Amir Yazdani

PhD candidate in Robotics, Utah Robotics Center

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Education

2016–current   **Ph.D.**, ***Mechanical Eng.-Robotics***, **University of Utah**, Salt Lake City, UT.
Advisors: Tucker Hermans, Andrew Merryweather
Committe: Jake Abbott, John Hollerbach, Jason Wiese
Thesis: *Improve Ergonomics and Safety in Physical Human-Robot Interaction via Posture Estimation, Ergonomically-Optimal Posture Correction and Smart Haptic Guidance*

2013–2015   **M.Sc.**, ***Mechanical Eng.***, **AmirKabir University of Technology**, Tehran, Iran.
Advisors: MohammadBagher Menhaj, Mehdi Tale Masouleh
Thesis: *Optimal Trajectory Planning and Fault Tolerant Control of Redundant Planar Serial Manipulators*

2005–2010   **B.Sc.**, ***Mechanical Eng.***, **Khajeh Nasir Toosi University of Technology**, Tehran, Iran.
Advisor: Ali Nahvi
Thesis: *Design and Development of VirSense: A Novel Haptic Device With Fixed-Base Actuators and Gravity Compensation*

Skills

AI	Probabilistic Modeling, Reinforcement learning, POMDP, HMM
Estimation	Posture estimation, Kalman filters, Particle filters, Smoothing, Prediction, SLAM
Planning	Optimal motion planning, MPC, Hierarchical motion planning, Collision avoidance, MILP optimization
HRI	Ergonomics and safety in physical HRI, Human-aware planning, Biomechanics, Human factors
Haptics & VR	Haptic guidance, Haptic device design, Driving simulators
Robotics	Design, Kinematics, Dynamics, Control, Sensor fusion

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Computer Skills

Languages	Python, C/C++, MATLAB
Robotics	ROS(Rviz, Gazeebo, OpenCV, OpenNI, OpenNI Tracker, OpenPose, OpenSlam, Gmapping, MoveIt, Rtabmap, KDL, tracIK, GTSAM), Tensorflow
Engineering	SolidWorks, Catia, ADAMS, MATLAB Simulink, Gurobi Optimization
Teamwork & documenting	Office, LATEX, Slack, Git, Wrike

Professional Experiences

May 2018 - current   **Research Assistant**, *Utah Learning Lab for Manipulation Autonomy, The University of Utah*, Salt Lake City, UT.
Research on ergonomics-based inference in telemanipulation

Jan 2016 - current   **Research Assistant**, *Laboratory of Ergonomics and Safety, The University of Utah*, Salt Lake City, UT.
Research on safety in human-robot collaboration

Dec 2011 - Dec 2015   **Research Assistant**, *Human and Robot Interaction Laboratory, The University of Tehran*, Tehran, Iran.
Research on parallel robots, motion planning and failure-tolerant robots

Apr-Jun 2011   **Robotics Engineer Intern**, *Kavosh Mechanized Inspection*, Tehran, Iran.
Design and development of sewer inspection robots

Jul 2008 - Sep 2011   **Lab Manager, Research Assistant**, *Virtual Reality Laboratory, Khajeh Nasir Toosi University of Technology*, Tehran, Iran.
Design and develop haptic devices and driving simulators

Research Projects

△ **Human-Robot Interaction:**

2019 Comparing virtual fixture and synthesis fixtures in haptic guidance of user through a 6-DOF maze

2019 Automatic and smart haptic guiding the user to apply the ergonomically-optimal posture correction

2019 Online ergonomics analysis and finding the ergonomically-optimal posture correction in physical human-robot interaction based on RULA and graph-based optimization

2018-2019 Patient fall risk modelling, prediction and prevention using a patient assistant mobile (PAM) robot

2016-2019 Developing a safe and optimal motion planning algorithm for serial robots to improve safety and productivity of the task in a shared autonomy

△ **Estimation/Prediction:**

2018-2019 Human posture estimation in physical human-robot interaction solely from a the robot trajectory using by modeling a partially-observable probabilistic dynamic system and a particle filter

2017 Mobile robot visual localization and 3D map generation using RGB-D and monocular cameras in ROS

△ **Machine Learning:**

2019 Learning the motion dynamics of human arm in physical human-robot interaction by applying force from the robot

2017 Spam users detection on Twitter using a series of machine learning algorithms

△ **Motion/Manipulation Planning:**

2018-2019 Learning predictive model of legged objects using Bayesian regression for mobile manipulation

2017-2019 Mobile robot manipulation planning to move a mobility aid using MPC-Convex optimization

2016 Manipulation planning of objects with mobile robots using a mixture of A* and RRT algorithms

2013-15 Collision-free and fault-tolerant optimal path planning of serial robots using MPC and convex optimization

2014-2015 Motion planning and model predictive control of a group of mobile robots using MPC

2015 Motion planning and model predictive control of a decoupled 3-DOF Cartesian parallel robot

△ **Robot Control:**

2016-17 Control a wearable rehabilitation robot and study on its performance in gait correction

2016 Developing and LQR control of a 2-DOF inverted pendulum

△ **Design, Kinematics and Dynamics:**

2017 Design and development of a robotic hand for grasping legged objects

2014 Developing Progressive Growing Neural Gas Network (PGNGN), a novel algorithm for workspace determination of parallel robots

2014 Optimal design and development of a 4-DOF Quattro-based parallel robot

2013 Design and dynamic simulation of a 3-DOF spherical parallel robot

2013 Design, development and dynamic simulation of a 2-DOF spherical parallel robot

2012-13 Design, development and dynamic simulation of a fully-decoupled 3-DOF parallel robot with 3-PRRR limb structure

2012-13 Design and development of a pneumatic 6-DOF Gough-Stewart robot

2012 Design, development and kinematic analysis of a novel 4-DOF serial-parallel robot for real-size urban bus driving simulators

2007 Design an autonomous and a teleoperated search and rescue robot for RoboCup competition

2008-10 Design and development of VirSense, a haptic device with fixed-base actuators and automatic gravity compensation using linear springs

Journal Publications

2016 Roya Sabbagh Novin, Mehdi Tale Masouleh, and **Mojtaba Yazdani**. "A new neural gas network approach for obtaining the singularity-free workspace of 3-DOF planar parallel manipulators.", *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science* (2016).

2016   Roya Sabbagh Novin, Amirhossein Karimi, **Mojtaba Yazdani**, and Mehdi Tale Masouleh. "Optimal motion planning for parallel robots via convex optimization and receding horizon." *Advanced Robotics*, 30, no. 17-18 (2016): 1145-1163.

2016   Roya Sabbagh Novin, Mehdi Tale Masouleh, and **Mojtaba Yazdani**. "Optimal motion planning of redundant planar serial robots using a synergy-based approach of convex optimization, disjunctive programming and receding horizon." *Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering* 230, no. 3 (2016): 211-221.

2016   Mehdi Zamani Fekri, Mojtaba Zareei, Mehdi Tale Masouleh, and **Mojtaba Yazdani**. "Optimal design and fabrication of a 4-DOF quattrotaar parallel robot with singularity-free workspace by ABC and PSO algorithms.", *Modares Mechanical Engineering*, (2016): Vol 16 No 6, 149-158.

2015   **Mojtaba Yazdani**, Mehdi Tale Masouleh, Milad Hasanvand, Iman Yahyapour, and Mahmoud Ghafouri Tabrizi. "Inverse dynamic problem of two parallel manipulators with identical limbs structures.", *Modares Mechanical Engineering*, Vol 15 No 13, 281-290 (2015).

2015   Amir Jaberi, Ali Nahvi, Milad Hasanvand, Mehdi Tale-Masouleh, Mohammadreza Arbabtafti, and **Mojtaba Yazdani**. "Design and kinematic analysis of a 4-DOF serial-parallel manipulator for a driving simulator." *International Journal of Robotics (Theory and Applications)* Vol.4, No. 3, 29-37 (2015).

2015   Roya Sabbagh Novin, Mehdi Tale-Masouleh, **Mojtaba Yazdani** and Behzad Danaei. "Optimal motion planning of a 3-DOF decoupled parallel robot using convex optimization and receding horizon concept." *Modares Mechanical Engineering* Vol.15, No. 8, (2015).

2014   Ahmad Mashayekhi, Ali Nahvi, **Mojtaba Yazdani**, Majid Mohammadi Moghadam, Mohammadreza Arbabtafti, and Mohsen Norouzi. "VirSense: a novel haptic device with fixed-base motors and a gravity compensation system." *Industrial Robot: An International Journal* 41, no. 1 (2014): 37-49.

Peer-Reviewed Conference Papers

2017   Roya Sabbagh Novin, **Amir Yazdani** , Tucker Hermans, and Andrew S. Merryweather. "Dynamics model learning and manipulation planning for objects in hospitals using a patient assistant mobile (PAM) robot." *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Madrid, Spain, 2018.

2015   **Mojtaba Yazdani**, Roya Sabbagh Novin, Mehdi Tale Masouleh, Mohammad Bagher Menhaj, and Hamid Abdi. "An experimental study on the failure tolerant control of a redundant planar serial manipulator via pseudo-inverse approach." *The Third IEEE/RSI International Conference In Robotics and Mechatronics (ICRoM)*, Tehran, Iran, 2015.

2014   Esmaeil Rostami Jame Bozorgi, Iman Yahyapour, Amirhossein Karimi, Mehdi Tale Masouleh, and **Mojtaba Yazdani**. "Design, development, dynamic analysis and control of a 2-DOF spherical parallel mechanism." *The Second IEEE/RSI International Conference on Robotics and Mechatronics (ICRoM)*, Tehran, Iran, 2014.

2014   Iman Yahyapour, **Mojtaba Yazdani**, Mehdi Tale Masouleh, and Mahmoud Ghafouri Tabrizi. "Dynamic modeling and computed torque control of a 3-DOF spherical parallel manipulator." *The Second IEEE/RSI International Conference on Robotics and Mechatronics (ICRoM)*, Tehran, Iran, 2014.

2014   Roya Sabbagh Novin, **Mojtaba Yazdani**, Mehdi Tale Masouleh, and Mohammad Bagher Menhaj. "Workspace determination of planar parallel robots via progressive growing neural gas network." *The Second IEEE/RSI International Conference on Robotics and Mechatronics (ICRoM)*, Tehran, Iran, 2014.

2013   Amir Jaberi, Ali Nahvi, Milad Hasanvand, Mehdi Tale Masouleh, Mohammadreza Arbabtafti, **Mojtaba Yazdani**, Mehrdad Lagha, Mehdi Hemmatabadi, and Saeid Samiezadeh. "Design and kinematic analysis of a 4-DOF serial-parallel manipulator for urban bus driving simulator." *The First IEEE/RSI International Conference on Robotics and Mechatronics (ICRoM)*, Tehran, Iran, 2013.

2013   Iman Yahyapour, Milad Hasanvand, Mehdi Tale Masouleh, **Mojtaba Yazdani**, and Siavash Tavakoli. "On the inverse dynamic problem of a 3-PRRR parallel manipulator, the Tripteron." *The First IEEE/RSI International Conference on Robotics and Mechatronics (ICRoM)*, Tehran, Iran, 2013.

Presentations and Abstracts

2017 **Amir Yazdani**, Roya Sabbagh Novin, Andrew S. Merryweather, And Tucker Hermans. "Human Posture Estimation and Ergonomics Analysis Solely from The Robot in Physical Human-Robot Interaction." *17th Annual Regional National Occupational Research Agenda (NORA) Young/New Investigators Symposium.* April 2019, Salt Lake City, UT

2017 **Amir Yazdani**, and Andrew S. Merryweather. "Changing Perceptions of Robotics in Industry: Recent Accomplishment in Safety and Injury Risk Reduction." *National Occupational Research Symposium (NOIRS)*, October 2018, Morgantown, WV

2017 **Amir Yazdani**, Roya Sabbagh Novin, and Andrew S. Merryweather. "Improvement of human safety in fault-tolerant human and robot collaboration using convex optimization and receding horizon control." *Expanding Research Partnership: State of The Science Conference*, June 2017, Aurora, CO

2017 Andrew Merryweather, Roya Sabbagh Novin, **Amir Yazdani**, "Optimal motion and mobility aid manipulation planning to enable personal activity monitoring and facilitate safer sit-to-walk transitions", *5th International Conference on Ambulatory Monitoring of Physical Activity and Movement (ICAMPAM)*, June 2017, Bethesda, MD

2017 **Mojtaba Yazdani**, Roya Sabbagh Novin, and Andrew S. Merryweather. "Towards Safe human and robot collaboration in industrial environments using fault-tolerant and optimal trajectory planning for robot manipulators." *15th Annual Regional National Occupational Research Agenda (NORA) Young/New Investigators Symposium*, April 2017, Salt Lake City, UT

Patents

2016 4-degree of freedom industrial-researching parallel robot with free singularity workspace, No.146720 issued by Iranian Organization of Patents Registration

2015 Pneumatically Actuated 6-DoF Gough-Stewart Parallel Robot, No.446327 issued by Iranian Organization of Patents Registration

2013 VirSense, a novel haptic device with fixed-base actuators and gravity compensation, No.036421 issued by Iranian Organization of Patents Registration

2013 Two degrees of freedom parallel mechanism for the purpose of rapid object tracking, No.78963 issued by Iranian Organization of Patents Registration

Awards and Honors

2019 American Society of Safety Engineers Foundation Scholarship

2019 Dr. Paul Richards Safe Workplace Scholarship

2018 Graduate Student Travel Assistance award, Graduate School, The University of Utah

2018 Dr. Paul Richards Safe Workplace Scholarship

2018 American Society of Safety Engineers Foundation Scholarship

2017 Dr. Paul Richards Safe Workplace Scholarship

2016 Pilot Project Research Training (PPRT) Award from National Institute of Occupational Safety and Health (NIOSH), Award number: T420H008414-10

2014 1st place in Senior Demo league in RoboCup IranOpen

Certified Experiences

American Society of Safety Engineers (ASSE) Student Leadership Conference, Apr 2017, Tucson, AZ

Development Management of Companies, Student Entrepreneurship and Talented Conduction, K.N.Toosi University of Tech.

Management Systems – Principles and Standards, NIS CERT.

Quality Management Systems(ISO 9001:2000) – Internal audit, TÜV-Academy Rheinland.

Personal Management, Management Association of Iran, Tehran, Iran.

Teamwork Techniques, Management Association of Iran, Tehran, Iran.

Professional Activities

Student member of IEEE

Student member of Robotic & Automation Society (RAS)

Student member of American Society of Safety Engineering (ASSE)

Peer Review Activities

Technologies, MDPI
Sensors, MDPI
Medicina, ELSEVIER
Applied Sciences, MDPI
Robotics, MDPI
Journal of Systems and Control Engineering, SAGE
Robotics: Science and Systems Conference (RSS), IEEE, Germany
IEEE International Conference on Robotics and Mechatronics (ICROM), IEEE, Iran

Hobbies

Fly fishing, mountain biking, and hiking