

SMART LAB BY THE NUMBERS IN 2022

* Emoticons from <http://lancastergeneralhealth.org/>



14

LAB MEMBERS



3,557

WEBSITE VISITS



35

LAB MEETINGS



29

LAB SEMINARS



5, \$5.8M

GRANTS PROPOSED



2, \$5.3M

GRANTS PENDING & AWARDED



5, \$2.9M

CURRENT FUNDED PROJECTS



5, \$506K

COMPLETED FUNDED PROJECTS



6

JOURNAL PAPERS PUBLISHED



5

CONFERENCE PAPERS PUBLISHED



16

POSTERS & TALKS PRESENTED



3

INVITED TALKS



2

MEDIA APPEARANCES



18

HONORS/AWARDS

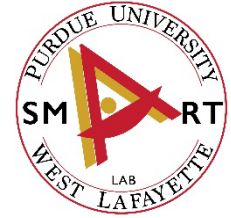


Narrative version available at
<https://tinyurl.com/SMARTLab2022>



Purdue SMART Lab Highlights 2022

January 2023



Lab Overview

The Smart Machine and Assistive Robotics Technology (SMART) Lab was established in 2015 by Dr. Byung-Cheol (“B.C.”) Min to research multi-robot systems, human-robot interaction, and robot design & control, with a focus on applications in field robotics and assistive technology and robotics. Since its establishment, 4 Postdocs, 6 PhD students, 5 MS students, 9 Undergrad students, 2 Visiting scholars, and 3 Visiting students have completed their research programs. In 2022, the lab was associated with 1 Director, 8 PhD students, 1 MS students, 3 Undergrad students, and 1 Visiting student.

Lab Meetings/Seminars

Lab Meetings

- In 2022, 35 lab group meetings were held. The lab had a group meeting every Friday from 3pm to 5pm in the POTR facility.

Lab Seminars

- During the spring semester, 11 technical seminars on machine learning and reinforcement learning for Robotics were conducted.
- During the fall semester, 8 paper review seminars were delivered by PhD students and MS students, and 10 research update presentations were delivered by PhD students, MS students, and Undergrad students.

Lab Members

Current Members (10)

- **Byung-Cheol Min** (Director) was appointed as Co-Lead for the Realizing the Digital Enterprise (RDE) Research Impact Area at Purdue Polytechnic, which comprises more than 60 research-active faculty members across the college. He received the Corps of Engagement Award from Purdue University in recognition of his project team’s scholarship of engagement. Dr. Min was also appointed as a review editor and a guest associate editor for *Frontiers in Robotics and AI*, and co-chair for the Workshop & Tutorial of the 18th International Conference on Intelligent Autonomous System.
- **Shyam Kannan** (PhD Student) was a GA for Purdue’s Library. He published 1 conference paper as a first author, and presented 3 posters and talks as a first author. Shyam won Second Place in the Autonomous Day 2.0’s Poster Sessions, and received the Engagement Award from Purdue University in recognition of his contributions to the 2021 Inaugural Indianapolis Autonomous Challenge as an Autonomous Systems Engineer in the Indy Autonomous Challenge Black & Gold Racing Team. He also received the Purdue Daniel & Martina Lewis Scholarship, as well as travel grants from Purdue Graduate Student Government (PGSG), Purdue Polytechnic Dean’s Office, the Dept of Computer and Information Technology, and Purdue Polytechnic’s Office of Globalization.
- **Go-Eum Cha** (PhD Student) was a TA for Prof. Pradhan during the spring semester and for Prof. Vhaduri during the fall semester. She published 1 conference paper as a first author, submitted 1 journal paper as a co-author, and presented 2 posters and talks: 1 as a first author and 1 as a co-author. She received the Purdue Daniel & Martina Lewis Scholarship and the Gary Marsden Travel Award from the Association for Computing Machinery (ACM). Go-Eum served as a lab committee chair during the spring semester, and mentored 1 undergrad student.
- **Vishnunandan Venkatesh** (PhD Student) was a TA for Prof. Salem. He presented 1 poster and talk as a first author. Vishnu served as a lab committee member during the spring semester.
- **Ruiqi Wang** (PhD Student) was a RA for Dr. Min during the spring semester and for a TA for Dr. Min during the fall semester. He published 1 conference paper as a first author and 1 archival paper as a co-author, and submitted 2 journal papers as a co-first author and 2 conference papers as a co-author. He

published 2 open source programming repositories via GitHub. He received the Purdue Daniel & Martina Lewis Scholarship. Ruiqi served as a lab committee member during the spring semester.

- **Weizheng Wang** (PhD Student) started his PhD study in August 2022. He published 1 conference paper as a co-author and submitted 1 journal paper as a co-author. He published 1 open source programming repository via GitHub.
- **Jeremy Pan** (MS Student) continued pursuing his MS degree. He published 1 archival paper as a co-author and submitted 1 conference paper as a co-author. Jeremy served as a lab committee chair during the fall semester.
- **Pou Hei (Gavin) Chan** (Undergrad Student) worked as an undergraduate research assistant for the Nexus project. He submitted 1 journal paper as a co-author, presented 2 posters and talks as a first author, and published 1 open source programming repository via GitHub. Gavin won First Place in the 2022 Fall Purdue Undergraduate Research Expo's Poster Session in the College of Engineering. He served as a lab committee member during the fall semester.
- **Revanth Krishna Senthilkumaran** (Undergrad Student) joined the lab in February 2022 and worked as an undergraduate research assistant for the CAREER project. He submitted 1 journal paper as a co-author, 1 conference paper as a co-author, presented 4 posters and talks: 2 as a first author and 2 as a co-author, and published 1 archival paper as a co-author. He was awarded 3rd Place for the interdisciplinary oral research presentations at the 2022 Spring Purdue Undergraduate Research Conference. Revanth served as a lab committee member during the fall semester.
- **Soomin Kim** (Undergrad Student) joined the lab in August 2022. Her research was about investigation of human preference with customizable robot facial interface.

Lab Alumni (4)

- **Wonse Jo** (PhD Student) completed his PhD in December 2022 and will start his postdoc at the University of Michigan under Prof. Lionel Robert and Prof. Dawn Tilbury. In 2022, he submitted 2 journal papers as a co-first author and 1 conference paper as a first author. He published 1 archival paper as a first author, presented 4 posters and talks: 2 as a first author and 2 as a co-author, and published 2 open source programming repositories via GitHub. Wonse received the Excellent Paper Award from the IEEE IROS 2021 Workshop on Cognitive and Social Aspects of Human Multi-Robot Interaction (HMRS). He was also awarded Second Runner Up at the 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium. In addition, Wonse mentored 1 undergrad student and was a RA for Dr. Min.
- **Su Sun** (PhD Student) was a TA for Dr. Min during the spring semester and for Prof. Hands during the fall semester. She left the lab in December 2022 after completing her internship at Bosch. Su submitted 1 journal paper a co-author and 1 conference paper as a first author, and presented 3 posters and talks: 1 as a first author and 2 as a co-author. Su was awarded Winner at the 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium.
- **Roman Ibrahimov** (PhD Student) was a RA for NASA RETH Institute at Purdue. He left the lab in September 2022. Roman presented 1 poster and talk as a first author, and was awarded First Runner Up at the 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium.
- **Jong-Beom Jeong** (Visiting Student) completed his research program as a visiting student in January 2022.

New Lab Members (3)

- **Weizheng Wang** (PhD Student) joined the lab in August 2022 as a direct PhD student. He obtained his BS degree in Robotics Engineering from Beijing University of Chemical Technology. Weizheng's main research interest is in reinforcement learning theory.
- **Soomin Kim** (Undergrad Student) joined the lab in August 2022. She is an undergrad student majoring in computer and information technology. Her research interests include human-robot interaction and social/personal robots.
- **Revanth Krishna Senthilkumaran** (Undergrad Student) joined the lab in February 2022. He is an undergrad student majoring in computer engineering. His research interests include human-robot interaction, unmanned aerial systems, robot dynamics, grasping and manipulation, and multi-robot systems.

Faculty Accomplishments & Awards (2)

- Dr. Min was appointed as Co-Lead for the Realizing the Digital Enterprise (RDE) Research Impact Area at Purdue Polytechnic, which comprises more than 60 research-active faculty members across the college, November 2022.
- Dr. Min received the Corps of Engagement Award from Purdue University in recognition of his project team's scholarship of engagement, April 2022.

Student Accomplishments & Awards (16)

Poster/Paper Awards (7)

- Pou Hei Chan won First Place in the 2022 Fall Purdue Undergraduate Research Expo's Poster Session in the College of Engineering, December 2022.
- Su Sun was awarded Winner in the category of Realizing Digital Enterprise (RDE) at the 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, May 2022.
- Roman Ibrahimov was awarded First Runner Up in the category of Realizing Digital Enterprise (RDE) at the 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, May 2022.
- Wonse Jo was awarded Second Runner Up in the category of Realizing Digital Enterprise (RDE) at the 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, May 2022.
- Revanth Krishna Senthilkumaran was awarded 3rd Place for the interdisciplinary oral research presentations at the 2022 Spring Purdue Undergraduate Research Conference, May 2022.
- Shyam Sundar Kannan won Second Place in the Autonomous Day 2.0's Poster Sessions. The event was held at the WestGate Academy Conferencing and Training center in Odon, Indiana, March 2022.
- Wonse Jo received the Excellent Paper Award from the IEEE IROS 2021 Workshop on Cognitive and Social Aspects of Human Multi-Robot Interaction (HMRS), January 2022.

Scholarships & Grants (8)

- Shyam Kannan received a Purdue Daniel & Martina Lewis Scholarship, December 2022.
- Go-Eum Cha received a Purdue Daniel & Martina Lewis Scholarship, December 2022.
- Ruiqi Wang received a Purdue Daniel & Martina Lewis Scholarship, December 2022.
- Shyam Sundar Kannan received the Purdue Graduate Student Government (PGSG) Travel Grant Award, August 2022.
- Shyam Sundar Kannan received a Purdue Polytechnic Dean's Graduate Student Travel Grant Award, May 2022.
- Shyam Sundar Kannan received a Purdue Computer and Information Technology Graduate Student Travel Grant Award, May 2022.
- Shyam Sundar Kannan received a Purdue Polytechnic's Office of Globalization Graduate Student Travel Grant Award, May 2022.
- Go-Eum Cha was awarded the Gary Marsden Travel Award from the Association for Computing Machinery (ACM), March 2022.

Recognitions (1)

- Shyam Sunder Kannan received the Engagement Award from Purdue University, in recognition of his contributions to the 2021 Inaugural Indianapolis Autonomous Challenge as an Autonomous Systems Engineer in the Indy Autonomous Challenge Black & Gold Racing Team, April 2022.

Grant Proposals (5 submitted, 1 awarded, 1 pending, 4 declined)

Submitted (5, \$5.8M)

- Towards Advanced Air Mobility via Reliable and Trustworthy Multi-Remote-Pilot Multi-Autonomous Aircraft Communications, Role: Co-PI (PI: Jin Kocsis), Sponsor: National Aeronautics and Space Administration, Amount: \$5,170,239 (09/01/2023 – 08/31/2026).

- Additive Manufacturing-capable Aerial Robots for Built Environment Maintenance and Rehabilitation, Role: Co-PI (PI: Jin Kocsis), Role: Co-PI (PI: Garam Kim), Sponsor: Purdue Polytechnic Institute, Amount: \$9,854 (06/01/2022 – 05/31/2023).
- Supplemental Funding Request for CAREER: Adaptive Human Multi-robot Systems, Role: PI, Sponsor: National Science Foundation, Amount: \$99,478 (07/01/2022 – 06/30/2023).
- FW-HTF-P: Interactive Multi-Human Multi-Remote-Robot Operations for the Future of Construction Work, Role: Co-PI (PI: Jin Wei-Kocsis), Sponsor: National Science Foundation, Amount: \$150,000 (10/01/2022 – 09/30/2023).
- Standard Research: Counterinterventions in Robot Assisted Therapy, Role: Co-PI (PI: Anna M. Williams), Sponsor: National Science Foundation, Amount: \$420,748 (08/01/2022 – 7/31/2024).

Awarded (1, \$150K)

- FW-HTF-P: Interactive Multi-Human Multi-Remote-Robot Operations for the Future of Construction Work, Role: Co-PI (PI: Jin Wei-Kocsis), Sponsor: National Science Foundation, Amount: \$150,000 (10/01/2022 - 09/30/2023).

Pending (1, \$5.1M)

- Towards Advanced Air Mobility via Reliable and Trustworthy Multi-Remote-Pilot Multi-Autonomous Aircraft Communications, Role: Co-PI (PI: Jin Kocsis), Sponsor: National Aeronautics and Space Administration, Amount: \$5,170,239 (09/01/2023 – 08/31/2026).

Declined (4, \$2.6M)

- Additive Manufacturing-capable Aerial Robots for Built Environment Maintenance and Rehabilitation, Role: Co-PI (PI: Jin Kocsis), Role: Co-PI (PI: Garam Kim), Sponsor: Purdue Polytechnic Institute, Amount: \$9,854 (06/01/2022 – 05/31/2023).
- Supplemental Funding Request for CAREER: Adaptive Human Multi-robot Systems, Role: PI, Sponsor: National Science Foundation, Amount: \$99,478 (07/01/2022 – 06/30/2023).
- Standard Research: Counterinterventions in Robot Assisted Therapy, Role: Co-PI (PI: Anna M. Williams), Sponsor: National Science Foundation, Amount: \$420,748 (08/01/2022 – 7/31/2024).
- RefleXAI: Explainable Reflexive Control, Role: Co-PI (PI: Shaoshuai Mou), Sponsor: Saab North America Inc, Amount: \$2,100,000 (03/01/2022 – 02/28/2026).

Current Funded Research Projects (5, \$2.9M)

- FW-HTF-P: Interactive Multi-Human Multi-Remote-Robot Operations for the Future of Construction Work, Role: Co-PI (PI: Jin Wei-Kocsis), Sponsor: National Science Foundation, Amount: \$150,000 (10/01/2022 – 09/30/2023).
- CAREER: Adaptive Human Multi-Robot Systems, Role: PI, Sponsor: National Science Foundation, Amount: \$500,000 (02/15/2019 – 01/31/2024).
- CPS: Medium: Collaborative Research: Closed Loop Sustainable Precision Animal Agriculture, Role: Co-PI (PI: Richard Voyles), Sponsor: National Institute of Food and Agriculture, Amount: \$541,448 (09/01/2018 – 08/31/2022).
- PFI-RP: Partnerships for Innovation in Interoperable Building Information Modeling Technology for Applications in Automated Building Code Compliance Checking and Modular Construction Automation, Role: Co-PI (Jiansong Zhang), Sponsor: National Science Foundation, Amount: \$1,108,003 (09/15/2018 – 08/31/2023).
- I/UCRC Phase I: Robots and Sensors for the Human Well-being, Role: Senior Personnel (PI: Richard Voyles), Sponsor: National Science Foundation, Amount: \$637,202 (09/15/2014 – 08/31/2022).

Completed Funded Research Projects (5, \$506K)

- UNSA NEXUS: Robotic Water Quality Monitoring and Distribution Systems: A Pilot Study, Role: PI, Sponsor: Universidad Nacional de San Agustin, Amount: \$365,439 (01/01/2018 – 02/15/2022).

- Polytechnic Post-Doc Support Competition Award, Role: Co-PI (PI: Sunghwan Lee), Sponsor: Purdue University, Amount: \$100,000 (7/01/2020 – 12/31/2022).
- 2021-22 COVID-19 Research Disruption Fund, Role: PI, Sponsor: Purdue University, Amount: \$25,000 (10/05/2021 – 04/30/2022).
- Detecting Humans' Adaptive Behavior Using Deep Learning Application to Provide Active Thermal Comfort Controls in Occupancy Spaces, Role: Co-PI (PI: Kyubung Kang), Sponsor: Purdue Polytechnic Institute, Amount: \$8,000 (09/01/2021 – 06/30/2022).
- A Visual-based Force Feedback Interface for Human-robot Systems using Compliant Mechanism Design, Role: Senior Advisor (PI: Milton Aguirre), Sponsor: Purdue Polytechnic Institute, Amount: \$8,000 (09/01/2021 – 06/30/2022).

Publications (6 journals, 5 conferences, 1 archive, 6 papers under review, 5 papers rejected)

Journals (6)

- Ramviyas Parasuraman, Byung-Cheol Min, and Petter Ögren, “Rapid Prediction of Network Quality in Mobile Robots”, *Ad Hoc Networks*, Vol. 138, 103014, January 2023.
- Shaocheng Luo, Jonghoek Kim, and Byung-Cheol Min, “Asymptotic Boundary Shrink Control with Multirobot Systems”, *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, Vol. 52, No. 1, pp. 591-605, Jan. 2022.
- Dongming Gan, Jiaming Fu, Han Lin, Haoguang Yang, Mo Rastgaar, Byung-Cheol Min, Richard Voyles, “Actuation-Coordinated Mobile Parallel Robots with Hybrid Mobile and Manipulation Function”, *Transactions of the ASME, Journal of Mechanisms and Robotics*, Vol. 14, No. 4, 041005, August 2022.
- Oscar Wong Chong, Jiansong Zhang, Richard M. Voyles, and Byung-Cheol Min, “BIM-based Simulation of Construction Robotics in the Assembly Process of Wood Frames”, *Automation in Construction*, Vol. 137, 104194, May 2022.
- Hyeonhun Kim, Molly Rothschild, Kwangdong Roh, Yunseok Kim, Ho Seong Jang, Byung-Cheol Min, and Sunghwan Lee, “Hybrid Silicon-Polymer Photodetector Engineered Using Oxidative Chemical Vapor Deposition for High-Performance and Bias-Switchable Multi-Functionality”, *Advanced Functional Materials*, 2022.
- Hyeonhun Kim, Molly Rothschild, Dong Hun Lee, Chung Soo Kim, Jeongmin Park, Byung-Cheol Min, and Sunghwan Lee, “Bias-Switchable Photodetector from Broad-Band to UV-Selective Detection Mode Leveraging Nanolayered Dual-Schottky Junction”, *ACS Applied Nano Materials*, November 2022.

Conferences (5)

- Ruiqi Wang, Weizheng Wang, and Byung-Cheol Min, “Feedback-efficient Active Preference Learning for Socially Aware Robot Navigation”, 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022), Kyoto, Japan, October 23-27, 2022.
- Shyam Sundar Kannan and Byung-Cheol Min, “Autonomous Drone Delivery to Your Door and Yard”, 2022 International Conference on Unmanned Aircraft Systems (ICUAS), Dubrovnik, Croatia, June 21-24, 2022.
- Go-Eum Cha and Byung-Cheol Min, “Correlation between Unconscious Mouse Actions and Human Cognitive Workload”, 2022 ACM CHI Conference on Human Factors in Computing Systems - Late-Breaking Work, New Orleans, LA, USA, April 30–May 6, 2022.
- Upinder Kaur, Xin Ma, Richard M. Voyles, and Byung-Cheol Min, “Malware Detection Using Pseudo Semi-Supervised Learning”, 3rd International Conference on Pattern Recognition and Artificial Intelligence (ICPRAI 2022), Paris, France, 1-3 June, 2022.
- Kwonsik Song, Kyubung Kang, and Byung-Cheol Min, “Recognition of Occupants' Cold Discomfort-Related Actions for Energy-Efficient Buildings”, The 9th International Conference on Construction Engineering and Project Management, Las Vegas, NV, USA, June 20-23, 2022.

Archive (1)

- Wonse Jo, Jaeun Kim, Ruiqi Wang, Jeremy Pan, Revanth Krishna Senthilkumaran, and Byung-Cheol Min, “SMARTmBOT: A ROS2-based Low-cost and Open-Source Mobile Robot Platform”, arXiv preprint, arXiv:2203.08903, 2022.

Papers Under Review (6)

- Geunsu Kim, Soohyeok Kang, Gyudo Park, and Byung-Cheol Min, “Electric Vehicle Battery State Of Charge Prediction Based On Graph Convolutional Network”, International Journal of Automotive Technology.
- Wonse Jo*, Ruiqi Wang*, Su Sun, Revanth Senthilkumaran, Daniel Foti, and Byung-Cheol Min (* equal contribution), “MOCAS: A Multimodal Dataset for Objective Cognitive Workload Assessment on Simultaneous Tasks”, IEEE Transactions on Affective Computing.
- Ruiqi Wang*, Wonse Jo*, Dezhong Zhao, Weizheng Wang, Baijian Yang, Guohua Chen, and Byung-Cheol Min (* equal contribution), “Husformer: A Multi-Modal Transformer for Multi-Modal Human State Recognition”, IEEE Transactions on Affective Computing.
- Jonghoek Kim, Go-Eum Cha, and Byung-Cheol Min, “Outer Space Rover Localization by Measuring a Base Station Utilizing a Monocular Camera”, Journal of Intelligent & Robotic Systems.
- Jun Han Bae, Pou Hei Chan, Yongho Kim, Richard M. Voyles, Sara K. Mcmillan, Bumjoo Lee, Mauricio Postigo-Malaga, Edgard Gonzales Zenteno, Jose Garcia-Bravo, Brittany Newell, J. Eric Dietz, and Byung-Cheol Min, “Uncrewed Remote Underwater Robotic Sediment Core Sampler”, IEEE Journal of Oceanic Engineering.
- Tamzidul Mina, Shyam Sundar Kannan, Wonse Jo, Shaocheng Luo, Galen B. King, and Byung-Cheol Min, “Distributed Multi-robot Arbitrary Object Transportation with Pushing Surface Identification and Model-based Pushing Effort Regulation”, IEEE Transactions on Systems, Man and Cybernetics: Systems.

Papers Rejected (5)

- Su Sun, Yu Xin, Wei Song, and Byung-Cheol Min, “DPConv: Dynamic Point Convolution for Point Cloud Learning”, European Conference on Computer Vision 2022 (ECCV 2022), Tel-Aviv, Israel, October 24-28, 2022.
- Wonse Jo, Jaeun Kim, Ruiqi Wang, Jeremy Pan, Revanth Krishna Senthilkumaran, and Byung-Cheol Min, “SMARTmBOT: A ROS2-based Low-cost and Open-Source Mobile Robot Platform”, 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022), Kyoto, Japan, October 23-27, 2022.
- Ike Obi, Ruiqi Wang, Prakash Chandra Shukla, and Byung-Cheol Min, “Robot Patrol: Using Crowdsourcing and Robotic Systems to Provide Indoor Navigation Guidance to The Visually Impaired”, 2022 ACM CHI Conference on Human Factors in Computing Systems - Late-Breaking Work, New Orleans, LA, USA, April 30–May 6, 2022.
- Upinder Kaur, Arunashish Datta, Haozhe Zhou, Xiabin Shen, Shreyas Sen, Byung-Cheol Min, and Richard Voyles, “PAAg: A Reference Architecture and Testbed for Closed-Loop Precision Animal Agriculture”, ACM/IEEE 13th International Conference on Cyber-Physical Systems (ICCPS 2022), Milan, Italy, May 4-6, 2022.
- Sangjun Lee and Byung-Cheol Min, “Secure Control Strategies of Multi-Robot Systems: Deception and Denial-of-Service Attack Cases”, Journal of Intelligent and Robotic Systems.

Poster Presentations & Talks (16)

- Pou Hei Chan, Pou Ut Chan, Wai Teng Sin, Chong Weng Lei, and Byung-Cheol Min, “INSERR: A Novel Search and Rescue ROV Design for Flooded Indoor Environments”, 2022 Purdue Fall Undergraduate Research Expo, Purdue University, November 2022. **[First Place]**
- Revanth Krishna Senthilkumaran, Wonse Jo, and Byung-Cheol Min, “Dynamic Cognitive Workload Allocation Method for Human-Robot Interaction”, 2022 Purdue Fall Undergraduate Research Expo, Purdue University, November 2022.
- Soomin Kim, Go-Eum Cha, and Byung-Cheol Min, “A Mobile Application for Customizable Robot Facial Interface”, 2022 Purdue Fall Undergraduate Research Expo, Purdue University, November 2022.
- Go-Eum Cha and Byung-Cheol Min, “Outer Space Rover Localization through Priori Object Information”, 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, Purdue University, April 2022.

- Roman Ibrahimov, Ruiqi Wang, Su Sun, Fahad Tajiki, and Byung-Cheol Min, “A Bio-inspired Nano-quadcopter for 2D Mapping Using AI”, 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, Purdue University, April 2022. **[First Runner Up]**
- Ruiqi Wang and Byung-Cheol Min, “Feedback-efficient Preference Learning for Socially Compliant Robot Navigation”, 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, Purdue University, April 2022.
- Shyam Sundar Kannan and Byung-Cheol Min, “Autonomous Drone Delivery to your Door and Yard”, 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, Purdue University, April 2022.
- Su Sun and Byung-Cheol Min, “A Semantic Segmentation and 3d Object Recognition Approach in LiDAR Point Clouds”, 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, Purdue University, April 2022. **[Winner]**
- Vishnunandan LN Venkatesh and Byung-Cheol Min, “Feasibility of a Learning from Demonstration Framework for Multi-robot Systems Using Visual Keypoint Inference and Off-policy Soft Actor Critic Methods”, 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, Purdue University, April 2022.
- Wonse Jo, Ruiqi Wang, Su Sun, Revanth Senthil, and Byung-Cheol Min, “A New Stimulus Tool to Generate and Measure Visual Perceptual and Cognitive Loads for Teleoperated Human-Robot Teams”, 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, Purdue University, April 2022. **[Second Runner Up]**
- Oscar Wong Chong, Jiansong Zhang, Richard M. Voyles, and Byung-Cheol Min, “BIM-based Simulation of Construction Robotics in the Assembly Process of Wood Frames”, 2022 Spring Purdue Polytechnic Research Impact Area Student Poster Symposium, Purdue University, April 2022.
- Revanth Krishna Senthilkumar, Wonse Jo, Ruiqi Wang, and Byung-Cheol Min, “A GUI for Measuring Cognitive Workload Stimulus in Human-robot Interaction”, Spring 2022 Purdue Undergraduate Research, Purdue University, April 2022. **[Third Prize]**
- Pou hei Chan, Pou Ut Chan, Wai Teng Sin, Chong Weng Lei, and Byung-Cheol Min, “INSERR: A Novel Search and Rescue ROV Design for Flooded Indoor Environments”, Spring 2022 Purdue Undergraduate Research, Purdue University, April 2022.
- Wonse Jo, Ruiqi Wang, Revanth Krishna Senthilkumar, and Byung-Cheol Min, “Development of Adaptive Controller for Human-Robot Team”, Autonomous Day 2.0’s Poster Sessions, WestGate Academy Conferencing and Training Center, Odon, Indiana, March 2022.
- Shyam Sundar Kannan and Byung-Cheol Min, “Autonomous Drone Delivery to Your Door and Yard”, Autonomous Day 2.0’s Poster Sessions, WestGate Academy Conferencing and Training Center, Odon, Indiana, March 2022. **[Second Place]**
- Shyam Sundar Kannan, “Autonomous Drone Deliver to your Door”, Three Minute Thesis, Purdue University, March 2022.

GitHub Repositories (3)

- Ruiqi Wang, Dezhong Zhao, Wonse Jo, and Byung-Cheol Min, “Husformer”, GitHub, November 2022.
- Weizheng Wang, Ruiqi Wang, and Byung-Cheol Min, “SAN-FAPL”, GitHub, October 2022.
- Pou Hei Chan, Jun Han Bae, Yongho Kim, and Byung-Cheol Min, “Sediment Core Sampler”, GitHub, September 2022.

Invited Talks (3)

- Byung-Cheol Min, “Purdue SMART Lab: HRI-oriented Research”, GIST, Gwangju, Korea, July 2022.
- Byung-Cheol Min, “Purdue SMART Lab Research”, Kyung Hee University, Yongin, Korea, July 2022.
- Byung-Cheol Min, “Environmental Sampling Robots for Sediments and Samples of Rivers & Lakes”, Underwater Robots - Trends & Challenges, Joint Webinar by Saab, Nanyang Technological University, and Purdue University, Virtual, January 2022.

Lab Media Appearances (2)

- Jaeun Kim, who presented her research at the 2021 Fall Purdue Undergraduate Research, and her mentors Wonse Jo and Dr. Min were featured in the Purdue Polytechnic's Newsroom in the article – “Undergraduate researchers present projects at fall expo”.
- Our Nexus project, the “Purdue-UNSA Robotic Water Quality Monitoring and Distribution Systems Project,” was featured in the Purdue Polytechnic's Newsroom in the article – “Major multidisciplinary research partnership with Peruvian university gets ready for third phase”.

Outreaches and Partnerships (2)

- Wonse Jo, Ruiqi Wang, Gavin Chan, and Dr. Min conducted an outreach event for K-12 students and teachers at Macau Anglican College as part of the NSF CAREER project, December 2022.
- Wonse Jo and Dr. Min had a meeting with James Basinger, a Deputy Commissioner of Operations for the Indiana Department of Correction (IDOC), to discuss potential applications of our research as part of the NSF CAREER project, December 2022.

New Lab Equipment

- In 2022, the lab's new highlighted equipment included desktop PCs with GPUs and wearable sensors.

Lab Social Media

YouTube Channel (4 new videos publicly published, 5,294 views, 49 new subscribers)

- “[IROS 2022] Feedback-efficient Active Preference Learning for Socially Aware Robot Navigation”, September 2022.
- “[CHI 22] Correlation between Unconscious Mouse Actions and Human Cognitive Workload”, May 2022.
- “[ICUAS 2022] Autonomous Drone Delivery to Your Door and Yard - Supplementary Video”, April 2022.
- “Feedback-efficient Active Preference Learning for Socially Aware Robot Navigation”, March 2022.

Facebook Page

- 46 new posts published.
- 460 post positive (like/love/wow) reactions.

Visit us at <http://www.smart-laboratory.org>