

Maryam "Mary" Pourebadi

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Research Interests

Robotics, Artificial Intelligence, Machine Learning, Human-Computer Interaction, Computer Vision, Healthcare Engineering

Education

1. **Ph.D. Student, Computer Science and Engineering** July 2020 (Expected)
University of California San Diego
Advisor: Dr. Laurel D. Riek
2. **M.S., Computer Science** July 2017
Kent State University
GPA 4.0/4.0
Thesis: "A Deep Learning Approach for Blind Image Quality Assessment"
3. **B.S., Computer Engineering** July 2014
Alzahra University, Tehran
Thesis: "Developing an AI Algorithm for Tumor Detection in MRI Images of Breast"

Awards and Honors

1. Computing Research Association women (CRA-W) Travel Grant Awardee Dec 2018
2. Graduate Student Council Awardee, UC San Diego School of Engineering Aug 2018
3. NSF Connections in Smart Health Student Travel Grant Awardee Aug 2018
4. UC San Diego Grace Hopper Celebration (GHC) Scholarship Awardee May 2018
5. GSS Domestic Travel Grant Awardee, Kent State University Mar 2017
6. 2nd Team Rank, Machine Learning Project Exhibition, Kent State University Mar 2016
7. 1st Team Rank, NASA Robotic Mining Competition, Robot Parade, Kent State University 2015
8. Best Student Paper Award at 5th Alzahra University Motion Festival 2014
9. 1st Team Rank, Intelligent Vacuum Cleaner Competition, Alzahra University 2013
10. Top 0.1% of Nationwide Matriculation Exam, among ~1.2M undergraduate applicants 2009
11. 2nd Team Rank, 5th Provincial League RoboCup 2D Soccer Simulation competition 2008

Publications

1. Moosaei M., **Pourebadi M.**, and Riek L., "Modeling and Synthesizing Idiopathic Facial Paralysis", Automatic Face and Gesture Recognition (FG), May 2019
2. **Pourebadi M.** and Riek L., "Expressive Robotic Patient Simulators for Clinical Education", Robots 4 Learning, workshop at the 13th Annual ACM/IEEE International Conference on Human-Robot Interaction (HRI), March 2018
3. **Pourebadi M.**, Pourebadi M., "MLP Neural Network Based Approach for Facial Expression Analysis", The 2016 World Congress in Computer Science, Computer Engineering, and Applied Computing (worldcomp), June 2016
4. Ghayoumi M., Khan J., **Pourebadi M.**, Bauer E., Hossain A., "Follower Robot with an Optimized Gesture Recognition System", Socially & Physically Assistive Robotics For Humanity workshop at Robotics: Science and Systems (RSS) conference, April 2016

Invited Presentations

1. "Expressive Robots for Clinical Education", Research Open House, CSE UCSD, Jan 2019
2. "Interactive, Expressive Robots for Medical Education", Healthcare Robotics, Contextual Robotics Institute Forum, Nov 2018
3. "Interactive, Expressive Robots to Support Clinical Learners", NSF Connections in Smart Health Workshop at the IEEE/ACM conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE), Sep 2018
4. "Expressive Robotic Patient Simulators for Clinical Education", the 13th Annual ACM/IEEE International Conference on HRI, Mar 2018
5. "Non-Distortion-Specific No-Reference Image Quality Assessment using Deep Convolutional Neural Network", the 2nd Annual Machine Learning Project Exhibition, Kent State University, Mar 2016
6. "Screening Mammogram Enhancement for Breast Calcification Diagnosis", the 3rd Annual Artificial Intelligence and Cancer Therapy Symposium, Tehran, Feb 2014
7. "Automatic Tumor Detection Based on Support Vector Machine Technique", the 3rd Annual Artificial Intelligence and Cancer Therapy Symposium, Tehran, Feb 2014

Research Experience

Graduate Research Assistant, Healthcare Robotics Laboratory, UC San Diego (2017 - present)

Lead Researcher: *Interactive Expressive robots for clinical education*, NSF-funded project

- Supporting the redesign of an expressive, high-fidelity, low-cost, physical Robot Patient Simulator (RPS) head with 22-DOFs which will integrate with existing human patient simulator systems to convey realistic interaction between a human and robot.
- Improving methods for automatic real-time synthesizing of expressions such as pain, as well as developing new techniques for evaluating nonverbal behaviors on our physical bespoke robot.
- Developing advanced mask models of atypical expressions to convey neurological impairment.
- Designing a shared control system of proposed expressive RPS to support a range of adjustable control modalities, including direct teleoperation, pre-recorded modes, and reactive modes.

Lead Researcher: *Autonomous Driving Car*

- Designed an algorithm for the PiCar to traverse waypoints using Ackerman kinematic model and implemented it using python/ROS on the PiCar platform.
- Drove the robot to specific locations in the environment using vision, employed multiprocessing arrays to do data parallelism of multiple ROS nodes, improved the localization performance and drove more efficiently using feedback from the detected landmarks.
- Implemented the KALMAN filter based version of the Simultaneous Localization and Mapping (SLAM) technique, built two maps of the environments by initially drive the robot in a: i) circle. ii) a figure 8 trajectory, and evaluated the performance.
- Designed a Voronoi based path planner to go from a random start point to different random endpoints, and generated a visibility graph based planner to execute the same mission.
- Designed a system like "Roomba" and raced in a maze!: used the previously implemented localization system to ensure the Roomba has a certain level of situation awareness, implemented the coverage/avoidance-related behaviors in ROS using Python, and provided an almost full performance guarantee for coverage with my system.

Lead Researcher: *CSE Tour guide robot*

- Designed a tour guide robot for the third floor of CSE building at UC San Diego
- Ran a series of robotic-centric experiments to evaluate the robot's performance

Lead Researcher; *Social Respite Care Robot*

- Developed ResBot, a human-friendly Respite Carebot, that employs face detection and voice-control navigation techniques to engage in conversation with people and relieve their stress.
- Implemented control system consisting of four main modules: localization, mapping, and navigation; synthetic sound generation; human face perception; voice recognition.

Graduate Research Assistant, Computer Vision and Image Processing Lab, Kent State Univ. (2015 - 2017)

Lead researcher; *Unsupervised DCNN model for IQA*

- Implemented a Deep Convolutional Neural Network, trained under unsupervised learning to
 - 1) Classify non-distortion-specific, no-reference distorted images based on types of distortions, and
 - 2) Estimate the quality of the distorted images using properties of the human visual system, which can be employed in a phone to automatically picks the perfect frame on live photos, or in a digital video server to dynamically monitor and adjust the image quality of medical images.

Lead researcher; *NASA Mining Robot*

- Developed a dynamic path-finding algorithm to autonomously control the NASA Mining Robot
- Developed an obstacle avoidance algorithm for the robot

Lead researcher; *Optimized MLP model for facial expression analysis*

- Modified Geometric Features of the human face for facial expression analysis
- Trained a Multi-Layer Perceptron model in Python for effective, automatic analysis of human facial expressions with minimum facial feature points, trained on the Cohn-Kanade facial expression and FER-13 databases.

Lead researcher; *Daily fluctuations of human's emotion visualizer*

- Built an artificial neural network in MATLAB to recognize subjects' facial expressions.
- Produced a dynamic, interactive visualization of the daily fluctuations of each subject's expressions using data-driven documents to enable efficient exploration of particular individual's feelings in time

Lead researcher; *Chatbot's Speech*

- Integrated a repurposed animatronic with an off the shelf chatbot platform
- Programmed a system to synchronize the robot's motor positioning and speech

Lead researcher; *Smart Shoe*

- Designed and 3D printed a shoe in a real size
- Integrated three Ultrasonic sensors with the shoe to detect obstacles
- Designed an alert system to assist and notify visually impaired people to avoid obstacles

Undergraduate Research Assistant, Medical Image Processing Laboratory, Alzahra University

Lead researcher; *Breast cancer detection*

- Developed Artificial Intelligence techniques for automatic Region of Interest (ROI) of cancer tissue detection
- Implemented different filters such as noise, Gaussian, and Gabor filtering for image processing and denoising purposes
- Developed a Support Vector Machine (SVM) classifier for region-based segmentation in mammography images.

Lead researcher; *Intelligent vacuum cleaner*

- Designed an intelligent path planning/decision-making technique for a smart vacuum cleaner using heuristic techniques in artificial intelligence.

Lead researcher; *Comprehensive management System of Nursing Department*

- Visited Kashani hospital and interviewed nurses to collect data
- Designed systematic case management models for the software and built configuration management using automated tools to help improve the efficient use of resources, and enhance the performance of nursing.
- Validated and measured the quality of the software
- Apply testing techniques, including blackbox and whitebox techniques, automatic testing activities, and regression testing

Lead researcher; *Smart Chess player*

- Designed an intelligent predictive-analytic decision-making model for a virtual chess-playing agent

Lead researcher; *M&M Textual Search Engine*

- Built a customized English-Persian/Farsi dictionary with 555 words
- Developed a search engine to search and retrieve information in Persian documents using the Stanford CoreNLP and parse

Professional Experience

- **Noor Company**, Tehran (Mar 2014 - Aug 2015)
Web app developer
Implemented the online library of Pajoohyar project capable of collecting, organizing, and creating citations, as well as cloud-based syncing of user's research.
Pajoohyar project: customized desktop and web-based library based on Zotero.
- **Hashie Web Design Studio**, Tehran (June 2013 – Jul 2014)
UX designer and API Developer
Designed web-based shop stores
- **Information and Communication Technology Center**, Tehran (Fall 2012 - Fall 2013)
Site Administrator
Provided computer, network, and information security services

Supervisees

University of California San Diego

1. Victoria Hoznek, B.S. student, Human Biology, Double Minor Psychology and Visual Art (2018 - now)
2. Andy Ma, B.S. student, Mechanical Engineering (2017 - 2018)
3. Jon Paden, MFA. student, Art Theory (2017 - 2018)

Press

- **Interview** with Jacobs Graduate Student Council at UC San Diego Sep 2018
- **Interview** with Pardazesh Magazine, Computer Science and Information Technology Jul 2018
- **Interview** with KentWired Newspaper: Research on Robotics Autonomism Dec 2015

Teaching Experience

Graduate Teaching Assistant, Kent State University

- Network Security Course Summer 2017
- Introduction to Computer Science Spring 2017
- Discrete Structures (Spring 2017 and Fall 2016)
- Algorithms and Programming Fall 2016
- Data Structures and Abstraction Summer 2016
- Procedural Programming Summer 2016
- Object-Oriented Programming Summer 2016
- Introduction to Computer Science Spring 2016
- Wireless Communication Networks Fall 2015

Undergraduate Teaching Assistant, Alzahra University

- Web Programming Fall 2015
- Data Structures (Fall 2013 and Fall 2014)
- Intro to Formal Languages and Automata Fall 2013
- Discrete Mathematics Spring 2013
- Fundamentals of CS and Programming Fall 2011
- Technical Language Fall 2011

Professional activities

- **Reviewer**, Cognitive Science Society (Cogsci 2018) Feb 2018
- **Judge**, VEX Robotics Competition, Robotics Education and Competition Foundation, California Jan 2018
- **UCSD IEEE fellow Judge**, The SumoBot competition, UC San Diego Nov 2017
- **Mentor**, SD Hackathon, UC San Diego Oct 2017
- **Mentor and Judge**, Robot Parade Competition, Kent State University Nov 2016

Leadership

- **Co-Coordinator**, CSE Mentorship Program, UC San Diego (Summer 2018 - present)
- **Vise senator**, The Graduate Student Senate, Kent State University (Fall 2016 – 2017)
- **Direct Manager**, Pardazesh Magazine, Computer Science and Information technology (Sep 2012 – 2014)
- **Senator**, ACES (Alzahra Computer Engineering Society) (Oct 2012 – Sep 2013)
- **President**, Computer Science and Engineering Research Committee, Alzahra University (2011 – 2013)

Service

- **Elected board member**, UC San Diego GradWIC (Spr 2018 - present)
- **Volunteer**, RoboGrads Community, UC San Diego (Summer 2018 – present)
- **Committee member**, Diversity Equity and Inclusion (DEI) Committee (Fall 2017 – present)
- **Member**, UC San Diego Graduate Women In Computing (GradWIC) (Fall 2017 - Spring 2018)
- **Committee member**, Faculty Candidate Student Panel, UC San Diego Winter 2017
- **Committee member**, Student Committee for Ph.D. Admissions, UC San Diego Fall 2017
- **Committee member**, CS GSA Graduate Student Association, Kent State University (Fall 2015 – 2017)

- **Organizer**, "A Day with Physics Congress", IUST, Tehran Apr 2013
- **Organizer**, IT's Role in Global Marketplace Seminar, Alzahra University Nov 2012
- **Organizer**, Research Methodology workshop, CSE Department, Alzahra University 2010
- **Team Leader**, Alzahra University Robotic Team, 3D Soccer Simulation 2010

Professional Affiliations

- **Member**, Association for Computing Machinery (ACM) (Fall 2017 – present)
- **Member**, The IEEE Association, Robotics and Automation Society (Spr 2016 – present)
- **Member**, The IEEE Women in Engineering (Spr 2016 – present)
- **Member**, Society for Industrial and Applied Mathematics (SIAM) (Fall 2017 – present)

Professional Competencies

- Proficient in: ROS, Torch + Lua programming, Python, C#, Objective C++, C, Java, VB, AVR 8086
- MATLAB, Arduino, Raspberry Pi, Eclipse, UI design: qt, rqt
- Human-robot interaction, SLAM, motion planning, task planning, computer vision
- Visualization: Tableau, Data-Driven Documents (D3.js)
- Unified Modeling Language tools: Rational Rose, Visio
- GNU/Linux (Red Hat Certified Engineer), Kali-Linux
- MOOC related tools: Moodle, Adobe Captivate, Quiz-Maker, Presenter, Articulate Engage
- Ajax, ASP.NET, JavaScript, HTML5, CSS3, PHP, Microsoft SQL Server & MySQL