Alex Ho

Curriculum Vitae
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RESEARCH INTEREST

Inverse Problem, Computational Geophysics, Machine learning, Data Science

EDUCATION

UNIVERSITY OF CALIFORNIA MERCED | Doctoral of Philosophy in Applied Mathematics
Aug 2019 – Present | Merced, California

UNIVERSITY OF CALIFORNIA MERCED | Bachelor of Science in Applied Mathematics
Aug 2015 – Dec 2018 | Merced, California

PROFESSIONAL EXPERIENCE

COMPUTATIONAL ENGINEERING DIVISION (CED) INTERN | Lawrence Livermore National Laboratory
Dr. Brenden Petersen and Jacob Pettit | LLNL Mentor
May 2023 - Sep 2023 | Livermore, California

- Developed an algorithm for and experimented with the decision tree task in DisCo-DSO project, a continuation of Deep Symbolic Regression (DSO). Responsible for carrying out ablation studies using Maestro Workflow on Pascal HPC.

DATA SCIENCE SUMMER INSTITUTE (DSSI) INTERN | Lawrence Livermore National Laboratory
Dr. Bhavya Kailkhura | LLNL Mentor
May 2021 - Aug 2021 | Livermore, California

- Developed a Bayesian optimization model for adversarial machine learning. Deployed digital and real-life adversarial attacks on state-of-the-art object detector YOLOv5 using procedural noise. [Github]

COMPUTATIONAL ENGINEERING DIVISION (CED) INTERN | Lawrence Livermore National Laboratory
Dr. Brenda Ng | LLNL Mentor
May 2020 - Aug 2020 | Livermore, California

- Developed an Actor-Critics Model with Reinforcement Learning and Deep Learning framework for cyber security data. Developed visual assistance for the training processes of the network in order to effectively monitor the training process.

AUTONOMY TECHNOLOGY RESEARCH (ATR) CENTER INTERN | Air Force Research Laboratory
Edmund Zelnio | ATRC Mentor
May 2019 – Aug 2019 | Dayton, Ohio

- Explored and implemented deep learning architectures for solving Air Force problems in the field of remote sensing and autonomy technologies. Fine-tuned hyperparameters of neural network architectures such as DenseNet, ResNet, GoogLeNet, and CycleGan. Utilized transfer learning for accuracy improvement.

STUDENT RESEARCHER | University of California Merced
Dr. Roummel Marcia | Research Advisor
May 2018 – Jan 2019 | Merced, California

- Developed machine learning methods based on stacked autoencoders for separating images that have been superimposed at the detection stage. Implemented approach in PyTorch and tested on the customized superimposed MNIST dataset. Investigated different loss functions to improve performance.

UNDERGRADUATE RESEARCH ASSISTANT | Mechatronics, Embedded Systems and Automation Lab
Dr. YangQuan Chen | Research Advisor
May 2017 – Aug 2017 | Merced, California

- Integrated QGroundControl(QGC) and Camera Streaming Daemon to increase flight stability and decrease streaming latency. Responsible for modifying Microsoft Kinects and learning python and C++.

PROJECTS

DISCO-DSO: COUPLING DISCRETE AND CONTINUOUS OPTIMIZATION FOR EFFICIENT GENERATIVE DESIGN IN HYBRID SPACES | Python | Reinforcement Learning
Explored the challenges of optimizing within hybrid discrete-continuous spaces, a problem that arises in various important applications, such as symbolic regression and decision tree learning. This utilizes the concept of risk-seeking policy gradient in generative models that produce a novel hybrid design of discrete and continuous variables.

DATA-DRIVEN EDDY DIFFUSION COEFFICIENT ESTIMATION IN MARINE LAKES | Python | Inverse Problem
Developed a PDE-constrained optimization model to solve for diffusion coefficient induced by turbulent motion using the finite element method. This is a combination of optimal control and inverse problem. Techniques used and studied include the adjoint method, regularized optimization, and sensitivity analysis.

LIGHT-PROJECTION ADVERSARIAL ATTACK WITH BAYESIAN OPTIMIZATION | Python | Deep Learning
Developed a Bayesian optimization based model to deploy adversarial attack on object detector YOLOv5 using light projectors. Utilized procedural noise generator as the source of adversarial attack. [Github]

IMAGE DENOISING USING RECURRENT NEURAL NETWORK WITH LIMITED DATA | Python | Deep Learning
This project, in collaboration with Applied Math professor at UC Merced, is to denoising images by simply using the structure of the network.

ELECTROENCEPHALOGRAM (EEG) CLASSIFICATION WITH DEEP NEURAL NETWORK | Python | Deep Learning
This project, in collaboration with the Cognitive Science department of UC Merced, is to process EEG data and perform classification using Deep Learning Algorithms.

IMAGE DISAMBIGUATION WITH DEEP NEURAL NETWORK | Python | Deep Learning
Customized Stacked Autoencoders using PyTorch neural network module. Generated training and testing datasets using EMNIST dataset. Loss functions and optimizers were compared for better performance during the training process.

QGROUNDCONTROL(QGC) CAMERA STREAMING DAEMON STREAMS | C++
This project is a drone competition project. C++ and Python courses were offered to help new research assistants learn the basics of coding.

PUBLICATIONS

Alex Ho , J. Alvarez, R. Marcia, "Image Denoising using Recurrent Neural Network with Limited Data", 55th Asilomar Conference on Signals, Systems, and Computers, 2021

O. DeGuchy, Alex Ho and R. Marcia, "Image Disambiguation with Deep Neural Networks", Applications of Machine Learning, SPIE Optical Engineering + Applications, 2019

TEACHINGS

TEACHING ASSISTANT | University of California Merced
Dr. Alexander Yatskar | Instructor of Record
Sep 2022 – Dec 2022 | Merced, California

- Responsible for facilitating student discussion and providing sections of supplementary lecture materials for Probability and Statistics.

TEACHING ASSISTANT | University of California Merced
Dr. Tommaso Buvoli | Instructor of Record
Sep 2019 – May 2020 | Merced, California

- Responsible for facilitating student discussion and providing sections of supplementary lecture materials for Calculus II.

AWARDS

2023 National Science Foundation (NSF) Research and Training Grant (RTG) Fellowship
2022 National Science Foundation (NSF) Research and Training Grant (RTG) Fellowship
2021 NSF Research Traineeship (NRT) Intelligent Adaptive Systems (IAS) Fellowship Program
2020 NSF Research Traineeship (NRT) Intelligent Adaptive Systems (IAS) Fellowship Program
2019 NSF Research Traineeship (NRT) Intelligent Adaptive Systems (IAS) Fellowship Program

PROFESSIONAL PRESENTATIONS

2023

Multi-Data Optimization with Variational Inverse Problem
Energy and Environment Seminar | Merced, California

2022

Data-Driven Eddy Diffusion Estimation in Marine Lakes
Energy and Environment Seminar | Merced, California

Turbulent Eddy Diffusion Estimation with PDE-Constrained Optimization
Energy and Environment Seminar | Merced, California

2021

Data-Driven Image Augmentation
DSSI Seminar | Livermore, California

A Deep Learning Approach for Computing Curvature in Level-Set Methods
Optimization Seminar | Merced, California

2020

Derivation of Recurrent Neural Network using Ordinary Differential Equation
Lawrence Livermore National Laboratory | Livermore, California

Image Denoising using Limited Data
Lawrence Livermore National Laboratory | Livermore, California

Deep Recurrent Neural Network Denoising using Prior Distribution
Optimization Seminar | Merced, California

2019

Image Disambiguation with Deep Neural Networks
SPIE Optical Engineering + Applications | San Diego, California

Stacked Autoencoder and Image Processing
SIAM UC Merced Chapter SAMPLe | Merced, California

Image Disambiguation with Deep Neural Networks
Optimization Seminar | Merced, California

SKILLS

CODING
Proficient:
Python • Pytorch • Tensorflow • FEniCs • MATLAB • Bash
Familiar/Studying:
R • C++

IDE'S / TEXT EDITORS
Emacs • VS Code • Vim • Jupyter Notebook • Atom

SPOKEN & WRITTEN
Fluency:
English • Mandarin
Conversational:
Hokkien

SOFTWARE / VERSION CONTROL
Terminal • Git