

Elias Arellano Campos

Houston, TX | elias.arellano.campos@gmail.com | 832-903-5702 | linkedin.com/in/eliasarellanocampos | github.com/E-techgod
Work Authorization: U.S. OPT Active | TN Visa Eligible (Does not require H-1B sponsorship)

Education

University of Houston B.S. in Computer Science, Minor in Mathematics Concentration: Data Science & Machine Learning Honors: Dean's List, Magna Cum Laude	May 2026 Houston, TX
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Experience

Personal Projects & Applied ML/AI Work	2024 -- 2025
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- Designed and deployed end-to-end GenAI applications integrating LLM APIs with custom retrieval pipelines, prompt engineering, and context-grounded generation.
- Built and productionized deep learning systems processing large-scale datasets, from architecture design through evaluation and REST API deployment.
- Enabled real-time model inference by integrating ML systems with Flask REST APIs and interactive dashboards (Streamlit), reducing time-to-insight for end users.
- Applied explainability techniques (SHAP, saliency maps) to validate model behavior and identify failure modes across diverse datasets.

Projects

EEG Seizure Detection	<i>PyTorch, Python, MNE, CHB-MIT</i>
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- Achieved best **F1 of 0.8537** and **AUC of 0.9924** by designing and comparing four deep learning architectures (CNN, CNN+LSTM, CNN+GRU, TCN) on **23-channel** pediatric EEG data.
- Addressed severe class imbalance (~**0.23%** positive rate) using weighted loss functions, threshold optimization, and learning rate scheduling with gradient clipping.
- Implemented saliency map explainability and per-patient error analysis to identify generalization gaps and guide model improvement.

Tennis RAG Coach	<i>Python, Streamlit, Gemini API, TF-IDF, PyPDF</i>
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- Engineered an AI-powered retrieval-augmented generation (RAG) system that answers beginner tennis questions from uploaded PDFs and text files using TF-IDF retrieval and cosine similarity ranking.
- Integrated the Gemini API to generate grounded, source-aware responses from retrieved context, with support for citation-based answers and clearly labeled inference when information was only partially documented.
- Improved LLM application reliability and response quality by implementing chunked document ingestion, overlap-based context preservation, retry logic for transient API failures, and continuation handling for truncated model outputs.

Fraud Detection System	<i>Python, scikit-learn, SHAP, pandas</i>
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- Achieved **97.1% F1**, **98.2% recall**, and **96.0% precision** on the fraud class by training a Random Forest model on a **108K-sample** balanced holdout dataset.
- Reduced false positives to **84 FP** against **2,016** correctly identified fraud cases, with **0.999** ROC-AUC and **99.55%** overall accuracy.
- Increased model transparency by implementing SHAP-based explanations for both global feature importance and individual prediction interpretation.

Amazon Review Opinion Search Engine	<i>Python, SBERT, NLP, Flask</i>
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- Increased average precision by **47.7% (0.39 → 0.58)** while reducing retrieved document volume by **83%** by replacing keyword search with SBERT-based semantic retrieval.
- Cleaned and transformed **210K+** reviews using custom preprocessing pipelines; demonstrated cleaner data outperforms larger unfiltered sets.
- Deployed as a Flask API enabling real-time semantic query over the full review corpus.

Activities

- Code Coogs**, University of Houston --- Participated in ML and AI workshops and collaborative technical sessions.
- University of Houston Tennis Club** --- Competed in club matches; developed teamwork, discipline, and leadership.

Skills

- Programming:** Python, R, SQL, C++ , Java
- ML & AI:** PyTorch, TensorFlow, scikit-learn, XGBoost, NumPy, pandas, SHAP, NLP, Deep Learning, GenAI, LLM APIs, Prompt Engineering, RAG, REST APIs
- Computer Vision:** OpenCV, MediaPipe
- Web & Tools:** Flask, Streamlit, Shiny, Git, Linux, Jupyter, VS Code
- Languages:** English (Fluent), Spanish (Native)