Max Ruby

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EXPERIENCE

Omnisight Inc., Arlington, Texas

Image Scientist May 2023 - Current

- Trained Neural Networks, including a YOLOv8, for detection and classification of vehicles.
- Removed image artifacts and incorrect labels from training data for Omnisight's Video Analytics, increasing the mAP by 21%.
- Designed and implemented algorithms for Image Stitching based on OpenCV, improving its success rate over OpenCV's default algorithm by 553%.
- Wrote multimodal fusion code for classification of vehicles with radar and camera data.
- Developed a parking lot detection program, with an accuracy over 95%.

Sabbatical, Rochester, New York

Independent Researcher August 2022 - April 2023

- Designed and tested inexpensive tools for detection of AI-generated artwork based on traditional Image Science methods.
- Built a Flask App for image forensics, called Ruby's Image Forensics Toolkit (RIFT).

L3Harris Technologies Inc, Rochester, New York

Senior Associate, Image Science Engineering May 2020 - July 2022

- Trained, optimized, and containerized binary classifiers, including a ResNet and a VGG, with AUROCs exceeding 0.99.
- Presented and documented recent findings on Adversarial Attacks on Neural Networks.
- Implemented and tested Multimodal Neural Networks based on recent research using a combination of Image Processing and Natural Language Processing techniques.
- Generated a dataset of synthetic images using Blender, then trained multiclass classifiers on that dataset.
- Developed and trained a novel CNN architecture for heat-map based vehicle tracking.

Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee

ASTRO Participant at Oak Ridge National Laboratory June 2019 - August 2019

- Developed, and published a paper describing, the Mertens-Unrolled Network (MU-Net), a novel CNN/GAN written in Python with Keras and Tensorflow.
- Integrated the MU-Net into an imaging pipeline for face recognition, increasing the AUROC by 8.9% over prior methods of HDR fusion.
- Improved Image Processing algorithms in the imaging pipeline, including fine registration.
- Wrangled training data for the MU-Net with conventional Image Processing algorithms.
- Set up an imaging system with a diverse team, sharing code using Git.

EDUCATION

Master of Science, Mathematics (GPA: 3.51) May 2020
Purdue University, West Lafayette, IN.

Bachelor of Science, Mathematics, *Departmental Honors Award in Mathematics, Summa Cum Laude* (GPA: 3.92) May 2014
Oklahoma State University, Stillwater, OK.

TECHNICAL SKILLS

Languages: Python, C, C#, C++.
AI frameworks: Keras, Tensorflow, PyTorch.
Other Tools and Packages: Numpy, OpenCV, Matplotlib, CUDA, Docker, Pandas, Flask.
Operating Systems: Linux, Windows.
Areas of Research: Machine Learning, GANs, CNNs, Applied Mathematics, Computer Vision, Image Forensics.

PUBLICATIONS

Max Ruby, David S. Bolme, Joel Brogan, David Cornett III, Baldemar Delgado, Gavin Jager, Christi Johnson, Jose Martinez-Mendoza, Hector Santos-Villalobos, Nisha Srinivas, "The Mertens Unrolled Network (MU-Net): A High Dynamic Range Fusion Neural Network for Through the Windshield Driver Recognition," *SPIE Autonomous Systems: Sensors, Processing and Security for Vehicles & Infrastructure*, 2020.

D. Hye Ye, G. T. Buzzard, M. Ruby, C. A. Bouman, "Deep Back Projection for Sparse-View CT Reconstruction," *GlobalSIP*, 2018.