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Pavithra Harsha

RESEARCH INTERESTS

AI for decision-making, including modeling, optimization, decision-making under uncertainty, machine learning and demand forecasting, with applications in IT automation, supply chains, pricing, and revenue management.

EDUCATION

- **Massachusetts Institute of Technology (MIT)**   Sep 2003 - Sep 2008
  Doctor of Philosophy (PhD), Operations Research
  Thesis : Mitigating Airport Congestion: Market Mechanisms and Airline Response Models
  Advisors : Prof. Cynthia Barnhart (MIT) & Prof. David Parkes (Harvard)

- **Indian Institute of Technology (IIT) Madras**   Jul 1999 - May 2003
  Bachelor of Technology (BTech)
  Major : Mechanical Engineering
  Minor : Operations Research (OR)

EMPLOYMENT

- **Principal Research Staff Member, IBM Research, Yorktown Heights**   May 2021 - Present
- **Visiting Scientist, Massachusetts Institute of Technology, Cambridge**   May 2011 - Present
- **Technical Assistant, Yorktown Heights**   Sept 2018 - Sept 2019
  Technical Assistant to Dr. Kathryn Guarini, Vice President of IBM Industry Research
- **Research Staff Member, IBM Research, Yorktown Heights**   May 2011 - April 2021
- **Postdoctoral Associate, MIT, Cambridge**   Aug 2009 - April 2011
  Hosted by Prof. Munther Dahleh at the Laboratory for Information and Decision Systems (LIDS).
- **Scientist, Analytical Services, Oracle Retail, Cambridge**   Oct 2008 - July 2009

LEADERSHIP EXPERIENCES

- **Research Focal for Turbonomic Business Unit**   Q1 2025 - Present
- **PI in an MIT-IBM lab project on AI in Supply Chains**   Q3 2020 - Q3 2025
- **Sub-theme lead on AI for IT Resource Management**   Q1 2024 - Q1 2025
- **Sub-theme lead on Future of Inventory in Supply Chain**   Q1 2020 - Q2 2022
- **Theme lead on Real-Time Prediction, Forecasting and Optimization**   Q2 2019 - Q4 2019

STUDENTS MENTORED

- **Thesis co-advisor:** Rares Cristian (MIT, graduated 2025), Anna Papush (MIT, graduated 2018, winner of the INFORMS Best Revenue Management and Pricing Dissertation Award 2018), Zachary Leung (MIT, graduated 2014).

- **IBM summer internship mentor**: Maxime Cohen (MIT 2012), He Wang (MIT 2013), Anna Papush (MIT 2014, 2015), Hari Bandi (MIT 2016), Divya Singhvi (MIT 2017), Ioannis Spantidakis (MIT 2020).

- **MIT-IBM MEng/MBAn co-advisor**: Kiran Gite (2020-21 MBAn), Clemente Ocejo (2021-22 MEng), Arpit Jain (2021-22 MBAn), Semi (2022 summer MBAn), Hamza Zerhouni (2022-23 MBAn), Michael L. Hensgen (2023-24 MEng), Maxime Wolf (2023-24 MBAn)

Honors and Awards

- *IBM Research Outstanding Technical Achievement Award 2021* for contributions to the development of Personalized Pricing and Promotions Analytics.

- *Second place* in the *2019 INFORMS Service Science Best Paper Award* for the paper "Learning Personalized Product Recommendations with Customer Disengagement" in collaboration with Hamsa Bastani, Georgia Perakis and Divya Singhvi.

- *IBM Research Outstanding Innovation Award 2019* for contributions to the IBM Research Spring Strategy and the Research Transformation.

- *IBM Research Outstanding Technical Achievement Award 2018* for science contributions to Energy Storage.

- *First place* in the *2017 INFORMS Service Science Best Cluster Paper Award Competition* for the paper "A data-driven approach for personalized bundle pricing and recommendation" in collaboration with Markus Ettl, Anna Papush and Georgia Perakis. Also, *Finalist* in the *2022 INFORMS M&SOM Society Award for Best Paper in M&SOM journal*.

- *Winner* of the *2017 INFORMS Revenue Management Practice Award* for the work on "Omnichannel markdown optimization" in collaboration with Markus Ettl, Shivaram Subramanian and Joline Uichanco.

- *Honorable mention* in the *2017 M&SOM practice-based research competition* for the paper "Dynamic Pricing of omnichannel inventories" in collaboration with Shivaram Subramanian and Joline Uichanco.

- *IBM Research Outstanding Technical Achievement Award 2015* for Omni-channel Pricing analytics under the category of accelerated market introduction resulting in significant level of realized revenue to IBM attributable to the research asset(s).

- Selected as a *2015 Technology Rising Star* by the Women of Color (WoC) magazine in recognition for the accomplishments in the STEM community.

- Eighth *IBM Invention Plateau* awards, one for every fourth patent applications submitted.

- *Honorable mention* for the *Aviation's Applications Dissertation Prize*, INFORMS 2009.

- *Honorable mention* for the *Transportation Science & Logistics Society Dissertation Prize*, INFORMS 2009

- *Alfred P. Sloan Foundation Fellowship, 2006–07*, awarded through the MIT Global Airline Industry Program.

- *Banco Foundation Prize, 2003*, awarded for the best academic record in Mechanical Engineering at IIT Madras.

- *Dr. S. Chandrasekhar Memorial Prize, 2002* and *Raghavendra Memorial Prize, 2001*, awarded for the best academic record in the first six and four semesters respectively in Mechanical Engineering at IIT Madras.

- *Summer Research Fellow 2001*, Jawaharlal Nehru Center for Advanced Scientific Research, India.

- *Prathibha Merit Scholarship 1999–2003*, given by the state government of Andhra Pradesh (AP) in India to the top six women students from AP in the IIT-Joint Entrance Exam. It covered half the undergraduate tuition.

Publications

- Theses

  1. *Mitigating Airport Congestion: Market Mechanisms and Airline Response Models.*
     Pavithra Harsha.
     Ph.D. Thesis, Sloan School of Management, Massachusetts Institute of Technology, Feb 2009.
  2. *Numerical Modelling of Water Jet Peening.*
     Pavithra Harsha.
     B.Tech Thesis, Dept. of Mechanical Engg., Indian Institute of Technology Madras, May 2003.

- Book Chapters

  3. *Decision-Focused AI in Supply Chains.*
     Georgia Perakis, Pavithra Harsha and Rares Cristian.
     AI in Supply Chains: Perspectives from Global Thought Leaders, Forthcoming 2025.
  4. *Censored Demand Estimation of Choice Models for Omnichannel Pricing.*
     Pavithra Harsha and Shivaram Subramaniam.
     Precision Retailing, University of Toronto Press, 2024.

- Jounral and Referred Conference Publications (Submitted and/or published)

  5. *Practical Contextual Bandits for Large-Scale Structured Discrete Constrained Optimization Problems.*
     Pavithra Harsha, Chitra Subramanian, Naoki Abe, Shivaram Subramanian, Amadou Ba, Kevin Fernandez, Mauricio Longinos and Chandrashekar Narayaswami.
     Proceedings of 31st ACM KDD Conference, 2025.
  6. *Causal Latency Modelling for Cloud Microservices.*
     Christopher Lohse, Diego Tsutsumi, Amadou Ba, Pavithra Harsha, Chitra Subramanian, Martin Straesser and Marco Ruffini.
     IEEE International Conference on Cloud Computing, 2025.
  7. *Optimal Workload Placement on Multi-Instance GPUs.*
     Bekir Turkkan, Pavan Murali, Pavithra Harsha, Rohan Arora, Gerard Vanloo and Chandrashekar Narayanaswami.
     Submitted, 2024.
  8. *CoRe: Coherency Regularization for Hierarchical Time Series.*
     Rares Cristian, Pavithra Harsha, Georgia Perakis, and Brian Quanz.
     Submitted, 2025.
  9. *Aligning Learning and Endogenous Decision-Making.*
     Rares Cristian, Pavithra Harsha, Georgia Perakis, and Brian Quanz.
     Submitted, 2025.
  10. *Fulfillment-Aware Learning in Inventory Allocation.*
      Rares Cristian, Pavithra Harsha, Georgia Perakis, Brian Quanz and Ioannis Spantidakis.
      Submitted, 2025.
  11. *Efficient End-to-End Learning for Decision-Making: A Meta-Optimization Approach.*
      Rares Cristian, Pavithra Harsha, Georgia Perakis, and Brian Quanz.
      Submitted, 2025.
  12. *Inter-series transformer: Attending to products in time series forecasting.*
      Rares Cristian, Pavithra Harsha, Clemente Ocejo, Georgia Perakis, Brian Quanz, Ioannis Spantidakis and Hamza Zerhouni.
      Submitted, 2024.
  13. *An Optimistic-Robust Approach for Dynamic Positioning of Omnichannel Inventories.*
      Pavithra Harsha, Shivaram Subramanian, Ali Koc, Mahesh Ramakrishna, Brian Quanz, Dhruv Shah, and Chandrashekar Narayanaswami.
      Submitted, 2023.
  14. *Enhancing the benefits of dual-sourcing with reverse information sharing.*
      Pavithra Harsha, Ashish Jagmohan, Retsef Levi, Elisabeth Paulson and Georgia Perakis.
      Submitted, 2023.
  15. *Deep policy iteration with integer programming for inventory management.*
      Pavithra Harsha, Ashish Jagmohan, Jayant Kalagnanam, Brian Quanz and Divya Singhvi.
      Manufacturing & Service Operations Management, Volume 27, Issue 2, pp 369–388, 2025.
  16. *Hierarchical Proxy Modeling for Improved HPO in Time Series Forecasting.*
      Arindam Jati, Vijay Ekambaram, Shaonli Pal, Brian Quanz, Wesley Gifford, Pavithra Harsha, Stuart Siegel, Sumanta Mukherjee, Chandra Narayanaswami.
      Proceedings of the 29th ACM KDD Conference, pp 891–900, 2023.

17. *End-to-End Learning for Optimization via Constraint-Enforcing Approximators.*
Rares Cristian, Pavithra Harsha, Georgia Perakis, Brian Quanz and Ioannis Spantidakis.
Proceedings of the AAAI Conference on Artificial Intelligence, 37(6), pp 7253–7260, 2023.

18. *Sequential Learning of Product Recommendations With Customer Disengagement.*
Hamsa Bastani, Pavithra Harsha, Georgia Perakis and Divya Singhvi.
Manufacturing & Service Operations Management, Volume 24, Issue 4, pp 2010–2028, 2022.

19. *A Prescriptive Machine-Learning Framework to the Price-Setting Newsvendor Problem.*
Pavithra Harsha, Ramesh Natarajan and Dharmashankar Subramanian.
INFORMS Journal on Optimization, Volume 3, Issue 3, pp 227–314, 2021.

20. *Demand modeling in the presence of unobserved lost sales.*
Shivaram Subramanian and Pavithra Harsha.
Management Science, Volume 67, Issue 6, pp 3803–3833, 2020.

21. *A data-driven approach for personalized bundle pricing and recommendation.*
Markus Ettl, Pavithra Harsha, Anna Papush and Georgia Perakis.
Manufacturing & Service Operations Management, Volume 22, Issue 3, pp 461–480, 2020.

22. *Designing Price Incentives in a Network with Social Interactions.*
Maxime Cohen and Pavithra Harsha.
Manufacturing & Service Operations Management, Volume 22, Issue 2, pp 292–309, 2020.

23. *Dynamic pricing of omnichannel inventories.*
Pavithra Harsha, Shiva Subramanian and Joline Uichanco.
Manufacturing & Service Operations Management, Volume 21, Issue 1, pp 47–65, 2019.

24. *A Practical Price Optimization Approach for Omni-channel Retailing.*
Pavithra Harsha, Shivaram Subramanian and Markus Ettl.
INFORMS Journal on Optimization, Volume 1, Issue 3, pp 185–264, 2019.

25. *Optimal management and sizing of energy storage under dynamic pricing for the efficient integration of renewable energy.*
Pavithra Harsha and Munther Dahleh.
IEEE Transactions on Power Systems, Volume 30, Issue 3, pp 1164–1181, May 2015.

26. *A framework for the analysis of probabilistic demand response schemes.*
Pavithra Harsha, Mayank Sharma, Ramesh Natarajan and Soumyadip Ghosh.
IEEE Transactions on Smart Grid, Volume 4, Issue 4, pp 2274–2284, December 2013.

27. *Optimal sizing of energy storage for efficient integration of renewable energy.*
Pavithra Harsha and Munther Dahleh.
50th IEEE Conference on Decision and Control and European Control Conference, 2011.

28. *Strong activity rules for iterative combinatorial auctions.*
Pavithra Harsha, Cynthia Barnhart, David C. Parkes and Haoqi Zhang.
Computers and Operations Research, Volume 37, Issue 7, pp 1271–1284, July 2010.

29. *Quantum Auctions.*
Tad Hogg, Pavithra Harsha and Kay-Yut Chen.
International Journal of Quantum Information, Volume 5, Issue 5, pp 751–780, October 2007.

- Working papers

30. *Markdown Optimization for an e-tailer.*
Pavithra Harsha, Zachery Leung and Georgia Perakis.

31. *Tractable Markdown Optimization Under Uncertainty.*
Pavithra Harsha and Georgia Perakis.

32. *Auctions for Airport Landing Slots: The Bidder Problem.*
Pavithra Harsha, Cynthia Barnhart and David C. Parkes.

- Workshop Publications

    33. *Causal Latency Modelling for Cloud Microservices.*
        Christopher Lohse, Diego Tsutsumi, Amadou Ba, Pavithra Harsha, Chitra Subramanian, Martin Straesser and Marco Ruffini.
        Deployable AI Workshop, AAAI, 2025.

    34. *Leveraging Interpretability in the Transformer to Automate the Proactive Scaling of Cloud Resources.*
        Amadou Ba, Pavithra Harsha and Chitra Subramanian.
        Deployable AI Workshop, AAAI, 2025.

    35. *Coherency Loss for Hierarchical Time Series Forecasting.*
        Rares Cristian, Pavithra Harsha, Michael Hensgen, Georgia Perakis and Brian Quanz.
        KDD MILETS Workshop, 2024.

    36. *End-to-End Learning via Constraint-Enforcing Approximators for Linear Programs with Applications to Supply Chains.*
        Rares Cristian, Pavithra Harsha, Georgia Perakis, Brian Quanz and Ioannis Spantidakis.
        AI for Decision Optimization Workshop, AAAI, 2022.

    37. *Math Programming Based Reinforcement Learning for Multi-Echelon Inventory Management.*
        Pavithra Harsha, Ashish Jagmohan, Jayant Kalagnanam, Brian Quanz and Divya Singhvi.
        Deep Reinforcement Learning Workshop, NeurIPS, 2021.

- Granted Patents

    38. Upstream visibility in supply-chain, US12099969B2.

    39. Loss augmentation for predictive modeling, US12307333B2

    40. Split-net configuration for predictive modeling, US12165057B2.

    41. Automated hybrid propensity decision vector generation using artificial intelligence, US11321762B2.

    42. Supply-chain simulation, US11488099B2.

    43. Freshness visibility in supply-chain, US11849046B2.

    44. Managing cross-channel fulfillment impact within shared inventory demand systems, US10755232B2.

    45. Real time personalized pricing for limited inventory assortments in a high-volume business environment, US11074601B2.

    46. Allocating a product inventory to an omnichannel distribution supply chain, US10423923B2.

    47. Distributed optimization method for realtime omnichannel retail operations, US9626646B1.

Talks: Invited Conference, Seminar and other

- "Practical Contextual Bandits for Large-Scale Structured Discrete Constrained Optimization Problems"
    - *INFORMS Annual Meeting*, October 2025.
    - *KDD*, August 2025.

- "End-to-end learning for information-gathering problems"
    - *INFORMS Manufacturing and Service Operations Management (M&SOM) Conference*, June 2025.

- "AI for IT Resource Management: Unlocking Learning and Decision Making"
    - *NYC Operations Research Day*, May 2025.

- "An Optimistic-Robust Approach for Dynamic Positioning of Omnichannel Inventories"
    - *INFORMS Annual Meeting*, October 2023.
    - *INFORMS Manufacturing and Service Operations Management (M&SOM) Conference*, June 2023.

- "Innovations in Inventory Management: Optimistic Robust and Learning-Based methods"
  - *Business Analytics class, Columbia University*, April 2023.
  - *McCoombs Business School, UT Austin*, February 2023.

- "Omnichannel Retail Operations: Pricing and Inventory Management"
  - *Indian Institute of Management, Ahmedabad*, November 2022.

- "Omnichannel inventory replenishment optimization"
  - *INFORMS Annual Meeting*, November 2022.
  - *INFORMS Annual Meeting*, November 2021.
  - *INFORMS Annual Meeting*, November 2020.

- "Application of AI to the multi-echelon inventory optimization problems"
  - *INFORMS Annual Meeting*, November 2020.

- "Blockchain Based Visibility and Supply Chain Gains"
  - *INFORMS Annual Meeting*, November 2019.

- "Dynamic pricing of omnichannel inventories"
  - *Math and Industrial seminar series, Purdue University*, April 2021
  - *Business Analytics class in Wharton Business School, University of Pennsylvania*, November 2020
  - *Seminar series in Johnson College of Business, Cornell University*, July 2020
  - *Supply Chain class in IEOR, Columbia University*, May 2019
  - *Business Analytics class in IEOR, Columbia University*, May 2019
  - *INFORMS Business Analytics Conference*, April 2019.
  - *Kellog Seminar Series*, November 2018.
  - *NYC Operations Research Day*, May 2018.
  - *Revenue management practice award at RM&P Conference*, July 2017.
  - *Practice-based research competition at M&SOM Conference*, June 2017.
  - *Business Analytics class in IEOR, Columbia University*, April 2017.
  - *Operations Research Colloquium, Penn State*, September 2016.
  - *POMS Conference*, May 2016.
  - *MBA class on supply chain logistics, University of Michigan*, March 2016.
  - *INFORMS Annual Meeting*, November 2015.
  - *International Symposium on Mathematical Programming*, July 2015.
  - *INFORMS Revenue Management and Pricing Conference*, June 2015.
  - *MBA class on business analytics, University of Michigan*, March 2015.

- "Demand modeling in unobserved lost sales settings"
  - *INFORMS Annual Meeting*, November 2017.

- "A prescriptive machine learning approach for the price-setting newsvendor problem with applications"
  - *INFORMS Revenue Management and Pricing Conference*, June 2018.
  - *INFORMS Revenue Management and Pricing Conference*, June 2013.
  - *International Symposium on Mathematical Programming*, August 2012.
  - *INFORMS Annual Meeting*, October 2012.

- "A novel approach to omni-channel demand modeling and price optimization for non-perishable items"
  - *INFORMS Annual Meeting*, November 2014.
  - *INFORMS Manufacturing and Service Operations Management (M&SOM) Conference*, June 2014.
  - *Operations Research Colloquium, Penn State*, March 2014.

- *INFORMS Annual Meeting*, October 2013.
- *Operations Management Fall Seminar Series, MIT*, October 2013.

- "A framework for the analysis of probabilistic demand response schemes"

  - *INFORMS Annual Meeting*, October 2012.

- "Optimal sizing and management of energy storage with intermittent supply in the presence of dynamic pricing"

  - *INFORMS Manufacturing and Service Operations Management (M&SOM) Conference*, June 2012.
  - *50th IEEE Conference on Decision and Control and European Control Conference*, December 2011.
  - *INFORMS Annual Meeting*, November 2011.

- "Tractable markdown optimization for multiple items under uncertainty"

  - *INFORMS Annual Meeting*, November 2011.
  - *INFORMS Manufacturing and Service Operations Management (M&SOM) Conference*, June 2011.
  - *INFORMS Revenue Management and Pricing Conference*, June 2011.

- "Optimal sizing and operations of a storage facility with intermittent supply"

  - *INFORMS Annual Meeting*, November 2010.
  - *INFORMS Manufacturing and Service Operations Management (M&SOM) Conference*, June 2011.

- "Tractable markdown optimization under uncertainty"

  - *Operations Management Fall Seminar Series, MIT*, December 2010.
  - *Operations Research Colloquium, Penn State*, November 2010.
  - *INFORMS Annual Meeting*, November 2010.
  - *IBM T.J. Watson Research Labs*, November 2010.
  - *INFORMS Manufacturing and Service Operations Management (M&SOM) Conference*, June 2010.
  - *INFORMS Revenue Management and Pricing Conference*, June 2010.

- "Mitigating airport congestion: market mechanisms and airline response models"

  - *INFORMS Annual Meeting*, October 2009 as part of the *Aviation's Application Dissertation Award.*
  - *Oracle Retail*, November 2010.

- "Activity rules for budget constrained bidders in ascending price combinatorial auctions," *INFORMS Annual Meeting*, November 2007.
- "Scalability of the auction model: 250K bids," *Emptoris*, August 2006.
- "Auctions for airport landing slots"

  - *INFORMS Annual Meeting*, November 2005.
  - *HP Research Labs*, June 2005.

- "Quantum auctions," *HP Research Labs*, August 2005.

Professional Activities

- Department Editor for the Practice Platform area in the INFORMS M&SOM Journal, 2021-Present.
- Associate editor for the INFORMS M&SOM Journal, (2021-Present), INFORMS Service Science Journal (2019–2022), Naval Research Logistics Journal (2018–2021), Journal of Revenue & Pricing Management, (2011–2015).
- Reviewer for the IBM Goldstein Fellow (2021, 2022, 2023, 2024, 2025); IBM PhD Fellowships & AI Residency Program (2020).
- Award committee member for the INFORMS DEI Best Student Paper Award, 2023.
- Award committee member for the Revenue Management and Pricing Practice Award, 2022.

- Award committee member of the INFORMS Wagner Prize, 2019-2021.
- Award committee member of the POMS Best Student Paper Award Competition, 2019.
- Member of the INFORMS Professional Committee Member, 2018.
- Secretary and treasurer for the INFORMS Revenue Management and Pricing section, Oct 2017– Oct 2018.
- Invited panelist at the Industrial Mathematics Workshop: Collaboratively Tackling Emerging Problems in Industry in the University of Minneapolis on the "Grand Challenges in Retail Analytics and Inventory Management".
- Head of the INFORMS Undergraduate Operations Research Prize Committee 2016 and member of the same committee in 2015.
- Served as the IBM Yorktown Lab advocate for the Global Technology Outlook 2017.
- Organizing the Commerce Seminar Series 2015-2016 at IBM Watson Research Center.
- Invited panelist at the 2015 INFORMS Doctoral Colloquium on the topic: "OR/Analytics industry opportunities and preparing for the industry job market".
- Reviewer for papers in the following journals and conferences: M&SOM Journal, Management Science, Operations Research, Transportation Science, Journal on Computing, Journal of Applied Analytics, Naval Research Logistics, Annals of Operations Research, Revenue & Pricing Management, Operations Research Perspectives, IBM Journal on Smarter Commerce, IEEE Journal on Selected Areas in Communications, IEEE Journal on Power Systems, IEEE Journal on Sustainable Energy, IEEE Journal of Smart Grid, M&SOM conference, IEEE SmartGridComm, IEEE International Conference on Communication
- Organizer, Operations Research Center(ORC) Spring Seminar Series, Spring 2006

Funding

- Contributed towards the NSF funding in Service Enterprise Engineering Program on "Dynamic Pricing for the Retail Industry." Collaborator: Georgia Perakis. Grant $ 75K/year. Duration: 3 years.
- Contributed towards Oracle Retail funding "Advanced Price Optimization algorithms." Collaborator: Georgia Perakis. Grant $ 75K. Duration: 1 year.
- Contributed towards MITEI Seed Fund 2011 "Towards efficient integration of renewables using energy storage: Optimal sizing and management." Collaborator: Munther Dahleh. Grant $ 150K. Duration: 2 years.

Other Experiences

- **Intern, Emptoris, Burlington**   Jun 2006 - Aug 2006
- **Teaching Assistant, Massachusetts Institute of Technology, Cambridge**   Sep 2005 - May 2006
- **Intern, Hewlett-Packard Research Labs, Palo Alto**   Jun 2005 - Aug 2005
- **Intern, Toyota Kirloskar Automotive Parts, Bangalore, India**   May 2002 - Jul 2002

Skills

- Programming and scripting: Java, Python, Matlab, SQL.
- Optimization and statistics packages: CPLEX, R