

Yeo Jung (Stella) Yoon

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EDUCATION

- University of Southern California**, Ph.D., Mechanical Engineering Aug. 2017 - Aug. 2023
- Dissertation: AI-driven experimental design to learn process parameter models for robotic applications.
 - Advisor: Prof. Satyandra K. Gupta at the Realization of Robotic Systems Lab.
- University of Illinois at Urbana-Champaign**, M.S., Mechanical Engineering Aug. 2011 - Aug. 2013
- Seoul National University**, B.S., Mechanical & Aerospace Engineering Mar. 2006 - Aug. 2010

RESEARCH & PROFESSIONAL EXPERIENCE

- University of Southern California**, Graduate Research Assistant Aug. 2017 - Sep. 2023
- Developed adaptive experimental design to efficiently learn process parameter models for robotic processing applications. The approach employed feasibility biased sampling, surrogate modeling using Gaussian Process, and greedy optimization. The approach was implemented for sanding applications performed by an ABB articulated robot. The proposed approach led to a decrease in task completion time when compared to conventional Design of Experiment (DOE) methods.
 - Developed a sequential decision making approach for safe learning of a manufacturing task with high failure costs. The proposed approach encapsulated aspects of look-ahead search, surrogate modeling, and a policy for process parameter selection. The approach was implemented and demonstrated on the spray painting application performed by a 6-DOF robotic manipulator.
 - Built and analyzed temporally varying process parameter models for maximum utilization of resources. The approach was implemented to direct writing applications performed by a Yaskawa robot arm, and the expected ink utilization was maximized by temporally adjusting process parameters estimated from the surrogate models.
 - Generated the trajectory planning algorithm to perform conformal 3D printing processes performed by a 6-DOF robotic manipulator. The algorithm included tool path generations from CAD files, robot trajectory generation using inverse kinematics, collision-check, smooth material extrusion on curved surfaces, and calibration.
 - Developed three-nozzle extrusion system for conformal multi-resolution 3D printing performed by a 6-DOF robotic manipulator. This work included the mechanical design and analysis of the extrusion tool, mechatronics integration, calibration, system testing and optimization.
 - Created digital resources and instructional content for robotic programming and manufacturing to support specialized training and employment opportunities for adults with intellectual and developmental disabilities.
- Samsung Electronics**, Research Intern Summer 2020
- Assessed machine learning algorithms for fault detection and classification in semiconductor manufacturing processes and conducted data analysis.
- Nan Inc.**, Project Engineer/Estimator Aug. 2014 - Oct. 2016
- Provided technical support throughout the construction project, which encompassed tasks such as planning, coordinating subcontractors, documenting progress, reviewing engineering deliveries, coordinating change-order, budgeting, and ensuring on-time project delivery.
 - Estimated money, time, materials, and labor required to complete a construction project.
 - Examined mechanical, electrical and architectural drawings, and technical specifications of projects to ensure accurate cost estimates.
- Amel Technologies, Inc.**, Mechanical Engineer Sep. 2013 - Jul. 2014
- Evaluated building energy performance (HVAC simulations) to improve efficiency and sustainability.
- Seoul National University**, Undergraduate Research Assistant Jan. 2009 - Aug. 2010
- Designed, developed and tested a CanSat rover for exploration and navigation.
 - Conducted dynamic simulations for the rover stability on rough terrain and safe landings from altitudes over 3km. The rover was launched at Black Rock Desert, Nevada with ARLISS CanSat missions.

TEACHING EXPERIENCE

- University of Southern California**, Teaching Assistant
- AME-404: Computational solutions to engineering problems Fall 2022
 - AME-546: Design for manufacturing and assembly Spring 2020

- AME-554: Additive manufacturing technologies Fall 2019
- Seoul National University**, Teaching Assistant
- Introduction to robot engineering Spring 2011 & Spring 2010

MENTORING EXPERIENCE

- **USC Women in Science & Engineering**, Mentor Aug. 2011 - Dec. 2022
Mentored three female graduate students pursuing engineering degrees, offering insights into prospective career trajectories while delivering essential guidance, motivation, and emotional support to enhance their graduate life experience.
- **USC CURVE Program**, Ph.D. Mentor Aug. 2021 - May 2022
Provided support for two undergraduate students to explore research opportunities and gain hands-on experience in the design and development of a wall-climbing robot.

SKILLS

- CAD software for 3D modeling and analysis: SolidWorks, and CATIA.
- Experience in mechanical design, modeling, and analysis for diverse applications.
- Robotic cell design: Hands-on experience in designing and building work cells for robotic processing applications, including sanding, spray painting, 3D printing, and assembly.
- Industrial robots: Experience with ABB, Yaskawa, UR, and KUKA robotic manipulators.
- Hardware development: Designing, building, and testing robotic systems/tools, such as a CanSat rover, ladder-crossing robot, cube-picking robot, gripper and multi-nozzle 3D printing extruder.
- Mechatronics: Hands-on experience with microcontrollers, sensor integrations, and actuation systems.
- Programming languages: MATLAB and Python.
- Languages: English and Korean.

AWARD & FELLOWSHIP

- **ASME IDETC-CIE**, The best paper award 2018
- **USC**, Viterbi/Graduate school merit fellowship 2017 - 2019
- **Kwanjeong Educational Foundation**, Study abroad scholarship 2011 - 2013
- **Ministry of Science and ICT, South Korea**, National science and technology scholarship 2006 - 2010
- **Robot Design Contest at SNU**, The best award 2010
- **ARLISS (2009 ARLISS competition (<http://ARLISS.org>))**, The 3rd award 2009
- **Electronics Show at SNU**, The silver award 2009
- **Venture Idea Competition at SNU**, The best presentation award 2008
- **CAD/CAM Contest at SNU**, The best product development award 2008
- **Electronics Show at SNU**, The silver award 2008

PUBLICATIONS

(* Indicates equal contributions from all authors, with author names listed alphabetically.)

- **Yoon, Y.J.**, Narayan, S., Gupta, S.K. (2024) "Self-supervised learning of spatially varying process parameter models for robotic finishing tasks," *Journal of Computing and Information Science in Engineering*, Feb. 24(2): 021008.
- Yang, Y., Cai, Y., **Yoon, Y.J.**, Zhao, H., Gupta, S.K. (2024) "Sensor-based planning and control for conformal deposition on a deformable surface using an articulated industrial robot," *Journal of Manufacturing Science and Engineering*, Jan. 146(1): 011008.
- **Yoon, Y.J.**, Yang, Y. Gupta, S.K. (2023) "Self-supervised learning of temporally varying process parameter models for direct ink writing," *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Boston, MA, United States.
- **Yoon, Y.J.**, Gupta, S.K. (2022) "A sequential decision making approach to learn process parameters by conducting experiments on sacrificial objects," *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, St. Louis, MO, United States.

- Thakar, S., Srinivasan, S., Al-Hussaini, S., Bhatt, P.M., Rajendran, P., **Yoon, Y.J.**, Dhanaraj, N., Malhan, R.K., Schmid, M., Krovi, V., Gupta, S.K. (2022) “A survey of wheeled mobile manipulation: a decision making perspective,” *Journal of Mechanisms and Robotics*, Apr. 15(2): 020801.
- Bhatt, P.M., Kulkarni, A., Malhan, R.K., Shah, B. **Yoon, Y.J.**, Gupta, S.K. (2022) “Automated planning for robotic multi-resolution additive manufacturing,” *Journal of Computing and Information Science in Engineering*, Apr. 22(2): 021006.
- Danaraj, N., **Yoon, Y.J.**, Malhan, R.K., Bhatt, P.M., Thakar, S., Gupta, S.K. (2022) “A mobile manipulator system for accurate and efficient spraying on large surfaces,” *Procedia Computer Science*, Jan. 200: 1528-1539.
- **Yoon, Y.J.**, Gupta, S.K. (2021) “Learning to improve performance during non-repetitive tasks performed by robots,” *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Online, Virtual.
- Bhatt, P.M.* , Malhan, R.K.* , Rajendran, P.* , Shah, B.* , Thakar, S.* , **Yoon, Y.J.*** , Gupta, S.K. (2021) “Image-based surface defect detection using deep learning: a review,” *Journal of Computing and Information Science in Engineering*, Aug. 21(4): 040801.
- **Yoon, Y.J.**, Almeida, O.G., Shembekar, A.V., Gupta, S.K. (2020) “A robotic cell for embedding prefabricated components in extrusion-based additive manufacturing,” *International Manufacturing Science and Engineering Conference*, Online, Virtual.
- Bhatt, P.M.* , Malhan, R.K.* , Shembekar, A.V.* , **Yoon, Y.J.*** , Gupta, S.K. (2020) “Expanding capabilities of additive manufacturing through use of robotics technologies: A survey,” *Additive Manufacturing*, Jan. 31: 100933.
- Shembekar, A.V., **Yoon, Y.J.**, Kanyuck, A., Gupta, S.K. (2019) “Generating robot trajectories for conformal three-dimensional printing using nonplanar layers,” *Journal of Computing and Information Science in Engineering*, Sep. 19(3): 031011.
- **Yoon, Y.J.**, Yon, M., Jung, S.E., Gupta, S.K. (2019) “Development of three-nozzle extrusion system for conformal multi-resolution 3d printing with a robotic manipulator,” *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Anaheim, CA, United States.
- Bhatt, P.M.* , Kabir, A.M.* , Malhan, R.K.* , Shah, B.* , Shembekar, A.V.* , **Yoon, Y.J.*** , Gupta, S.K. (2019) “A robotic cell for multi-resolution additive manufacturing,” *International Conference on Robotics and Automation*, Montreal, Canada.
- Shembekar, A.V., **Yoon, Y.J.**, Kanyuck, A., Gupta, S.K. (2018) “Trajectory planning for conformal 3d printing using non-planar layers,” *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Quebec City, Canada.

MEDIA FEATURES

- “Too complex to print? Call a robot”, *USC Viterbi School News*, Mar. 2020.
<https://viterbischool.usc.edu/news/2020/03/too-complex-to-print-call-a-robot/>
- “Robots developed to 3D-print complex shapes”, *Plant Engineering Robotics*, Mar. 2020.
<https://www.plantengineering.com/articles/robots-developed-to-3d-print-complex-shapes/>
- “When robots, 3-D printers and teenagers collide”, *USC Viterbi School News*, Oct. 2019.
<https://viterbischool.usc.edu/news/2019/10/when-robots-3-d-printers-and-teenagers-collide/>
- “ROS-industrial for real-world solutions”, *A3 Association for Advancing Automation News*, May. 2019.
<https://www.automate.org/industry-insights/ros-industrial-for-real-world-solutions>
- “Spraypainting a mural using a mobile manipulator robot”,
<https://www.youtube.com/watch?v=mzjhlWPdHAW>
- “Multi-resolution material extrusion additive manufacturing using Yaskawa manipulator ”,
<https://www.youtube.com/watch?v=5FUN47JXnt4>
- “Non-planar 3D printing using Yaskawa Motoman GP12”,
<https://www.youtube.com/watch?v=HaOvKdOUBPE>

REFERENCES

- Dr. Satyandra K. Gupta, Professor, University Southern California
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