Vaibhav V. Unhelkar *Ph.D. Candidate*

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Areas of Interests: Human-Machine Interaction • Algorithms for Inference • Machine Learning • Robotics

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Education

Massachusetts Institute of Technology (MIT)   Feb '13 – present
Ph.D. Candidate, Aeronautics and Astronautics, and CSAIL
Master of Science (M.S. '15), Aeronautics and Astronautics   *GPA: 4.9/5.0*
Selected Coursework: Robotics (2.165), Algorithms for Inference (6.437 & 6.438), Online Methods in Machine Learning (6.883)

Indian Institute of Technology Bombay (IITB)   Jul '07 – Jun '12
Master of Technology (M. Tech.), Aerospace Engineering (Ranked 2nd)
Bachelor of Technology (B. Tech.), Aerospace Engineering with Minor in Electrical Engineering   *GPA: 9.3/10.0*

Research

Ph. D. Research, Interactive Robotics Group, MIT (Advisor: Prof. Julie A. Shah)   Jun '15 – present
Algorithms for Effective Communication during Human-Machine Collaboration
• Researching inference and decision-making algorithms to enable effective communication during human-machine interaction; applications include personal digital assistants, collaborative manufacturing and disaster response
• Designed a decentralized algorithm for multi-agent systems, ConTaCT, that enables autonomous agents (such as, robots) to make communication decisions during sequential multi-agent tasks (e.g., decentralized POMDP) [1]
• Developing a Bayesian nonparameteric clustering technique to improve inference of human intention and to generate explainable AI behavior during sequential human-machine collaborative tasks

M. S. Thesis, Interactive Robotics Group, MIT (Advisor: Prof. Julie A. Shah)   Feb '13 – May '15
Introducing Mobile Robots on the Automotive Final Assembly Line
• Designed a planning, control and sensing system to enable robot motion in moving-floor environments
• Evaluated the designed system through hardware implementation in Robot Operating System (ROS); achieved the first ever implementation of a robot operating on moving-floor environments, such as, automotive assembly lines

M. Tech. Thesis, IITB (Advisor: Prof. Hari B. Hablani)   Jun '11 – Jun '12
Satellite Attitude Estimation using Sun Sensors, Horizon Sensors and Gyro
• Developed a Kalman filter-based estimation algorithm to achieve satellite pointing accuracy of 0.1^{o}

Work Experience

Summer Intern, Turbomeca, Safran Group, France   May – Jul '10
• Reviewed procedures for quick performance recovery of helicopter engines after flights in volcanic ash
• Carried out customer studies and interacted with company officials to assess and improve existing techniques

Core Team Member, IITB Student Satellite Team   Aug '08 – Apr '10
• Validated the satellite control strategy through Monte Carlo simulations; achieved 40% reduction in simulation time
• Involved in selection, testing, simulation and modeling of actuators and sensors (Magnetometer and Torquers)

Teaching Assistant, Indian Institute of Technology Bombay   Aug – Nov '10 *and* Aug '11 – May '12
Courses: *Control Theory* (graduate level) • *Calculus* • *Data Analysis and Interpretation*

Recent Publications (Please refer to my webpage people.csail.mit.edu/unhelkar/ for the complete list of publications.)

[1] Unhelkar, V. V. and Julie A. Shah, "ConTaCT: Deciding to Communicate during Time-Critical Collaborative Tasks in Unknown, Deterministic Domains", AAAI Conference on Artificial Intelligence (AAAI), Phoenix, AZ, 2016.

[2] Unhelkar, V. V. et al. , "Human-Robot Co-Navigation using Anticipatory Indicators of Human Walking Motion", IEEE International Conference on Robotics and Automation (ICRA), Seattle, WA, 2015.

Skills
Programming: C++, Python, Matlab;
Software: Simulink, Mathematica, ROS, LaTeX

Awards and Distinctions
Participant, HRI Pioneers   '15
Recipient, Boeing Scholarship, IITB   '11
Winner, Technical Design Challenge, IITB   '09

Interests bamboo flute, badminton, reading science-fiction

Service, Leadership and Outreach
Co-organizer, AAAI Symposium on Human-Agent Groups '17
Member, Technical Program Committee, ACM/IEEE HRI   '18
Supervised 7 undergraduate researchers at MIT   '13 – '17
Instructor, Robotics 101, Youth Development Organization '15
Head, Department Mentorship Program, IITB   '11 – '12

Memberships   AAAI, IEEE, Robotics and Automation Society
Reviewer   IJRR, Mechatronics, AuRo, ICRA, IROS, HRI, R:SS