Vandad Davoodnia

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Vandad-Davoodnia Google Scholar Website

A Ph.D. graduate with 2 years of industry experience in machine learning and computer vision. 12+ years of professional programming experience and 3+ years of data science research experience with 14 publications and reviewer of 25+papers. Interested in deep learning, computer vision, graphics, game development, generative models, self-supervised learning, natural language processing, and virtual worlds and characters.

Technical Skills

Programming:	Python, C/C++, C#, Java, LISP, MATLAB, JavaScript, TypeScript, HTML, CSS, PHP
Libraries:	PyTorch, TensorFlow, ONNX, FastAPI, Gradio, Streamlit, Scikit-learn, OpenCV, SDL, GLUT, Raylib, GTK+, Arduino
Technologies:	Git+Github Actions, Gitlab+CI/CD, Docker, SLURM, Kubernetes, SQL, MongoDB
Graphics:	Unity 3D, Blender+API, Motion Builder+API, 3DsMax

Education

Queen's University **Kingston, Canada**
Ph.D. Candidate, Electrical and Computer Engineering (A^+) *Sept 2018 - June 2024*

- Dissertation: Estimating Human Pose from Pressure and Vision Data (Link)

Sharif University of Technology **Tehran, Iran**
B.Sc., Electrical Engineering - Bioelectronics (B^+) *Sept 2012 - June 2017*

Experience

ECE Department, Queen's University **Kingston, Canada**
Ph.D. Research Assistant *Sept 2018 - June 2024*

- **Multi-modal LLMs**
  Developed a pose-aware LLM for accurate body posture understanding using a synthetic dataset
- **Publication Record**
  Authored 5 papers on pose estimation from ambiguous pressure recordings using statistical machine learning, self-supervision, and generative models (CycleGAN, Pix2Pix), and domain adaptation
- **Collaborative Research on Diverse Applications**
  Co-authored 5 papers on supervised & semi-supervised EEG representation learning, the impact of e-textiles on drivers' experience, cancer prediction from medical features, and irony detection in tweets
- **Grant Acquisition & Industry Partnership**
  Secured $30,000 Mitacs internship grant supporting 8 months of research at Ubisoft Toronto Inc.
- **Vision Research Experience**
  Explored consistency regularization, self-supervised Learning, and differential rendering for 3D human pose, appearance, and body shape representation learning from monocular images
- **Cloud Infrastructure Management**
  Managed lab's GPU servers and cloud services, ensuring a secure and smooth user experience

Ubisoft Toronto Inc. **Toronto, ON, Canada**

Research and Development Programmer *May 2022 - Jan 2024*

- **End-to-end Markerless Motion Capture Development**
  Developed a markerless MoCap application for outdoor human animation capture to enable low-cost and portable prototyping using GoPro and iPhone cameras
- **Pushing State of the Art**
  Obtained competitive results compared to top industry competitors (*XSens*, *MoveAI*) while achieving top performance among academic models by 47% error reduction on out-of-distribution data
- **Academic Publications & Industrial Deployment**
  Published two papers on markerless MoCap methods (publications) and deployed the solution on proprietary servers using Docker, Gradio, FastAPI, and Kubernetes
- **3D Modeling & Synthetic Data Generation**
  Investigated synthetic data generation strategies (Blender, MoBu, Python) for training pose estimation models and developed a parametric 3D body model with blend shapes in PyTorch
- **Deep Generative Model Exploration**
  Explored generative models (VAE, VQ-VAE, GAN, Denoising Diffusion) for developing a pose embedding and facilitating human motion generation

Institute for Research in Fundamental Sciences (IPM), Brain Eng. Center **Tehran, Iran**

Neuroscience Research Scientist *Sept 2015 - July 2018*

- **Industrial Software Development**
  Developed a software for Blackrock Microsystems Inc. to enable synchronized video and multi-neuron recordings using `C++`, Qt, and OpenCV
- **Conventional Machine Learning for Publication**
  Developed a neuro-fuzzy model (ANFIS) and trained it for biomass behavior prediction using PSO
- **Mobile App Development for Publication**
  Developed Eye Speed app (iOS/Objective-`C`, Android/Java) for glaucoma diagnosis
- **Time-series and Statistical Analysis**
  Publication: Developed a novel response tuning method by analyzing neuron activity time series
  Research: Analyzed the relation between single-unit activity and local-field potential signals in primate visual cortex, honing signal processing and statistical analysis skills
- **Lab Setup & Experimental Control**
  Managed the lab's equipment and implemented a real-time experimental control software in MATLAB for the neuroscience study of primates
- **International Collaborative Research**
  Published 3 SFN abstracts with Dr. Gottlieb (Columbia University) and Dr. Alonso (SUNY)
- **Medical Image Analysis**
  Performed MRI segmentation and provided 3D visualizations for surgical decision-making using MATLAB

Contract Work **Tehran, Iran**

Software Developer *Oct 2012 - July 2018*

- **Computer Vision Robotics Development**
  Developed a robot and its interface for object and path tracking using OpenCV and `C++`
- **Industrial Software Development**
  Implemented software for simulating Iran's transit roads and rails network using Transcad/GISDK, facilitating analysis for engineers
- **Diverse Software Development Experience**
  Programmed over 20 games, apps, and simulation programs in `C`, `C++`, Java, MATLAB, and Python

Honors

- **Ranked 4th** in the nationwide university entrance exam (Concours) for B.Sc. admission among 500,000+ high school graduate examinees *2012*

Publications

Conferences

- **Davoodnia V.**, Ghorbani S., Carbonneau M. A., Messier A., Etemad A., "UPose3D: Uncertainty -Aware 3D Human Pose Estimation with Cross-View and Temporal Cues", *Under Review, Available on arXiv*, 2024
- Khorsandi P. M., Jones L., **Davoodnia V.**, Lampen T. J., Conrad A., Etemad A., Nabil S., "FabriCar: Enriching the User Experience of In-Car Media Interactions with Ubiquitous Vehicle Interiors using E-textile Sensors", *ACM DIS*, 2023
- **Davoodnia V.**, Etemad A., "Human Pose Estimation from Ambiguous Pressure Recordings with Spatio-temporal Masked Transformers", *IEEE ICASSP*, 2023
- **Davoodnia V.**, Ghorbani S., Etemad A., "In-bed Pressure-based Pose Estimation using Image Space Representation Learning", *IEEE ICASSP*, 2021
- **Davoodnia V.**, Etemad A., "Identity and Posture Recognition in Smart Beds with Deep Multitask Learning", *IEEE SMC*, 2019
- Sarkar P., **Davoodnia V.**, Etemad A., "Computer-Aided Diagnosis using Class-Weighted Deep Neural Networks", *IEEE ICMLA*, 2019

Journals

- **Davoodnia V.**, Ghorbani S., Messier A., Etemad A., "SkelFormer: Markerless 3D Pose and Shape Estimation using Skeletal Transformers", *Under Review, Available on arXiv*, 2024
- Zhang G., **Davoodnia V.**, Etemad A., "Parse: Pairwise alignment of representations in semi-supervised eeg learning for emotion recognition", *IEEE TAFFC*, 2022
- **Davoodnia V.**, Ghorbani S., Etemad A., "Estimating Pose from Pressure Data for Smart Beds with Deep Image-based Pose Estimators", *Springer APIN*, 2021
- **Davoodnia V.**, Slinowsky M., Etemad A., "Deep Multitask Learning for Pervasive BMI Estimation and Identity Recognition in Smart Beds", *Springer AIHC*, 2020
- Zhang G., Sepas-Moghaddam A., **Davoodnia V.**, Zhang Y., Etemad A., "Classification of Hand Movements from EEG using Attention-based LSTM", *IEEE Sensors Journal*, 2019
- Aghbashlo M., Tabatabaei M., Nadian M. H., **Davoodnia V.**, Soltanian S. "Prognostication of Lignocellulosic Biomass Pyrolysis Behavior using ANFIS Model Tuned by PSO Algorithm", *Fuel*, 2019
- Fayyaz Z., Bahadorian M., Doostmohammadi J., **Davoodnia V.**, Khodadadian S., Lashgari R., "Multifractal Detrended Fluctuation Analysis of Continuous Neural Time Series in Primate Visual Cortex", *Neuroscience Methods*, 2019
- Zhao, L., Sendek, C., **Davoodnia, V.**, Lashgari, R., Dul, MW., Zaidi, Q., Alonso, JM., "Effect of Age and Glaucoma on the Detection of Darks and Lights", *IOVS*, 2015

Reviewer

- NeurIPS, IEEE SMC, IEEE ICASSP, IEEE TAI, Springer APIN *2024*
- IEEE TAI, IEEE JBHI, Springer APIN, AAAI R2HCAI Workshop (**Best Reviewer Award**) *2023*
- IEEE Sensors Journal, Springer APIN, IEEE TAI *2022*
- ACII, Springer APIN *2021*
- IEEE TNSRE, IEEE CVPR, IEEE SMC, IEEE ICASSP *2020*
- IEEE Sensors Journal, ACM SAP, IEEE SMC *2019*

Teaching Assistant Roles

Computer Architecture, *Prof. Naraig Manjikian*, Queen's University *2019 & 2021 & 2022 & 2023*

- Graded exams and assisted in laboratory sessions with Assembly

Operating Systems, *Prof. Thomas Dean*, Queen's University *2020*
• Graded exams and assisted in laboratory sessions with C++

Artificial Intelligence and Interactive Systems, *Prof. Ali Etemad*, Queen's University *2018 & 2020*
• Graded exams and assisted in laboratory sessions with MATLAB and Python
• Developed course materials from "Artificial Intelligence - A Modern Approach" by Russell

Related Academic Courses

Machine Learning for Natural Language Processing, *Prof. Xiaodan Zhu* (Ph.D. A^+) *2019*
• Created an NLP model for detecting irony on Tweets, achieving 10% improvement over the top competitor

Biological Signal Analysis, *Prof. Evelyn Morin* (Ph.D. A^+) *2019*
• Developed an ML solution for predicting heavily loaded lifts from EMG signals with less than 100g error

Advanced Research Human-Computer Interactions, *Prof. Nick Graham* (Ph.D. A^-) *2018*
• Developed a hand movement tracking software using 3DsMax, Vicon MoCap, and Unity 3D

Wearable and IoT Computing, *Prof. Ali Etemad* (Ph.D. A^+) *2018*
• Developed a deep-learning model for user and posture detection in smart beds, resulting in a publication

Computational Intelligence, *Prof. Sepideh Hajipour* (B.Sc.) *2016*
• Implemented a neural network for BCI2003 competition using feature extraction and feature selection