

# YANALL BOUTROS

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Yanall-Boutros.github.io

Baltimore, MD

## EDUCATION

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**University of California, Santa Cruz [UCSC]**

September 2016 - August 2020

*Bachelor of Science (B.Sc.) Physics, B.Sc. Computer Science*

*Santa Cruz, CA*

- Electives: Advanced Programming, AI, Computational Physics, Quantum Computing; GPAs: 3.40/4.00

## TECHNICAL STRENGTHS

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**Languages:** Python, C/C++, C#, Bash, Powershell, Tex, HTML, NodeJS, Haskell, Perl, Nix

**Frameworks:** TensorFlow, PyTorch, Scikit-HEP, Bootstrap, JQuery, Numpy, Matplotlib, Pandas, Unreal Engine

**Infrastructure:** GNU/Linux, Unix, Windows, PostgreSQL, Kafka, Docker, Podman, Git, Jira, Ansible, NixOS

**Mathematics:** Scientific Communication, Modeling, Statistics, Artificial Intelligence, Simulations

**Data Science:** Natural Language Processing [NLP], Data Analysis, Data Validation, Research, Debugging, Testing

**InfoSec:** Metasploit, Burp Suite, OWASP Zap, Nmap, Shodan, Maltego, Snrk, Wireshark

## EXPERIENCE

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**DCS Corp**

October 2021 - June 2024

*T1 Computer Engineer II ← T1 Software Engineer I*

*Aberdeen, MD*

- Exceeded Expectations in AI and Data Engineering Tasks for Army Research Lab [ARL], Human Research and Engineering Directorate [HRED], Humans in Complex Systems [HCxS], Information for Mixed Squads [INFORMS] Lab, by delivering four times more projects than requested, measured by my performance reviews
- Achieved 70% accuracy in associating bio/physio data with firing events, by downsampling signals and statistical features as inputs to a TensorFlow EEG Net Feed Forward Binary Classifier, measured by confusion matrix in validation testing
- Achieved realtime Computer Vision [CV] classification and Speech-To-Text [STT] by multiprocessing AI Data Pipelines in Python, measured by publishing inferences within a 1 second polling rate
- Achieved 70% average True-Positive object detection classification by synthesizing initial training set of image mask pairs, then training a Region-based Convolutional Neural Network [RCNN] CV agent
- Scaled CV Classifier's prior initial training dataset 100× by rendering post-processed scenes in Unreal Engine, measured by comparing the number of unique samples in the previous dataset
- Improved average True-Positive accuracy 5% in 2 weeks by automatically detecting, masking, and augmenting new target classes, generating 2× more data in those 2 weeks
- Plotted model performance as function of distance, orientation, terrain in Python, Numpy, Matplotlib
- Orchestrated deployment of docker/podman containers by writing unit file templates, systemd services, and Ansible Playbooks
- Achieved 10% improvement of STT/Automatic Speech Recognition [ASR] Pipeline, by switching to a transformer based model, measured by Word Error Rate [WER]
- Improved Audio Signal in Real Time Transcriptions and STT Pipeline by applying Root-Mean-Square thresholds and Fast Fourier Transform Frequency Ranges to run transcriptions only on active speakers, measured by reducing phrase level tokenization issues
- Made tool to accelerate supervised transcription corrections in half the time-length of the audio source, to update large language model [LLM] and lexicon with military specific vernacular

- Achieved 50% success rate in extracting survey answers from transcriptions within 10 shots, by calculating cosine similarity of word embeddings between queries, and passages encoded by a sentence transformer
- Integrated STT, NLP, and Benchmarking tools in NodeJS/Express/Bootstrap interface. Dockerized services
- Simulated Subsystem Failures in Unreal Engine, by making a Component Health System for prototypical autonomous vehicles powered by the Robot Operating System [ROS]
- Integrated Kafka/PostgreSQL Producer/Consumer in Component Health System, ASR/NLP/CV tools

### **Bitwork Solutions**

*Partner, AI Engineer*

April 2023 - Present

*Remote - Baltimore, MD*

- Achieved > 80% categorization of which business categories most accurately represent a URL within 10 shots, by calculating cosine similarities between passages and encodings from a sentence transformer
- Integrated APIs to automate generating articles of keywords for target industry and audience
- Mentored Junior AI Engineer on LLMs for physics, by suggesting additional corpuses for retrieval augmented generation
- Implemented information retrieval algorithms to determine competitor keywords
- Implemented LLM-based text generation algorithms to mass-schedule Search Engine Optimized posts
- Assigned tasks to subcontractors with Jira, Trello. Review deliverables
- Designed SQL Data Schemas for interface, managed user group / role permissions
- Wrote flask middleware for accessing database and automating database model ORMs
- Consulted feasibility of AI integration and modern data science techniques to project goals
- Consulted on server architecture, microservice architecture

### **Independent Contractor**

*Software Engineer, Open Source Investigator*

August 2021 - Present

*Chico, CA; Baltimore, MD*

- Made Decentralized Exchange Volume Liquidity trade bot for Full Send Network [FSN]
- Made order queue for client web application in PostgreSQL, NodeJS; for FSN
- Made accelerated mask creation tool with click carving ResNext FPN AI application for FSN
- Setup server with 10x1080TI GPUs to brute force recover a private key for client
- Determined computational feasibility from combinatorics and recovered client information
- Setup local home security system and monitor dashboard for client
- Streamlined conversion from artists rendition to video game asset for Digital Asset Management Group [DAMG]
- Implemented Neural Radial Fields and ZeroShot. Made transforms matrix from 2D drawings for DAMG
- Setup dedicated local Jax/Dalle/Imagegen server, researched Text → 2D → 3D generation
- Found missing person's full name, social media, and contact information given only an online username
- Found locations, owned organizations, social networks, and private information on behalf of tenant

### **Santa Cruz Institute for Particle Physics [SCIPP]**

*Undergraduate Research Assistant Intern*

August 2018 - August 2020

*Santa Cruz, CA*

- Achieved 80% accuracy, 5% bias in Confusion Matrix in classification of parent particles, by training a Deep Neural Network Binary Classifier on Simulated LHC events/interactions, in TensorFlow
- Streamlined, benchmarked, and built docker containers documenting the Python workflow and modules for simulating particle physics
- Multiprocessed simulation/training loop, dispatched SLURM Batch Jobs in Hummingbird Computer Cluster
- Taught new research assistants how to use the framework, docker, and python

- Made histograms to identify expected values for Higgs boson

## **UCSC**

*Teachers Assistant*

March 2019 - June 2019

*Santa Cruz, CA*

- TA for Physics Class on Pressure, Buoyancy, basic fluid mechanics
- Graded Papers, Reviewed common mistakes, reported and updated quiz curriculum

## **UCSC, Learning Support Services [LSS]**

*Tutor*

August 2018 - August 2020

*Santa Cruz, CA*

- Taught Introduction to Data Structures, Electromagnetism, Mechanics, and Thermodynamics
- Mentored in individual and group settings

## **Private Tutor**

*Self Employed*

August 2018 - August 2020

*Santa Cruz, CA*

- Taught Precalculus, Physics, and Piano
- Assigned learning targets, supervised children

## **PROJECTS**

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### **Rocket League Research Labs**

December 2022 - Present

- Scraping Championship level Rocket League Replay files to train an autoregressive decoder to predict what sequences of moves a lower level ranked player could have made in their replay file
- Bought Unreal Engine 5 Rocket League Remake assets, rendered custom shapes and visualizations
- Uses differential geometry to calculate set of all possible intersection points
- Intersection points do not depend on initial impulse, allowing predictions to be made before impulse
- Draws parabolas with increasing conal radiuses to predict possible ball locations after an initial impulse
- Visualizes positioning as probability density map from play positions, velocities, and momentum centered around ball

### **CUDA Interview Assignment with Vorticity, inc**

October 2023 - October 2023

- Implemented linear algebra functions in C CUDA, applied test inputs by initializing buffers on the host and loading to the device

### **Text To Speech [TTS] Voice Cloning**

April 2023 - July 2023

- Conducted literature review on Tortoise TTS to further study architecture of modern AI networks
- Researched Vector Quantized Variational Auto Encoders [VQ-VAE], Autoregressive Decoders, Contrastive Language-Voice Pretrained Transformer [CLVP], Denoising Diffusion Probability Models [DDPM], Tokenizers, and Vcoders
- Setup bash pipeline to preprocess audio files to clone voices

### **Botler - Personal Discord Bot**

February 2023 - Present

- Made discord bot to play audio files over discord
- Setup AWS server, then self hosted botler instance
- Integrating Text Generation and TTS AI services

### **IP Camera Hacking**

November 2022 - December 2022

- Assisted in anonymous operation to monitor war crimes in Russian occupied Ukraine, to report to International Criminal Court
- Used shodan to determine what type of a device an ip address was in Russian occupied Ukraine
- Generated list of IP Addresses of vulnerable IP Cameras

### **Multithreaded HTTP Server**

July 2020 - August 2020

*Senior Project*

*Santa Cruz, CA*

- Made Multithreaded HTTP Server with health monitor, load balancer, and no FILE \* pointers; in C