ALEX ALLAHAR

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EDUCATION

Texas A & M University   **Expected Graduation: May 2025**
B.S. in Electrical Engineering

SKILLS

- **Programming Languages**: C++, Python, Verilog, Java, R, LEGv8, MATLAB, HTML, CSS, JavaScript
- **Libraries & Frameworks**: Pandas, Scikit-learn, TensorFlow, PyTorch, Seaborn, SQL, Firebase, Flask
- **Hardware Design & Tools**: Xilinx Vivado, Multisim, LTSpice, LabVIEW, Altium Designer, CUDA C

PROJECTS

SolarEye Security Detection System   **August 2024 - Present**
- Led and managed the SolarEye Security System project, overseeing all phases from concept to deployment, ensuring successful integration of IoT, embedded systems, and solar power technology.
- Engineered an embedded system with custom PCB designs and microcontroller-based hardware to control lighting, outlets, and camera activation based on motion detection.
- Utilized IoT protocols and wireless communication to enable seamless data transmission between embedded hardware and mobile application for live updates and notifications.
- Developed a mobile app for real-time monitoring and control of the security system, including features like threat alerts, camera streaming, and manual system control.

TheHuzz Hardware Fuzzer
- Optimized the mutation engine by implementing an effectiveness-checking algorithm to evaluate and refine mutation strategies, increasing diversity in test cases and reducing redundancy.
- Achieved up to a 7.95% improvement in bug detection coverage across processors by applying advanced mutation techniques and dynamic test case generation.
- Developed a smart mutation algorithm with a feedback mechanism to streamline the mutation process, significantly reducing runtime while maintaining or increasing test coverage.
- Ensured the algorithms integrated within the provided verification tool framework to compare mutated instruction outputs against a golden reference model, enabling precise identification of hardware design bugs.

Transformer-Based Text Binary Classifier
- Constructed a Fully Connected Transformer without using frameworks, implementing layers such as: self-attention, multi-head attention, pooling, etc. by applying linear algebra and vector matrix multiplication.
- Integrated NLP techniques by utilizing GloVe embeddings for text representation and custom tokenization to capture semantic meaning.
- Implemented custom backpropagation and gradient descent algorithms for training, optimizing with binary cross-entropy loss and manual weight adjustments.

WORK EXPERIENCE

Smithsonian Migratory Bird Center   **May 2018 – June 2019**

Student Data Analyst Intern
- Utilized R to efficiently clean and preprocess raw GeoJSON data.
- Developed the Migratory Bird Tracking Table using Excel for data organization and analysis.
- Volunteered in ornithology educational demonstrations for students visiting the Smithsonian Zoo.

Student Web Developer Intern
- Contributed to the design of Google Leaflet maps to visualize migration patterns using GeoJSON data.
- Integrated Migratory Bird Tracking Maps into the "Follow That Bird" curriculum website.
- Proficient in using GitHub for version control, collaboration, and managing project repositories.