Yalda Foroutan

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Research Interests

Deep Learning • Computer Vision

Education

Ph.D. | Engineering Science (ENSC)
Simon Fraser University | 2021 - Present

Ph.D. Taken Courses:
ENSC 813 - Deep Learning Systems
ENSC 801 - Linear System Theory
ENSC 802 - Stochastic Systems
ENSC 808 - Information Theory
ENSC 424 - Multimedia Communications
ENSC 895 - Digital Image Processing

M.Sc. | Electrical Engineering
University of Tehran | 2017 - 2020
Thesis: Control of Computer Mouse Using Hand Gesture Recognition

B.Sc. | Electrical Engineering (Control)
Amirkabir University of Technology (Tehran Polytechnic) | 2012 - 2017
Thesis: Driver's Consciousness Level Analysis Using EEG Signals

Online Courses on Coursera
Neural Networks and Deep Learning (Certificate)
Improving Deep Neural Networks (Certificate)
Structuring Machine Learning Projects (Certificate)
Convolutional Neural Networks (Certificate)
Convolutional Neural Networks in TensorFlow
Introduction to TensorFlow
Sequence Models
Machine Learning

Skills

Programming Languages
Expert: Python (PyTorch • TensorFlow• OpenCV)
Advanced: Bash • MATLAB • C/C++ • R • Julia

Languages
English: Academic IELTS (2021): 7.5/9
(Listening: 8.5, Reading: 8, Writing: 6.5, Speaking: 7)
Persian (Farsi): Native Speaker

Teaching Experience

at Simon Fraser University:
ENSC405 Capstone A (2 Consecutive Semesters)
ENSC204 Graphical Communication

at Neuromatch Academy:
Computational Neuroscience (Certificate)
Deep Learning (Certificate)

at University of Tehran:
Neural Networks and Deep Learning
Assignment and Project Design, TA Session Management
Electronic 1 (2 Consecutive Semesters)
Electronic 3

Awards and Honors

Talent Bursary from amii | 2023
Ph.D. Admission from University of Tehran | 2020
2nd Place in Iran Math. Olympiad PAYA | 2008
1st Place in Abadan Math. Olympiad | 2006
Exceptional Talent Recognition by NODET | 2005

Publication

Base Layer Efficiency in Scalable Human-Machine Coding
Yalda Foroutan, Alon Harell, Anderson de Andrade, Ivan V. Bajić
Accepted in *ICIP 2023*
The base layer used for machines is more compressible than the content required for human viewing. In state-of-the-art scalable human-machine image codec, the base layer for obj. detection and instance seg. is improved by 20-40% in BD-Rate.

Rate-Distortion Theory in Coding for Machines and its Applications
Alon Harell, Yalda Foroutan, Nilesh Ahuja, Parual Datt, Bhavya Kanzariya, Srinivasa Somayaulu, Omesh Ticko, Anderson de Andrade, Ivan V. Bajić
Submitted in *TPAMI 2023* [arXiv]
In collaborative intelligence, the AI-based sub-model is executed on the edge device while remaining model runs on the cloud. We compare rate-distortion performance of multiple cut (where the model is split) and distillation (where the loss function is calculated) points and extend the rate-distortion theory for machines.

VVC+M: Plug and Play Scalable Image Coding for Humans and Machines
Alon Harell, Yalda Foroutan, Ivan V. Bajić
Accepted by *ICME 2023* [arXiv]
Using the efficient base layer to improve human viewing is challenging. A preview image is generated form the base layer using a synthesis model. The difference between the input and the preview images is then compressed using VVC.

Conditional and Residual Methods in Scalable Coding for Humans and Machines
Anderson de Andrade, Alon Harell, Yalda Foroutan, Ivan V. Bajić
Accepted by *ICME 2023* [arXiv]

Control of Computer Pointer Using Hand Gesture Recognition in Motion Pictures
Yalda Foroutan, Ahmad Kalhor, Saeid Mohammadi Nejati, Samad Sheikhaei
[arXiv] We present a hand gesture detection system for mouse control, leveraging a collected dataset of 6720 gestures. Deep models are utilized to develop the system.

Research Experience

Research Assistant at Simon Fraser University | Feb 2022 - Apr 2023
SFU Multimedia Laboratory, Supv. Ivan V. Bajić
I worked on scalable image codecs for both humans and machines and focused on enhancing the efficiency of base and enhancement layers. I gained advanced proficiency in PyTorch and made significant contributions to four research papers.

Research Assistant at University of Tehran | 2018 - 2020
Advanced Circuits for Data Communication Laboratory, Supv. Samad Sheikhaei

Selected Projects

Project of ENSC 813 - Deep Learning
Finding the Minimum Bitrates for a Computer Vision Task (Python)

Project of ENSC 424 - Multimedia Communication
Evaluating the Efficiency and Limitations of CANF-VC (Python)
Evaluating the state-of-the-art learnable video compression technique, Improving performance for shot transitions, motion information, and reference frames

Seminar of ENSC 808 - Information Theory
Presentation and Proving Equations of Information Bottleneck Paper

Project of ENSC 895 - Digital Image Processing
Breast Cancer Segmentation (MATLAB)

Other Python Projects
Design of a CNN Classifier for Fashion MNIST Dataset
Implementation of RNN for Stock Market Prediction
Text Generation Based on Shakespeare's Book with RNN Networks
DCGAN, WGAN, ACGAN Implementations
Face Filters: Changing Eye Color, Eye Size, and Putting 3D Sunglasses
Enhancing Low-Light Images and Increasing Image Resolution using GANs