zhou, A. Ghosh, **A. Gupta**, and N. Shroff, *"Interference Constrained Beam Alignment for Time-Varying Channels via Kernelized Bandits"*, in *Proc. of 20th International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt)*, pp. 25-32, 2022.

[C7] Y. Deng, X. Zhou, B. Kim, A. Tewari, **A. Gupta**, and N. Shroff, *"Weighted Gaussian Process Bandits for Non-stationary Environments"*, in *Proc. of 25th International Conference on Artificial Intelligence and Statistics*, pp. 6909-6932, 2022.

[C8] H. You, H. Wang, J. R. Regatti, J. Hall, A. Schnabel, B. Hu, J. Zhang, **A. Gupta**, and J. Wang, *"Intelligent Health Monitoring System Hardware Design for Paralleled Devices with Fast Dv/dt Output". In 2021 IEEE International Electric Machines & Drives Conference (IEMDC)*, 2021.

[C9] J. R. Regatti, H. You, H. Wang, J. Hall, A. Schnabel, B. Hu, J. Zhang, J. Wang, and **A. Gupta**, *"A Discussion of Artificial Intelligence Applications in SiC MOSFET Device Operation". In 2021 IEEE International Electric Machines & Drives Conference (IEMDC)*, 2021.

[C10] J. Regatti, G. Tendolkar, Y. Zhou, **A. Gupta**, and Y. Liang, *"Distributed SGD Generalizes Well Under Asynchrony". In Proc. 57th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, pp. 863-870, 2019.

[C11] J. Regatti and **A. Gupta**, *"Traffic-Aware Adaptive Routing for Minimizing Fuel Consumption"*, in *Proc. of 2019 American Control Conference*, pp. 4818-4825, 2019.

[C12] J. L. Heyman and **A. Gupta**, *"A Polynomial Time Algorithm to Solve $2 \times n$ Bimatrix Games"*, in *Proc. of 18th European Control Conference (ECC)*, pp. 1049-1054, 2019.

[C13] H. Sharma, R. Jain, and **A. Gupta**, *"An empirical relative value learning algorithm for non-parametric MDPs with continuous state space"*, *in Proc. of 18th European Control Conference (ECC)*, pp. 1368-1373, 2019.

[C14] B. Dakhil and **A. Gupta**, *"Selling renewable generation with a penalty for shortfall"*, in *57th IEEE Conference on Decision and Control (CDC)*, pp. 6495–6500, December 2018.

[C15] J. Tang and **A. Gupta**, *"Communication link elimination in static LQG teams"*, in *56th Annual Allerton Conference on Communication, Control, and Computing*, pp. 290–296, IEEE, 2018.

[C16] **A. Gupta**, B. Dakhil, and R. Jain, *"Dynamic economic dispatch and price evolution under ramping constraints and uncertain demand"*, in *56th Annual Allerton Conference on Communication, Control, and Computing*, pp. 48–55, IEEE, 2018.

[C17] J. L. Heyman and **A. Gupta**, *"Colonel Blotto game with coalition formation for sharing resources"*, in *International Conference on Decision and Game Theory for Security*, pp. 166–185, Springer, 2018.

[C18] A. Nayyar and **A. Gupta**, *"Information structures and values in zero-sum stochastic games"*, in *2017 American Control Conference (ACC)*, pp. 3658–3663, IEEE, 2017.

[C19] **A. Gupta**, *"Privacy-aware stochastic control with a "snoopy" adversary: A game-theoretic approach"*, in *Proc. of 2016 Annual Conference on Information Science and Systems*, pp. 193–197, March 2016.

[C20] **A. Gupta**, R. Jain, K. Poolla, and P. Varaiya, *"Equilibria in two-stage electricity markets"*, in *Proc. of 54th IEEE Conference in Decision and Control (CDC)*, pp. 5833–5838, December 2015.

[C21] **A. Gupta**, R. Jain, and P. Glynn, *"An empirical algorithm for relative value iteration for average-cost MDPs "*, in *Proc. of 54th IEEE Conference in Decision and Control (CDC)*, pp. 5079–5084, December 2015.

[C22] **A. Gupta**, R. Jain, and R. Rajagopal, *"Scheduling, pricing, and efficiency of non-preemptive flexible loads under direct load control"*, in *Proc. of 53rd Annual Allerton Conference on Communication, Control, and Computing*, pp. 1008–1015, October 2015.

[C23] **A. Gupta**, S. Yüksel, and T. Başar, *"On the existence of optimal strategies in dynamic stochastic teams"*, in *Proc. of 53rd IEEE Conference in Decision and Control (CDC)*, pp. 1681–1686, December 2014.

[C24] **A. Gupta** and T. Başar, *"Dynamic incentive design in multi-stage linear-Gaussian games with asymmetric information: A common information based approach"*, in *Proc. of 53rd IEEE Conference in Decision and Control (CDC)*, pp. 414–419, December 2014.

[C25] **A. Gupta**, T. Başar, and G. Schwartz, *"A three-stage Colonel Blotto game: When to provide more information to an adversary"*, in *Decision and Game Theory for Security (GameSec)*, Lecture Notes in Computer Science edited by R. Poovendran and W. Saad, Volume 8840, pp. 216 – 233, November 2014.

[C26] **A. Gupta**, G. Schwartz, C. Langbort, S. Sastry, and T. Başar, *"A Three-Stage Colonel Blotto game with applications to cyberphysical security"*, in *Proc. of 2014 American Control Conference (ACC)*, pp. 3832–3837, June 2014.

[C27] **A. Gupta**, S. Yüksel, and T. Başar, *"On the existence of optimal strategies in multi-agent stochastic teams"*, in *Proc. of 2014 American Control Conference (ACC)*, pp. 1945–1950, June 2014.

[C28] **A. Gupta**, A. Nayyar, C. Langbort, and T. Başar, *"A dynamic transmitter-jammer game with asymmetric information"*, in *Proc. of 51st IEEE Conference on Decision and Control (CDC)*, pp. 6477–6482, December 2012.

[C29] **A. Gupta**, P. Grover, C. Langbort, and T. Başar, *"On myopic strategies in dynamic adversarial team decision problems"*, in *Proc. of 46th Annual Conference on Information Sciences and Systems (CISS)*, pp. 1–6, March 2012.

[C30] **A. Gupta**, C. Langbort, and T. Başar, *"One-stage control over an adversarial channel with finite codelength"*, in *Proc. of 50th IEEE Conference on Decision and Control (CDC)*, pp. 4072–4077, December 2011.

[C31] S. Bhattacharya, **A. Gupta**, and T. Başar, *"Decentralized opportunistic navigation strat- egies for multi-agent systems in the presence of an adversary"*, in *Proc. of IFAC World Congress*, vol. 18, pp. 11809–11814, August 2011.

[C32] **A. Gupta**, S. Bhattacharya, and T. Başar, *"Decentralized control of multi-agent system with adversarial switching topology"*, in *Infotech@Aerospace Conference, AIAA*, March 2011.

[C33] **A. Gupta**, C. Langbort, and T. Başar, *"Optimal control in the presence of an intelligent jammer with limited actions"*, in *Proc. of 49th IEEE Conference on Decision and Control (CDC)*, pp. 1096–1101, December 2010.

MANUSCRIPTS SUBMITTED

[S1] H. Chen, **A. Gupta**, Y. Sun, and N. Shroff, *"Hoeffding's Inequality for Markov Chains under Generalized Concentrability Condition"*. *in revision, arXiv preprint arXiv:2310.02941*.

[S2] W. B. Haskell, **A. Gupta**, and S. Shao *"Dynamic Capital Requirements for Markov Decision Processes"*, *in revision*, 2025.

PROFESSIONAL SERVICE

- General Chair for 2019 IMACCS Workshop at OSU
- Associate Editor for 2019, 2025 Indian Control Conference and 2019 American Control Conference
- Served as a reviewer for
  - IEEE Transactions on Automatic Control
  - SIAM Journal on Control and Optimization
  - Mathematics of Operations Research
  - IEEE Transactions on Control of Networked Systems
  - Automatica
  - Discrete Event Dynamic Systems
  - International Game Theory Review
  - Mathematics of Control, Signals, and Systems
  - IEEE Conference on Decision and Control (IEEE-CDC)
  - American Control Conference (ACC)
  - INFORMS Annual Meeting
  - IEEE International Conference on Computer Communications (INFOCOM)
- General Chair of 8th CSL Student Conference, 2013