Jonathan Stokes

stokesj84@gmail.com ● 215-207-1143 ● Oakland, CA ● https://sophist0.github.io/ ● https://github.com/sophist0

Profile

I have a PhD. in Electrical Engineering from Drexel University. My research was in graph sampling which gave me experience in software engineering, applied math, and the fundamentals of machine learning. Most of my programming experience is in Python, however I have also worked in several other languages. I have worked on both research projects and production projects. I thrive off the ability to work in a collaborative environment with technically strong peers where I can get feedback on my work and whiteboard ideas. I believe I do my best work in the processes of learning new skills and look forward to new challenges.

Education

PhD. of Electrical Engineering — **Drexel University**; Philadelphia, PA
Advisor: Steven Weber — Graduation: December 2018 | GPA: 3.7/4.0

Masters of Science in Electrical Engineering — **Drexel University**; Philadelphia, PA
Advisor: Steven Weber & Mark Hempstead — Graduation: December 2015 | GPA: 3.7/4.0

Bachelors of Science in Electrical Engineering — **University of Rhode Island**; Kingston, RI
Graduation: May 2012 | GPA: 3.8/4.0

Experience

AI Software Development Engineer: Intel - Phoenix AZ (Remote) — January 2022 - March 2024

Project: Automatic Homography estimation.

- Realized that object detection algorithms can be used to select calibration points for Homography estimation.
- Showed that this technique is effective even when there is a large angular shift between image planes, a scenario where visual feature point based methods struggle.
- Filed an Innovation Disclosure Forum with Intel and I am currently resubmitting with additional details.

Project: Host generative AI Jupyter notebooks in the cloud.

- Determined the system requirements to run several stable diffusion models and LLM's on a server.
- Created a custom Jupyter notebook kernel to run the LLM's including LLama2.
- Tested that the notebooks functioned as expected in the cloud environment.

Project: Track object location given a moving RGB camera.

- Realized that the Homography transform has been used by self driving cars to estimate object location without recomputing the transform for each pose.
- Used the synthetic SPEAR dataset and Unreal engine to test an algorithm based on this realization.
- Wrote the code to create an occupancy grid and determine the accuracy of the object location estimates.

Project: Benchmark ML models on baremetal and in a virtual machine.

- Wrote scripts to automate OpenVINO model benchmarking using psutil and the OpenVINO benchmark_app.
- Ran the each ML model 10 times on baremetal and in the virtual machine to generate the benchmark results.
- Parsed and plotted the results, allowing stake holders to understand the performance cost of running a model in a virtual machine.

Project: Optimized an object tracker.

- Wrote a framework to tune a Kalman filter based tracker using the Bayesian Expected Improvement algorithm.
- Modified the Expected Improvement algorithm to avoid resampling points in the parameter space.
- Showed that the resulting optimization algorithm could achieve better results than random sampling.

Project: Testing video object tracking.

- Created an object tracking ground truth dataset, generating video and location information in the Unity engine.
- Wrote a framework in Python to calculate object tracking metrics relative to the ground truth dataset.

- Used the results from the testing framework to make recommendations regarding improving the object detection and tracking algorithms.

Senior Software Engineer: General Dynamics - Groton CT January 2021 - December 2021

Project: Estimating construction times.

- Collected and cleaned the data stored on various databases.
- Fit Gaussian process regression models to the data using Pytorch and using Bayesian optimization.
- Experimented with applying Reinforcement Learning to select a construction process using Stable-Baselines implementations of DQN, and A2C.

Project: Classifying documents.

- Collected and cleaned the data stored on various databases.
- Used a bag of words model combined with a gradient boosting model solve a binary classification problem with 95% accuracy.
- Used Pytorch implementation of an LSTM module to solve the same binary document classification problem with over 95% accuracy.

Software Engineer (Contract): Centrly - San Diego CA January 2020 - April 2020

Project: Designing and testing web scrapers.

- Created several web scrapers using Python, Selenium, Azure, and AWS to collect business intelligence data.
- Required correctly scoping various projects, designing web scrapers, implemented and tested scrapers with regard to initial objectives.

Student and Research Assistant: Drexel University - Philadelphia PA September 2013 - September 2018

Project: Estimate the expected cost of star sampling to find a target node in a large graph.

- Estimated the expected unit and linear cost to find a target node in Erdős Rényi (ER) graphs under three types of star sampling: Star sampling with replacement (SS-R), Star sampling with center removal (SS-C), Star sampling with star removal (SS-S).
- Proved asymptotically in the size of the graph the probability of finding a target node on a given sample under the three variants of star sampling is approximately equivalent.
- Coded the simulations showing the estimates of the expected unit and linear cost of using star sampling to find a target node are accurate on ER graphs and can be accurate on real-world graphs.

Project: Estimate the expected steps for a biased random walk in a large graph to find a maximum degree node.

- Developed a Self Avoiding Walk Jump (SAWJ) algorithm to search large graphs for maximum degree nodes.
- Modeled a rough upper bound on the expected number of steps required by SAWJ to find a maximum degree node using a discrete time Markov chain model which is shown to be accurate if the joint degree distribution of the graph is known.
- Coded the simulations showing that SAWJ outperformed competing algorithms in the literature on degree assortative ER graphs and some degree assortative real-world graphs.

Key Papers

Journal of Internet Mathematics: "*Graph search via sampling with and without replacement*" (2020)

IPL: "*Common greedy wiring and rewiring heuristics do no guarantee maximum assortative of given degree*" (2018)

KDD Workshop MLG: "*Star Sampling with and without Replacement*" (2017)

IEEE BigData: "*The Self-Avoiding Walk-Jump (SAWJ) Algorithm for Finding Maximum Degree Nodes in Large Graphs*" (2016)

Experience Using

Artificial Neural Networks
Deep Reinforcement Learning
Gaussian Processes
Graph Theory

K-Nearest Neighbor
Linear Regression
Markov Chains Models
Naive Bayes

Principle Component Analysis
Reinforcement Learning
Long Short-Term Memory Models
Support Vector Machines

Academic Background - Interests

Artificial Intelligence
Algorithm Design
Detection & Estimation

Graph Theory
Information Theory
Machine Learning

Optimization
Applied Probability
Stochastic Processes