Jacob Oaks

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EDUCATION

University of Pittsburgh
Dec 2021

BS: Computer Science
GPA: 3.81
Courses: Computer Graphics, OS, Algorithms, Formal Methods, Web Programming, Machine Learning, Data Science, Systems Software, Assembly Language and Computer Organization, Data Structures, Software QA
Dean's Honor List
Honors College

SKILLS

Proficient: Python, Java
Familiar: C/C++, JavaScript, HTML, CSS, SQL, GLSL, Swift, Visual Basic
Python Libraries: PyTorch, NumPy, Pandas, Matplotlib, Flask
Other Libraries: OpenGL, Junit, React
Tools: Git, Docker, Jupyter, Bash

EXPERIENCE

Associate Software Developer
Jan 2022 – Present

Carnegie Mellon University Software Engineering Institute

- **Knowing When You Don't Know (Uncertainty Quantification)**
  - Extended detectron2-based codebase for training probabilistic object detection models on arbitrary data.
  - Used codebase to evaluate probabilistic object detection techniques from recent literature on both canonical and practical datasets, according to a variety of relevant metrics.
  - Experimented with methods of conveying uncertainty in easily digestible forms given trained probabilistic object detector outputs.

Emerging Technology Center Intern
Jan 2020 – Dec 2021

Carnegie Mellon University Software Engineering Institute

- **Knowing When You Don't Know (Uncertainty Quantification)**
  - Developed an experimental framework for evaluating calibration of image classification models.
    - User-specified configuration files are corresponded to experiments which could contain any number of training, calibration, and evaluation runs, with any number of hyperparameter combinations.
    - Metric outputs from evaluation are automatically collated and used to produce visualizations and tables to aid in analyzing experimental results.
    - An artifact repository with hash-based check-in/check-out system reduces duplicate work within a team.
  - Used the experimental framework to run an extensive empirical evaluation of many calibration methods on many models and datasets, using various versions of our novel proposed metric, Generalized Expected Calibration Error.
    - Research paper accepted at ICLR Evaluation Standards Workshop 2022, under review for ICML 2022.

- **A Series of Unlikely Events (Inverse Reinforcement Learning)**
  - Created an interactive web demo showcasing our maximum causal entropy inverse reinforcement learning model (MCEIRL) trained on AIS ship data.
    - The demo explains some mechanics of the MCEIRL model and its capabilities and was used to show project progress and introduce the concept to interested parties.
    - The demo was deployed online: https://resources.sei.cmu.edu/downloads/IRL-demo/

- o Developed an environment to simulate the state and action space of ships, used to investigate noise injection techniques for imitation learning over continuous spaces.
- o Performed extensive empirical analysis of the AIS ship data using tools like Pandas and Matplotlib.

PERSONAL PROJECTS

Spacedust
Feb 2021 – May 2021

https://github.com/JacobOaks/spacedust
https://www.youtube.com/watch?v=bRZ01woRtTQ

- Android spaceship battle game built on top of OpenGL ES, a subset of OpenGL meant for mobile and embedded systems.
- Spaceship is controlled using two custom implemented joysticks. All textures and animations, shaders/lighting calculations, simple physics, and UI elements are custom as well.

Ambulare
Feb 2021 – May 2021

https://github.com/JacobOaks/ambulare
https://www.youtube.com/watch?v=2CYq9vNzst4&t=3s

- Side-scrolling game engine built upon the light-weight java game library (LWJGL).
- Contains all custom components such as: textures, animations, a basic physics engine, shader programs, lighting systems, menus and user interface design, and a sound system using OpenAL.
- Uses a custom serialization format and a data loading process that provides precise and easy-to-understand failure messages to support players creating their own content ("stories").

GeoArt
Mar 2019

https://github.com/JacobOaks/steelhacks19

- Created an iOS app in Swift for Steelhacks 2019 that generates pieces of artwork derived from the unique latitude/longitude location of the device.
- Artwork generated for two locations will resemble each other semi-proportional to how close the locations are.
- The project won second place in the hackathon.