UPINDER KAUR

EDUCATION

Purdue University — West Lafayette, USA
Ph.D. Technology, Robotics and Cyber-Physical Systems — *August 2019 - May 2023(expected)*
Advisor: Dr. Richard M. Voyles — *GPA: 3.97/4.00*

Indira Gandhi Delhi Technical University (IGDTUW) — Delhi, India
Masters of Technology, Robotics and Automation — *August 2015 - June 2017*
Thesis Advisor: Dr. N. K. Chauhan, Dr. Sudipto Mukherjee — *Score: 90.05%*

Amity University — Noida, India
Bachelors of Technology, Mechanical and Automation Engineering — *August 2011 - June 2015*
Thesis Advisor: Dr. Gaurav Gupta — *GPA: 8.82/10*

ACADEMIC AND PROFESSIONAL HONORS

Best Paper Award, *AgSys, SenSys* 2022
Dean's Travel Grant, *Purdue University* 2022
Purdue Graduate Student Travel Grant, *Purdue University* 2022
Chancellor's Gold Medal, *IGDTUW* 2017
Vice Chancellor's Gold Medal, *IGDTUW* 2017
Exemplary Performance Silver Plaque, *IGDTUW* 2017
Ministry of Human Resource Development (MHRD) Scholarship 2015-2017
Academic Bronze Medal, *Amity University* 2015

PROFESSIONAL EXPERIENCE

- **Research Intern, Microsoft Research** May 2022 - September 2022
  - Designed and Implemented an active tracking node capable of withstanding the pressures of agri-food supply chains for enabling traceability.
  - Validated its performance on apple and wheat farms.
- **Research Intern, Microsoft Research** May 2021 - August 2021
  - Developed a unique tracking framework with sensor fusion, motion detection, and stochastic process modeling for GPS-denied environments.
  - Validated the performance on commercial farms of oats and wheat.
- **Lab Manager, Purdue University** May 2020 - Present
  - Leading the operations, research, and outreach activities of the *Collaborative Robotics Lab.*
- **Graduate Research Assistant, Purdue University** June 2019 - Present
  under the guidance of Prof. Richard M. Voyles
- **Senior Software Engineer, General Motors** August 2017- May 2019
  - Developed and implemented verification and validation protocols for ECU software modules.
  - Directed a team of four engineers in the design and execution of ECU memory and timing control software validation and testing.
  - Formulated algorithms for Ethernet protocol validation for vehicle ECUs.
  - Trained a group of 65 colleagues in Mexico and USA in internal python-based tools.

PUBLICATIONS

Book Chapter

- **Upinder Kaur**, Richard Voyles, and Shawn Donkin, 2020. "Future of Animal Welfare: Technological Innovations for Individualized Animal Care". In: Temple Grandin, ed., Improving Animal Welfare: A Practical Approach, 3rd ed. Wallingford: CABI.

Patent

- Vaishnavi Ranganathan, **Upinder Kaur**, Peeyush Kumar, Tusher Chakraborty, and Ranveer Chandra, 2022. "Information traceability using sensor nodes for supply chains." Patent Filed.

Peer-Reviewed Conferences

1. **Upinder Kaur**, Yuanmeng Huang, and Richard M. Voyles, "Hybrid Acoustic Localization with NLOS detection for in-vivo dynamic underwater environments". Submitted to International Conference on Acoustics, Speech, and Signal Processing **(ICASSP)**, 2023.
2. **Upinder Kaur**, and Richard M. Voyles, "CASPER: Criticality-Aware Self-Powered Wireless in-vivo Sensing Edge for Precision Animal Agriculture". In First Workshop on Internet-of-Things and Sensing for Agriculture and Food Systems **(AgSys)** of the 20th ACM Conference on Embedded Networked Sensor Systems **(SenSys)**, 2022. **Best Paper Award**
3. **Upinder Kaur**, Xin Ma, Yunameng Huang, and Richard Voyles, "Human-Like Multimodal Perception and Purposeful Manipulation fro Deformable Objects." In 2022 18^{th} International Conference on Autmation Science and Engineering **(CASE)**.
4. **Upinder Kaur**, Z. Berkay Celik, and Richard M. Voyles,"Zero-Day Security for Robot Networks Using Zero-Shot Learning". Submitted to International Conference on Conference on Robotics and Automation **(ICRA)**, 2023.
5. **Upinder Kaur**, Z. Berkay Celik, and Richard M. Voyles, "Robust and Energy Efficient Malware Detection for Robotic Cyber-Physical Systems". In 2022 13^{th} International Conference on Cyber-Physical Systems **(ICCPS)**, 2022.
6. Vaishnavi Ranganathan, Peeyush Kumar, **Upinder Kaur**, Sarah HQ Li, Tusher Chakraborty, and Ranveer Chandra. "Re-Inventing the Food Supply Chain with IoT: A Data-Driven Solution to Reduce Food Loss." **IEEE Internet of Things Magazine** 5, no. 1 (2022): 41-47.
7. **Upinder Kaur**, Xin Ma, Richard M. Voyles, and Byung-Cheol Min, "Malware Detection Using Pseudo Semi-Supervised Learning". In 3^{rd} International Conference of Pattern Recognition and Artificial Intelligence **(ICPRAI)**, 2022.
8. Datta, Arunashish, **Upinder Kaur**, Victor Malacco, Mayukh Nath, Baibhab Chatterjee, Shawn S. Donkin, Richard M. Voyles, and Shreyas Sen. "In-body to Out-of-body Communication Channel Modeling for Ruminant Animals for Smart Animal Agriculture." In 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society **(EMBC)**, IEEE, 2021.
9. **Upinder Kaur**, Haozhe Zhou, Xiaxen Shen, Byung-Cheol Min, and Richard Voyles, "RoboMal: Malware Detection for Robot Network Systems", in 5th IEEE Robotics Computing **(IRC)**, 2021.
10. **Upinder Kaur**, Praveen Abbaraju, Harrison McCarty, and Richard Voyles, "Clutter Slices Approach for Identification-on-the-Fly of Indoor Spaces", in Proceedings of PRAConBE workshop of International Conference on Pattern Recognition **(ICPR)**, 2020. (available on arxiv)
11. Mythra V. Balakunthala, **Upinder Kaur**, Xin Ma, Juan Wachs, and Richard Voyles, "Learning Multimodal Contact-Rich Skills from Demonstrations Without Reward Engineering", in IEEE International Conference on Robotics and Automation **(ICRA)**, 2021.
12. Glebys Gonzalez, Mridul Agarwal, Mythra V. Balakunthala, Md Masudur Rahman, **Upinder Kaur**, Yexian Xue, Richard Voyles, Vaneet Aggarwal, and Juan Wachs, "DESERTS: Delay-Tolerant Semi-Autonomous Robot Teleoperation for Surgery" in IEEE International Conference on Robotics and Automation **(ICRA)**, 2021.
13. Yuanmeng Huang, Jonathan Miller, **Upinder Kaur**, Ram M. S. Ramdas, Shashank Priya, and Richard M. Voyles, "Hybridization Through Modularity: Exploring Complex Modes of Locomotion with a "Bag of Robotic Modules", **ReMAR**, 2021.

Journals

14. Arunashish Datta, **Upinder Kaur**, Victor Malacco, Mayukh Nath, Baibhab Chatterjee, Shawn S. Donkin, Richard M. Voyles, and Shreyas Sen. "Sub-GHz In-Body to Out-of-Body Communication Channel Modeling for Ruminant Animals for Smart Animal Agriculture." IEEE Transactions on

Biomedical Engineering **(TBME)**, 2022.

15. **Upinder Kaur**, Chan Su Han, Huiwen Bai, Barbara Roqueto dos Reis, Robin White, Robert A Nawrocki, Richard M. Voyles, Min Gyu Kang, and Shashank Priya, "Invited Review: Sensor technologies for real-time monitoring of the rumen environment", In Journal of Dairy Science **(JDS)**, 2022.
16. **Upinder Kaur**, Rammohan Sriramdas, Xiaotian Li, Xin Ma, Arunashish Datta, Barbara Roqueto dos Reis, Shreyas Sen, Kristy Daniels, Robin White, Richard M. Voyles, Shashank Priya, "Indwelling Robotics for Active Health Monitoring in Ruminants: A Review of Elements", In Journal of Smart Agriculture Technology (SAT), 2022.
17. Sangjun Eom, Haozhe Zhou, **Upinder Kaur**, David Kusuma, and Richard Voyles, "TupperwareEarth: Bringing Intelligent User Assistance to the "Internet of Kitchen Things", in IEEE Internet of Things Journal **(IOTJ)**, 2022.
18. **Upinder Kaur**, Victor Malacco, Arunashish Datta, Lei Xin, Kristy Daniels, Robin White, Shreyas Sundaram, George Chiu, Shreyas Sen, Shawn Donkin and Richard Voyles,"Implementation and Integration of Precision Dairy Systems", accepted in Journal of Animal Science **(JAS)**, 2023.
19. Haoguang Yang, Mythra V. Balakuntala, **Upinder Kaur**, Jhon J. Quione, Abigayle E. Moser, Ali Doosttalab, Antonio Esquivel-Puentes, Tanya Purwar, Luciano Castillo, Xin Ma, Richard M. Voyles (2022). "Occupant-centric robotic air filtration and planning for classrooms for Safer school reopening amid respiratory pandemics". Robotics and Autonomous Systems **(RAS)**, 147, 103919.
20. **Upinder Kaur**, Glebys Gonzalez, Md Masudur Rahman, Vishnunandan Venkatesh, Natalia Sanchez, Gregory Hager, Yexiang Xue, Richard Voyles, and Juan Wachs, "From the DESK (Dexterous Surgical Skill) to the Battlefield - A Robotics Exploratory Study" in Military Health System Research Symposium (Military Medicine), 2020.
21. Masadur Rahman, Mythra V. Balakuntala, Glebys Gonzalez, Mridul Agarwal, **Upinder Kaur**, Vishnunandan Venkatesh, Natalia Sanchez-Tamayo, Yexian Xue, Richard Voyles, Vaneet Aggarwal, and Juan Wachs, "SARTRES: a semi-autonomous robot teleoperation environment for surgery". Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization, pp.1-8. 2020.

In Submission

- **Upinder Kaur**, Vaishnavi Ranganathan, Peeyush Kumar, Vikram Iyer, and Ranveer Chandra. "Enabling Traceability in Agriculture Supply Chains" In preparation for *Science Robotics*.
- **Upinder Kaur**, and Richard M. Voyles, "Robust Hybrid Localization for in-vivo Robots with NLOS Recovery". *To be submitted to IEEE Transactions on Robotics (T-RO).*
- **Upinder Kaur**, and Richard M. Voyles, "DITEC: A digital twin and testbed for CPS in precision animal agriculture," *To be submitted to IEEE Internet of Things Journal.*

TEACHING AND SERVICE

- **Cyber-Animal Systems I, Purdue University** Fall 2021
  Graduate Technology Mentor for Prof. Richard M. Voyles
- **Lab Manager** 2020-2023
  Collaborative Robotics Lab, Purdue
- **Vice President** 2021-2022
  League of Robotics Engineers (LoRE), Purdue
- Reviewer for ICRA, ICASSP, JDS, and RAS. 2022

INVITED TALKS AND DEMOS

- **Cyber-Physical Systems with Robots at the Edge for Precision Animal Agriculture** October 2022
  Invited Presentation, *Nokia Bell Labs*
- **End-to-end Traceability in Agri-foods Supply Chains** September 2022
  Internship Presentation, *Microsoft Research*

- **Sci-Vibes Podcast** September 2022
  Invited Interview, *Microsoft Research*
- **Robots for Precision Animal Agriculture** June 2022
  Invited Presentation, *Microsoft Research*
- **Tracking for Agri-foods Supply Chains** October 2021
  Internship Presentation, *Microsoft Research*
- **Multimodal Perception for Robots and Cyber-Physical Systems** May 2021
  Invited Presentation, *Microsoft Research*
- **AutoVal: Hands-on Tutorial** March 2019
  General Motors US, Mexico, and India
- **Introduction to Lauterbach** February 2019
  General Motors Technical Center, India

MENTORING

Graduate Students

- Srushti Vichare, Naveen Kusumanchi 2022-2023
- Harikrishnan Manoj Krishnan 2021-2023
- Yuanmeng Huang, Yubing Han 2020-2023
- Sangjun Eoms 2020-2021

Undergraduate Students

- Prathyush Sai Ravula *(Purdue)*, Kyle Drummonds *(Berea College)* 2022
- Haozhe Zhou, Xiaxin Shen, Ishita Agarwal, Aayusha Ajay Nair *(Purdue)* 2021
- Tawanda Kumbula, Ali Ali *(Berea College)*, Jessica Quaye *(MIT,MSR)* 2021
- Haozhe Zhou, Xiaxin Shen*(Purdue)*, Tawanda Kumbula, Ali Ali *(Berea College)* 2021
- Haozhe Zhou, Shih Hsuan Hung *(Purdue)* 2020

OPEN SOURCE CONTRIBUTIONS

RoboMal Dataset

- Created the first publicly available malware dataset for robots using a scaled autonomous car.
- Collection of 450 malware and good software files created by three contributors.
- Published supervised and semi-supervised baselines on the dataset.

DESK Dataset

- Contributed to the surgical robot task dataset by collecting data for the dVRK system.
- Published a transfer learning approach for sim-to-real and robot-robot task transfer.

REFERENCES

- **Richard M. Voyles**
  Daniel C. Lewis Professor of Purdue Polytechnic
  Purdue University
  email: rvoyles@purdue.edu
- **Byung-Cheol Min**
  Associate Professor
  Purdue University
  email: minb@purdue.edu
- **Z. Berkay Celik**
  Assistant Professor
  Purdue University
  email: zcelik@purdue.edu
- **Ranveer Chandra**
  Managing Director, Partner Manager & CTO
  Microsoft Research
  email: ranveer@microsoft.com
- **Vaishanvi Ranganathan**
  Senior Researcher
  Microsoft Research
  email: vnattar@microsoft.com
- **Vikram Iyer**
  Assistant Professor
  University of Washington
  email: vsiyer@uw.edu