Aditya Milind Deshpande

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Education

University of Cincinnati — *Cincinnati, Ohio, USA*

PH.D. IN MECHANICAL ENGINEERING, GPA: 4.0 — *Aug. 2017 - Present*

- Research Focus: Embodied Intelligence in robots

University of Cincinnati — *Cincinnati, Ohio, USA*

M.S. IN MECHANICAL ENGINEERING, GPA: 3.9 — *Aug. 2015 - Jul. 2017*

- Thesis: Robot Swarm Based On Ant Foraging Hypothesis With Adaptive Lévy Flights. (Electronic Thesis).

Maharashtra Institute of Technology — *Pune, India*

B.E. IN MECHANICAL ENGINEERING, First Class with Distinction — *Aug. 2010 - Jul. 2014*

- Senior Design Project: Design Optimization of Heat Exchanger

Experience

Cooperative Distributed Systems Lab, University of Cincinnati (Prof. Manish Kumar) — *Cincinnati, Ohio, USA*

GRADUATE RESEARCHER — *May. 2017 - Present*

- Doctoral research is focused on embedding embodied intelligence in multi-legged modular robots using developmental-learning framework.
- Researched model-based reinforcement learning for unmanned aerial vehicles.
- Automated quadcopter for indoor and outdoor flights using PX4-firmware, C++ and Python to assist firefighters in search and rescue.
- Led the software development and delivered the non-invasive Computer Vision Toolkit (CVT) to enable digitization of legacy machines using Python and OpenCV which was successfully deployed in Faurecia and Raytheon.
- Created computer vision software for road traffic monitoring with quadcopters using TensorFlow based fine-tuned Faster-RCNN model and OpenCV.

CEAS, University of Cincinnati — *Cincinnati, Ohio, USA*

INSTRUCTOR — *Jan. 2019 - Apr. 2019*

- Taught the large enrollment (60 students) course of MECH6032/5132 Robot Control and Design as a primary instructor.
- Revamped the course material and incorporated open-source hardware and software projects in the curriculum.
- Supervised students in the development of autonomous mobile robots and robot arms as class projects using Arduino Uno and ROS.

Viaanix, Inc. — *Wichita, Kansas, USA*

ENGINNEERING INTERN — *Jun. 2016 - Jul. 2016*

- Designed sensor fusion algorithm for wearable IMU sensors for use in human motion tracking using MATLAB.
- Presented wearable device design solution as per the customer/chiropractor requirements and budgets.
- Collaborated with design and firmware teams for hardware-software interface testing.

Dassault Systèmes (SIMULIA) — *Pune, Maharashtra, India*

SOFTWARE ENGINEER — *Jul. 2014 - Jul. 2015*

- Collaborated with the front-end team and refined the graphical front-end of the SIMULIA products using Polymerjs and JavaScript
- Focused on website rendering time minimization and usability to improve the user experience.

Skills

Software	Python, Robot Operating System (ROS), OpenCV, Gazebo Sim, PyBullet, MuJoCo, MATLAB, Julia, LaTeX, Git, SolidWorks
Deep Learning	Pytorch, Keras, TensorFlow
Hardware	PixHawk Autopilot, NVIDIA Jetson (TX2, Nano), Arduino Uno, Raspberry Pi

Publications and Presentations

CONFERENCE PUBLICATIONS

- **Deshpande, A. M.**, Minai, Ali A., Kumar, M. "One-Shot Recognition of Manufacturing Defects in Steel Surfaces." Submitted to the 48th SME North American Manufacturing Research Conference (2020) [Accepted].
- **Deshpande, A. M.**, Telikicherla, A. K., Jakkali, V., Wickelhaus, D., Kumar, M., Anand, S., "CV Toolkit: Computer Vision Toolkit for Non-invasive Monitoring of Factory Floor Artifacts." Submitted to the 48th SME North American Manufacturing Research Conference (2020) [Accepted].
- Kumar, R., Bhargavapuri, M., **Deshpande, A. M.**, Sridhar, S., Cohen, K., Kumar, M. "Quaternion Feedback Based Autonomous Control of a Quadcopter UAV with Thrust Vectoring Rotors." Submitted to the 2020 American Control Conference [Accepted].
- Scott, D., Radmanesh, M., Sarim, M., **Deshpande, A.**, Kumar, M., Pragada, R. (2019, June). "Distributed Bidding-Based Detect-and-Avoid for Multiple Unmanned Aerial Vehicles in National Airspace." In 2019 International Conference on Unmanned Aircraft Systems (ICUAS) (pp. 930-936). IEEE.

- **Deshpande, A. M.**, Kumar, R., Radmanesh, M., Veerabhadrappa, N., Kumar, M., Minai, A. A. (2018, June). "Self-Organized Circle Formation around an Unknown Target by a Multi-Robot Swarm using a Local Communication Strategy." In 2018 Annual American Control Conference (ACC) (pp. 4409-4413). IEEE.
- **Deshpande, A.**, Kumar, M., Ramakrishnan, S. (2017, October). "Robot swarm for efficient area coverage inspired by ant foraging: The case of adaptive switching between Brownian motion and Lévy flight." In ASME 2017 Dynamic Systems and Control Conference (pp. V002T14A009-V002T14A009). American Society of Mechanical Engineers.
- **Deshpande, A. M.**, Phatnani, G. M., Kulkarni, A. J. (2013, June). "Constraint handling in firefly algorithm." In 2013 IEEE international conference on cybernetics (CYBCO) (pp. 186-190). IEEE.

Journal Publications

- **Deshpande, A. M.**, Ramakrishnan, S., Kumar, M. (2019) "Adaptive Switching between Brownian and Lévy Foraging Strategies for Improved Area Coverage by a Biologically Inspired Robot Swarm." Submitted to Swarm Intelligence (Under review).

Book Chapter

- Kumar R., **Deshpande, A. M.**, Scott D., Wells J. Z., Kumar, M. "Special Transportation Modes." in "Disruptive Emerging Transportation Primer". American Society of Civil Engineers (ASCE) (Under review).

Posters

- **Deshpande, A. M.**, Kumar, R., Kumar, M. "IoT based AI Application for Posture Recognition to Reduce Workplace Injuries." 20th Annual 2019 Pilot Research Project (PRP) Symposium, University of Cincinnati Education and Research Center, October 2019.
- Kumat, A., Omotuyi, O., **Deshpande, A. M.**, Calabrese, N., Kumar, M. "Autonomous Mobile Robot Localization and Navigation system using Camera and Inertial Measurement Unit (IMU) in indoor environment." 2019 AIAA Intelligent Systems Workshop, July 2019.
- Anand, S., Kumar, M., **Deshpande, A.**, Jakkali, V., Telikicherla, A. K. "Non-Invasive Computer Vision Toolkit (CVT) using MTConnect®." Future Factory Technology Showcase, UI Labs, Chicago, Illinois, Nov. 13, 2018.

Presentations

- **Deshpande, A. M.**, Kumar, M., Minai A. A. "Teaching Quadruped Robot to Walk using Reinforcement Learning and Central Pattern Generators." 2019 AIAA Intelligent Systems Workshop. July 2019.
- Wells, J., **Deshpande, A. M.**, Kumar, R., Ssaxena, A., Brown, B., Vanderelst, D., and Kumar, M. "Autonomous Indoor Flight in GPS Denied, Degraded Environments." 44th Dayton-Cincinnati Aerospace Sciences Symposium. March 2019.
- Kumar, R., **Deshpande, A. M.**, Sridhar, S., Cohen, K., Kumar, M. "Quaternion Feedback Based Full Pose Control of a Quadcopter UAV with Thrust Vectoring Capabilities." 44th Dayton-Cincinnati Aerospace Sciences Symposium. March 2019.
- Omotuyi, O., Wells, J., **Deshpande, A. M.**, Kumar, R., Kumar, M. "Laser Based EKF Localization on TurtleBot3 Robot." 44th Dayton-Cincinnati Aerospace Sciences Symposium. March 2019.
- **Deshpande, A. M.**, Kumar, M., Ramakrishnan, S. "Robot Swarm inspired by Ant Colony for Augmented Search and Retrieval." 43rd Dayton-Cincinnati Aerospace Sciences Symposium. February 2018
- **Deshpande, A. M.**, Kumar, M., Minai, A. A. "Self-Organized Circle Formation around an Unknown Target by a Multi-Robot Swarm using a Local Communication Strategy." 43rd Dayton-Cincinnati Aerospace Sciences Symposium. February 2018.
- **Deshpande, A. M.**, Kumar, M., Ramakrishnan, S. "Area Coverage Based On Lévy Foraging Hypothesis Applied to Robot Swarm Emulating Ant Foraging Behavior." 42nd Dayton-Cincinnati Aerospace Sciences Symposium. March 2017.

Affiliations and Professional Activities

Affiliations

2017-Present	**American Society of Mechanical Engineers (ASME)**, **Student Member**
2019-Present	**American Association for the Advancement of Science (AAAS)**, **Student Member**

Professional Activities

2019	**IEEE International Conference on Robotics and Automation (ICRA)**, **Reviewer**
2017-19	**Dynamic Systems and Control Conference**, **Reviewer**
2017-19	**American Control Conference**, **Reviewer**

Honors & Awards

Oct. 2019	**People's Choice Best Poster Award**, 20th Annual Pilot Research Project Symposium. "IoT based AI Application for Posture Recognition to reduce Workplace Injuries".	*Cincinnati, Ohio*
2019	**Pilot Research Project Award, $7000**, IoT based AI Application for Posture Recognition to reduce Workplace Injuries. University of Cincinnati's Education and Research Center	*Ohio*
2019	**Video in Science Award**, 44th Dayton-Cincinnati Aerospace Sciences Symposium, presented the implementation of Style transfer on the scenic video from quadcopter.	*Dayton, Ohio*
2018	**Media Coverage: "UC researchers team up with ODOT to study traffic with drones"**, WCPO-TV, Channel 9 Cincinnati, July 10, 2018	*Cincinnati, Ohio*
2018	**University Reseach Council (URC) Award, $5000**, Principal Investigator (PI) for the research on "Deep Intelligence for Complex Learning in Robots"	*Cincinnati, Ohio*
2015-19	**University Graduate Scholarship**, University of Cincinnati	*Cincinnati, Ohio*