ZACH LOFQUIST
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EDUCATION

California Polytechnic State University, San Luis Obispo 2022 | GPA: 3.6

Bachelor of Science in Computer Science and Aerospace Engineering

- CPAMP Leadership Program: Served as a mentor for first year aerospace engineering students
- Summer study abroad at Chiang Mai University, Chiang Mai Thailand

PROJECTS

Spacecraft Design

- Worked in a team of 70+ to design a spacecraft to meet customer solicitation. Developed spacecraft system to reach and identify interstellar objects akin to 1I/'Oumuamua and 2I/Borisov
- Developed model for determining apparent magnitude of incoming interstellar object. Created image processing algorithm for centroid finding on interstellar object used for ephemeris updating.
- Implemented image pre-processing, edge detection and ellipse fitting methods to accurately determine center as necessitated by optical and autonomous navigation

Faster R-CNN Object Detector

- Labeled images with Pascal VOC format to identify frogs within images and create labeled dataset for training neural network.
- Created a neural network via transfer learning. Used a base model of MobileNetV2 for object detection. Added trainable layers on top. Trained network to identify frogs.
- Utilized OpenCV selective search segmentation to acquire proposed bounding boxes
- Iterated through proposed bounding boxes, performing non-maximum suppression and intersection over union calculation to filter predictions, resulting in a single bounding box for each frog in the image

Autonomous Car with Integrated Sensor System

- Integrated a sensor system to determine distance between car and objects around vehicle.
- Implemented C++ software to communicate between servos, sensors, and motors. Applied a Kalman filter on the recorded sensor data to remove noise and thus accurately determine distances to external obstacles
- Used derived environment knowledge to determine speed and path of vehicle for obstacle avoidance

Genealogy Extractor from Text

- Created program to take in a name from the command line and return a genealogy
- Scraped web sources to find text. Parsed text to perform named entity recognition, filtering out sentences that do not include people. Scanned through filtered text using regular expressions to check for relations.
- Additionally used synsets and nltk part of speech tagging to iterate through the filtered text to extract familial relations and outputted a GEDCOM format family tree as well as a visual representation

Simply Rented Web App

- Developed a full stack web application using React, Express.js and Atlas database following Agile practices.
- Set up continuous integration/deployment and checked builds using test suite created through test driven development
- Features implemented include account creation and login, item posting and editing, item search, and renting items among others.

Cancer Detection in Tissue Images

- Utilized a labeled dataset of human tissue images. Cropped and centered dataset for standardization, then performed data augmentation before splitting into training, testing and validation sets
- Built Convolutional Neural Network. Methods included 2D convolution, ReLU activation, 2D Max Pooling, and SoftMax activation. Flattening layers and dense layers also used.
- Trained network was able to accurately label 87% of test images

Virtual Reality Labyrinth

- Built virtual reality game in Unity Game Engine using C# for the HTC Vive headset.
- Modeled custom game assets using Blender, designed and developed Labyrinth, stylized with lighting and particle effects, within which player works to reach the end.
- Implemented game mechanics including patrolling enemies, bow and arrow combat against enemies, and teleportation for movement

Object Tracking

- Developed an application to detect and track a colored ball in a video using OpenCV
- Utilized a gaussian blur and circle detection method to identify the ball within each frame of the video.
- Implemented function to calculate the 2D projection of a 3D point. Used this to draw a 3D bounding box around each ball that appears in the image
- Successfully tracked balls' x, y, and z coordinates as they moved through space

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EXPERIENCE

Smart Information Flow Technologies 2022-Present

Associate Researcher

- Contributed to multiple research projects across several disciplines.
- Created procedural generation tool for modeling flight landscapes including customizable obstacles enabling rapid testing of A.I. navigation route planning and focused targeting of areas of improvement
- Developed decentralized drone swarm simulation, modeling drone flight, swarm mechanics and communications between drones. Applied further swarm restrictions via communication requirements upon signal-to-noise ratio, bandwidth, and channel capacity.
- Analyzed binary of compiled C code to debug and correct program designed to identify the library used in compilation. Identified and corrected error in program analysis of relocations made by the linker. Created bash scripts to test and evaluate the program's effectiveness in identifying library symbols and library via comparison to object files.
- Implemented simulation for flight of fixed-wing aircraft within a swarm. Enabled the issuing of commands to fixed-wing craft, dictating target altitude, heading, and velocity. Created second order dynamic response to commands modeling forces including lift, thrust, and drag.

Cygnet Aerospace 2021-2022

Aerospace Machinist

- Setup, validate and run product using CNC lathes and mills, inspecting raw material before operation
- Operate multiple types of machine tools and performs progressive machining operations to completion, creating tooling components and assemblies with close tolerances or high finish requirements.
- Inspect components for quality and assemble manufactured components into finished products to be delivered to customers