Ali Marjaninejad

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Education

Ph.D., Biomedical Engineering — **University of Southern California (USC)**
GPA: **3.95**/4.0 — Aug 2020 (expected)

M.Sc., Electrical Engineering — **University of Southern California (USC)**
GPA: **3.88**/4.0 — December 2017

M.Sc., Biomedical Engineering (Bioelectrics**)** — **Amirkabir University of Technology (AUT)**
GPA: **4.0**/4.0 — Feb 2015

B.Sc., Electrical Engineering (Bioelectrics**)** — **Sahand University of Technology (SUT)**
GPA: **3.83**/4.0 (Junior/Senior: **3.96**/4.0) — Feb 2012

Honors & Awards

- Being featured on the cover of the march 2019 issue of the *nature machine intelligence*
- USC Stevens center for innovation's "Best Commercial Potential" award for the work done on bio-inspired autonomous robots (2019)
- USC Provost's fellowship; the most prestigious fellowship at USC (2015 – 2019)
- USC Grad. School's Research Advancement fellowship recipient; The most competitive project award at USC (2018 – 2019)
- Society for Brain Mapping & Therapeutics (SBMT) and Brain Mapping Foundation Student Outstanding Leadership and Service Award (2019)
- USC Grad. Student Government's International Student Recognition Award (2018)
- Finalist in Maseeh Entrepreneurship Prize Competition, USC Stevens Innovation Awards, and the Creating Reality Hackathon (Won the Sponsor award)
- Appeared on the Wired magazine for my role in the neuromorphic quadruped robot project (2018)
- Featured on USC news for instructing MATLAB classes for students in the SHINE program (2016)
- Honor student privilege package award (Iran ministry of science and technology 2012)
- Awarded the Certificate of Appreciation from the Deputy Minister of Science for my active role in the "Bioelectric" journal (awarded as the best national student journal of the year – Iran, 2009)

Publications

Refereed Journal Articles

1. "Autonomous functional movements in a tendon-driven limb via limited experience" | A. Marjaninejad, D. Urbina-Meléndez, B. A. Cohn, and F. J. Valero-Cuevas | *Nature Machine Intelligence*, vol. 1, no. 3, pp. 144–154, 2019.
2. "Blood Glucose Regulation Using Adaptive Fuzzy Sliding Mode Control in Type I Diabetic Patients" | M Khazaei, A Geramipour, S Sadat-Hosseini, A Marjaninejad | *International Journal of Mechatronics, Electrical and Computer Technology (IJMEC), 2018*
3. "Design of FPGA-based Digital PID controller using Xilinx SysGen® for regulating blood glucose level of type-i diabetic patients" | *A Geramipour, M Khazaei, A Marjaninejad, M Khazaei | International Journal of Mechatronics, Electrical and Computer Technology (IJMEC), 3 (7), 56-69, 2013*

Refereed Book Chapters

1. "Should Anthropomorphic Systems be 'Redundant,'?" | A Marjaninejad, FJ Valero-Cuevas | *Biomechanics of Anthropomorphic Systems, Springer Tracts in Advanced Robotics (STAR) series, Springer, 2019*

Refereed full-length Conference proceedings

1. "Model-Free Control of Movement in a Tendon-Driven Limb via a Modified Genetic Algorithm" | A Marjaninejad, R Annigeri, FJ Valero-Cuevas | *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS, 2018*
2. "An Analytical Approach to Posture-Dependent Muscle Force and Muscle Activation Patterns" | A Marjaninejad, J Berry, FJ Valero-Cuevas | *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS, 2018*
3. "Finger movements are mainly represented by a linear transformation of energy in band-specific ECoG signals" | A Marjaninejad, B Taherian, FJ Valero-Cuevas | *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS, 2017.*
4. "A Radial Basis Function Neural Network approximator with fast terminal sliding mode-based learning algorithm and its application in control systems" | *M Khazaei, H Sadat-Hosseini, A Marjaninejad, S Daneshvar | Iranian Conference on Electrical Engineering (ICEE), 2017*
5. "A model-based exploration of the role of pattern generating circuits during locomotor adaptation" | A. Marjaninejad and J. M. Finley | *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS, 2016.*
6. "Online signal to noise ratio improvement of ECG signal based on EEMD of synchronized ECG beats" | A Marjaninejad, F Almasganj, AJ Sheikhzadeh | *Iranian Conference on Biomedical Engineering (ICBME), 2014*
7. "A low-cost real-time wheelchair navigation system using electrooculography" | A Marjaninejad, S Daneshvar | *Iranian Conference on Electrical Engineering (ICEE), 2014*

Under-review (full-length papers)

1. "Autonomous Control of a Tendon-driven Robotic Limb with Elastic Elements Reveals that Added Elasticity can Enhance Learning". | Marjaninejad, Ali, Tan, J., & Valero-Cuevas, F. J. | *ArXiv Preprint ID arXiv:1909.12436, 2019.*
2. "Simple Kinematic Feedback Enhances Autonomous Learning in Bio-Inspired Tendon-Driven Systems" | Marjaninejad, Ali, Urbina-Meléndez, D., & Valero-Cuevas, F. J. | *ArXiv Preprint ID arXiv:1907.04539, 2019*.
3. "The utility of tactile force to autonomous learning of in-hand manipulation is task-dependent" | R Mir, A Marjaninejad, FJ Valero-Cuevas | *ArXiv Preprint ID arXiv:2002.02418, 2020.*

Non-refereed full-length publications

1. "Quantifying and attenuating pathologic tremor in virtual reality." | Cohn, Brian A., Dilan D. Shah, Ali Marjaninejad, Martin Shapiro, Serhan Ulkumen, Christopher M. Laine, Francisco J. Valero-Cuevas, Kenneth H. Hayashida, and Sarah Ingersoll | *ArXiv preprint ID arXiv:1809.05970 (2018)*

Refereed Conference/Workshop abstracts

1. Autonomous Functional Movements in a tendon-driven leg via limited experience | Ali Marjaninejad, Urbina-Meléndez D, Cohn BA, Valero-Cuevas FJ | *Dynamical Walking, Canmore, Canada, 2019.*
2. "Autonomous Functional Locomotor Movements in a Tendon-Driven Limb via Limited Experience" | Marjaninejad A, Urbina-Meléndez D, Cohn BA, Valero-Cuevas FJ | *The 9th International Symposium on Adaptive Motion of Animals and Machines EPFL, Lausanne, 2019.*
3. *Few-shot learning of autonomous behavior in a bio-plausible hardware-software setting* | *Ali Marjaninejad* | *15th Annual World Congress of Society for Brain Mapping and therapeutics (SBMT), Los Angeles, CA, 2019.*
4. "Simple and Two-Element Hill-Type Muscle Models Cannot Replicate Realistic Muscle Stiffness" | Ali Marjaninejad, Babak Taherian, Kian Jalaleddini, and Francisco J Valero-Cuevas | *The 41st American Society of Biomechanics (ASB) Conference, Boulder, CO, 2017.*

Non-refereed Conference/Workshop abstracts

1. "Bioinspired few-shot learning in robotic systems" | Ali Marjaninejad, Urbina-Meléndez D, Cohn BA, Valero-Cuevas FJ | *Society for Neuroscience (SfN) Conference, Chicago, IL, 2019.*
2. "New generation of bio-inspired robots that learn and adapt using limited experience" | Ali Marjaninejad | *23th Grodins Research Symposium, Los Angeles, CA, 2019.*
3. "Autonomous Functional Movements in a Tendon-Driven Limb via Limited Experience" | Ali Marjaninejad | *USC Biomedical Graduate Talk Series, Los Angeles, CA, 2019.*
4. "Using Genetic Algorithm to Control a Tendon-Driven limb" | Ali Marjaninejad, F.J. Valero-Cuevas | *22th Grodins Research Symposium, Los Angeles, CA, 2018.*
5. *"Using genetic algorithm to control tendon-driven systems with unknown structure"* | Ali Marjaninejad, R. Annigeri, F.J. Valero-Cuevas | *Society for Neuroscience (SfN) Conference, San Diego, CA, 2018.*
6. *Evaluating the learnability-dimensionality relationship in a tendon- driven finger"* | *Brian A. Cohn, A. Marjaninejad, F. J. Valero-Cuevas*| *Society for Neuroscience (SfN) Conference, San Diego, CA, 2018.*
7. "A NeuRoBotic experimental system to study muscle function" | D. Urbina-Meléndez, A. Marjaninejad, B.A. Cohn, J.A. Berry, H. Zhao, F.J. Valero-Cuevas | *Society for Neuroscience (SfN) Conference, San Diego, CA, 2018.*
8. *Simple and Two-Element Hill-Type Muscle Models Cannot Replicate Realistic Muscle Stiffness* | Ali Marjaninejad and Francisco J Valero-Cuevas | *21th Grodins Research Symposium, Los Angeles, CA, 2017.*
9. "A Model-based Exploration of the Role of Pattern Generating Circuits during Locomotor Adaptation." | Ali Marjaninejad, James M. Finley | *Society for Neuroscience (SfN) Conference, San Diego, CA, 2016.*
10. "An Exploration of the Role of Pattern Generating Oscillators during Locomotor Adaptation" | Ali Marjaninejad, James M. Finley | *The 20th Grodins Research Symposium, Los Angeles, CA, 2016.*

Invited Talks

1. On the New Generation of Bio-inspired Robots – MATLAB EXPO 2019, San Jose, Ca. 2019
2. Bio-plausible Mechanics, Learning, and Control for Robots – Google Brain / Robotics, Mountain View, Ca. 2019
3. Learning without forgetting in real-time with limited experience: A bio-inspired approach. | Ali Marjaninejad, S.C. Raja, F.J. Valero-Cuevas | DARPA Electronics Resurgence Initiative (ERI) Summit. Detroit, MI, July 15-17, 2019.
4. Learning and Control in Bio-inspired Robots – Kanso Bioinspired Motion Lab, University of Southern California, Los Angeles, Ca. 2019
5. Experience-driven, Autonomous Learning for Robots – ICAROS Lab, University of Southern California, Los Angeles, Ca. 2019.
6. Principles and the future of Biomedical Signal Processing (BSP) – Amirkabir University of Technology, 2014.

Professional Experiences

- Research Assistant at Brain-Body Dynamics Lab: Exploring the neuromechanics of the hand and its representation in human cortex (2016 – present)
  - Finding sensory motor representations on human brain in EEG, ECoG, and Single Unit Activity (SUA) signals

- Showed that a linear mapping can efficiently describe the relationship between finger positions (joint angles) and signal power in different frequency bands of ECoG recordings
- Used Genetic Algorithm (GA) to find optimal tendon excursion values in a tendon-driven robotic limb (with unknown parameters) to follow a desired trajectory
- Addressed the long-standing problem of redundancy in the anthropomorphic neuromechanics using optimization and dimensional reduction approaches
- Developed the Neuromechanics toolbox in MATALB environment as a complementary toolbox for the book: Fundamentals of Neuromechanics
- Led two groups of interns in hardware and software development projects; resulted in peer-reviewed publications and raising research grant funding

- A.I. Residency offer from Google X (2019)
- Internship as a Data Scientist at Neural Analytics (Summer 2018)
  1. Worked on algorithms to improve the search speed and efficiency of the robotic brain scanner
  2. Designed machine learning protocols to enable robotic system to make data driven clinical decisions
- Trained in Computational Sensory Motor Neuroscience (CoSMo) and Health Data Exploration (HDE) summer schools (2017, 2018)
  - Received competitive, merit-based fellowships to attend each program
  - Trained to work with bigdata, neural data, and health related data by the most famous leaders of the field
- Research Assistant at Intelligent Signal and Data Processing Lab: Biological and Array Signal Processing (2012 – 2015)
  - Used SVM and Neural Network regressors to predict the direction of arrival of a sound wave to a microphone array system
  - Collected a database of microphone array recordings using Persian vocabulary and implemented a MATLAB toolbox that increased speech recognition ratio using beamforming; the project was later integrated successfully in industry
- Internship at the MRI section of the exclusive service provider for the General Electric Healthcare in Iran (Pishrafteh Co., 2011)
  - Contributed to both hardware and software Installation, repair, and maintenance
  - Mastered the general principles of physics of imaging modalities especially the MRI

Teaching Experiences

- Course Instructor
  1. *Electronics I Laboratory (at AUT)*
  2. *Electrical Circuits Laboratory (at AUT)*
  3. *Microprocessors Laboratory (at AUT)*
- *Teaching Assistantships*
  1. *BME/BKN 504 - Neuromuscular Systems (at USC) | Supervisor: Dr. Francisco Valero-Cuevas*
  2. *Digital Signal Processing (at AUT) | Supervisor: Dr. Farshad Almasganj*
  3. *Microprocessors (at AUT) | Supervisor: Dr. Farshad Almasganj*
  4. *Signals and Systems (at SUT) | Supervisor: Dr. Mousa Shamsi*
  5. *Bio-statistics (at AUT) | Supervisor: Dr. Mousa Shamsi*
- *Workshop Instructor*
  1. *Introduction to MATLAB (at SUT, AUT, and USC)*
  2. *Pspice Electronic Circuit Optimization & Simulation Software (SUT)*
  3. *Advanced MATLAB Courses (at SUT and AUT):*
     - *Neural Networks*
     - *Fuzzy Inference Systems*
     - *Genetic Algorithm*
     - *Digital Signal Processing*
     - *Digital Image Processing*
     - *Adaptive Neuro-fuzzy Inference Systems*
  4. *How to prepare an academic publication using Endnote and MS-Word (at AUT)*

Professional Skills

- *Programming Languages*
  - *MATLAB*
  - *Python*
  - *C*
  - *C++*
  - *VHDL*
  - *Assembly*
- *Other Engineering software packages*
  - *Pspice*
  - *ModelSim*
  - *CodeVision (AVR)*
  - *ATMEL Studio (AVR)*
  - *Chart (ADinstruments)*
  - *Protel*
  - *Xilinx ISE (FPGA)*
  - *Proteus*
- *General software packages*
  - *Microsoft Office (Word, Excel, PowerPoint)*
  - *Adobe Suite*
  - *Latex*
  - *Mendeley*

Professional Certificates

- Graduate Certificate in Health, Technology and Engineering from the Health, Technology, and Engineering Program (HTE) at USC, May 2019
- Data Scientist with Python accomplishment certificate, DataCamp (in progress)
- ISO 13485 Internal audit training certificate, Oxfordcert. Registration Number: TIA1331509010

Services and Memberships

- Assistant editor of Paladyn, Journal of Behavioral Robotics – De Gruyter
- President of the student branch of the Society for Brain Mapping & Therapeutics (SBMT) at USC (2018)
- Chairing the "Biorobotics and Biomechanics & Computational Systems & Synthetic Biology; Multiscale modeling " session at IEEE EMBC (2018)
- Vice president of the organizing committee for the Grodins conference (2018)
- Vice president of the Iranian Graduate Student Association (IGSA) at USC (2016)
- Editor of the Student Journal of Biomedical Engineering at Amirkabir University of Technology (2014)
- IEEE Student member
- Society for Neuroscience (SfN) student member
- American Society of Biomechanics (ASB) student member

Languages

- English (Fluent)
- Persian (Native)
- Turkish (Native)

References can be provided upon request