Arjun **Rana**

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Summary

A PhD physicist with experience in high performance computing, algorithm design and numerical simulation. Research background in imaging with a strong foundation in optimization and linear algebra. Highly motivated to build and operationalize machine learning pipelines that generate vital business insight and drive decision making.

Education

Ph.D., Physics — *Los Angeles, CA*

University of California, Los Angeles — *April 2021*

B.S., Physics/Economics — *New Brunswick, NJ*

Rutgers University — *May 2011*

Technical Skills

General	optimization, quantitative analysis, high performance computing (HPC), machine learning, data management, visualization
Languages	Python, Matlab, C++
Systems/Packages	Linux/bash, TensorFlow, Keras, scikit-learn, SciPy, NumPy, Pandas, Docker, Git, Google Cloud Platform (GCP), Jupyter, Matplotlib, Globus, ParaView, Blender, SolidWorks

Experience

PhD Researcher

Dept. of Physics & Astronomy, UCLA — *09/2015-04/2021*

- Advanced the understanding of magnetic nanomaterials through computational reconstruction of 3D experimental data
  - Led a multidisciplinary team through 2 intensive experiments at a national x-ray imaging facility
  - Designed a parallel 3D reconstruction algorithm to probe magnetism in structured materials and deployed it on the UCLA HPC to analyze experimental data (`Matlab, HPC`)
- Extended the capability of computational imaging by creating reconstruction algorithm that can utilize broadband light sources
  - Devised a novel, GPU-acclerated algorithm with regularization techniques to remove aberrations induced by broadband light sources (`Matlab, HPC`)
  - Designed and built a tabletop broadband light diffraction experiment to provide benchmark data for reconstruction algorithms (`Matlab, Labview, SolidWorks, C++`)
- Presented research findings to peers and executive faculty at National Science Foundation (NSF) meetings
- Redesigned software pipeline for capture and analysis of optical light diffraction data, improving reliability and ease of use
- Negotiated large (10+Tb) parallel data transfers between national lab and university HPCs (`Globus, GridFTP`)
- Designed and fabricated a holder for cryogenic transport of transmission electron microscope samples (`SolidWorks, 3d printing`)
- Communicated scientific and technical concepts to undergraduate students while teaching a physics lab course at UCLA
- Managed a group of fellow graduate students as the lead teaching assistant for an undergraduate physics course

Projects

HoneyNet (arjunrana.com/projects/honeynet)

TensorFlow, Keras, GCP, C++

- Implemented a regularized Generative Adversarial Network (GAN) to synthesize photorealistic images from a small training dataset
- Deployed a model on Google Compute Engine and accelerated training with GPU (`TensorFlow, Keras, GCP`)
- Utilized transfer learning and iterative data augmentation scheme to improve generator output
- Automated data pre-processing with facial-recognition CNN (`dlib, C++`)

MMA Gym Analysis (TBA)

Pandas, scikit-learn, Jupyter, Matplotlib

- A data-driven assessment of amateur mixed martial arts (MMA) gyms across California
- Generated and processed a dataframe of MMA bouts from scraped data (`Pandas`)
- Scraped thousands of datapoints from amateur MMA athletic commission website (`Pandas, BeautifulSoup`)
- Extracted features from raw data to assess overall gym quality
- Performed agglomerative text clustering to get accurate gym-wise statistics (`scikit-learn, jellyfish)`
- Conveyed novel insight about gym quality through visualization (`Matplotlib, folium, Google Maps API`)