Solomon Ghebretatios

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A dynamic and self-motivated AI/ML and Electrical Engineer, passionate about leveraging machine learning, data analytics, generative AI, and large language models to develop innovative solutions addressing business, governmental, and societal challenges. Driven by curiosity and adaptability, I thrive in rapidly mastering new skills and technologies to deliver meaningful and impactful results.

Education

American University of Sharjah *Sep 2024 - present*

- Master of Science in Machine Learning
- Graduate Teaching Assistant

United Arab Emirates University *Jan 2019 - Aug 2023*

- Bachelor of Science in Electrical Engineering
- Minor in Artificial Intelligence
- Cumulative GPA: 3.72/4.0
- Honor Student

New York University Abu Dhabi *Sep 2021 - Apr 2022*

- The Sheikh Mohammed bin Zayed Scholars Program (SMSP)
- Elected among the top 24 distinguished students in the UAE
- Courses: Leadership, Public Speaking, Critical Thinking & Persuasive Writing, Challenges of The New Political Economy
- Cumulative GPA: 3.75/4.00

Recent Projects

Generative AI-based Background Music Removal Tool

- Developed a Generative AI-based audio separation model that removes background music from speech recordings while preserving ambient sounds.
- Built a custom audio dataset combining speech, music, and environmental sounds to simulate realistic usage scenarios.
- Conducted extensive experiments to improve audio clarity and speech quality.
- Achieved superior audio separation compared to existing industry-standard models, improving audio clarity and speech intelligibility significantly.
- Outperformed popular audio separation tools (Conv-TasNet and HT-Demucs) by clear margins in benchmark tests.
- Conducted human perceptual evaluation validating our model's superior real-world applicability.

Analog Circuit Sizing using Decision Transformer

- Developed a GPT architecture-based Decision Transformer model for analog circuit sizing, reframing reinforcement learning as supervised sequence modeling.
- Implemented a Deep Deterministic Policy Gradient (DDPG) agent in AnalogGym environment interfacing with Ngspice for expert trajectory generation.
- Established a robust data preparation pipeline, including discounted Return-To-Go (RTG) computations, sequence normalization, and masking.
- Conducted supervised offline training of the transformer to predict optimal circuit sizing actions.
- Evaluated model performance, identified challenges including data limitations and complexity inherent in analog sizing tasks, paving the way for future research directions.

Freelancer Job Effort and Price Estimation

- Built predictive models (XGBoost, CatBoost, LightGBM, Neural Networks) to estimate freelancer job pricing using Upwork dataset.
- Utilized Large Language Models (LLMs) for structured, semantic representation of job descriptions.
- Applied Explainable AI techniques (SHAP, LIME) for model transparency and actionable insights.
- Performed correlation analyses and rigorous cross-validation to validate model accuracy.
- Improved pricing fairness and operational efficiency on freelancing platforms.

Unsupervised Anomaly Detection in Space Imagery

- Explored SOTA unsupervised anomaly detection models (FastFlow, Reverse Distillation, Diffusion Models, Variational Autoencoders) on the ALLO dataset for lunar imagery.
- Engineered preprocessing pipelines (normalization, augmentation) tailored to space imagery.
- Integrated Large Language Models (LLMs) for context-aware anomaly detection, significantly enhancing accuracy for sparse and ambiguous anomalies.
- Implemented structured prompting and JSON-based post-processing to improve model interpretability.
- Achieved high anomaly detection performance (80% accuracy, 88% precision, 86% F1-score), demonstrating potential for autonomous space exploration systems.

Experience

Engineering Intern at STRATA Manufacturing *May 2023 - Aug2023*

- Inspected high-voltage and low-voltage panels, and improved the company's load schedule
- Applied cutting-edge equipment testing methods including thermal imaging, vibration testing, laser alignment, and PAT testing
- Collaborated with the R&D team to develop an IoT device that employs load cell sensors and Arduino for weight-based equipment tracking via WiFi
- Analyzed energy-saving solution scheme presented by WSP and proposed a sensor-based, data-driven intelligent approach towards becoming a smart factory

Research Assistant, UAEU *Sep 2021 - Nov 2023*

- Researched and developed the signal acquisition circuit for a novel wearable Brain-Computer Interface (BCI) device
- Processed raw EEG data and performed Fast Fourier Transform and Welch PSD estimate using Python and MATLAB
- Extracted and studied key features like Inter Blink Interval and Spectral Power Changes
- Evaluated various machine learning and deep learning algorithms to determine the optimal choice for drowsiness detection
- Co-authored and presented our research findings for IEEE publication at the 15th International Conference on Innovations in Information Technology

Sustainable Development Goals (SDG) Research Program Sep 2021 - Mar 2022

- Conducted research funded by the United Nations on the deployment of sustainable energy alternatives on university grounds
- Utilized PVsyst software to analyze and assess the impact of shadows from buildings and trees on solar panel energy harvesting efficiency
- Studied various machine learning algorithms for optimizing energy distribution and efficiency

Anjal Z Abu Dhabi Youth Challenge *Nov 2021*

- Participated in an experiential Bootcamp where, as a part of a team, I designed an award-winning innovative AI-based startup app aimed at advancing early childhood cognitive development

Publications

- Philip, P.C., Subaihi, F., Musgun, S., **Ghebretatios, S**., Alnajjar, F. (2022). Solar Car Parking for Maximum Power Utilization at the United Arab Emirates University: Case Study. In: Daimi, K., Al Sadoon, A. (eds) Proceedings of the ICR'22 International Conference on Innovations in Computing Research. ICR 2022. Advances in IntelligentSystems and Computing, vol 1431. Springer, Cham.

- *Mohammad Shakeel Laghari, Hamdan T. A. Hraiz,* ***Solomon I. Ghebretatios****, and Aamna S. H. K. Alshehhi. 2023. Academic Course Planning Software System at EECE Department. In Proceedings of the 2023 12th International Conference on Software and Computer Applications (ICSCA '23). Association for Computing Machinery, New York, NY, USA, 97–104.*

- ***S. Ghebretatios****, H. Teklesenbet, M. Woga, N. Yemane and A. N. Belkacem, "Wearable Device for Drowsy User Detection," 2023 15th International Conference on Innovations in Information Technology (IIT), Al Ain, United Arab Emirates, 2023, pp. 20-25, IEEE doi: 10.1109/IIT59782.2023.10366477.*