Harnan Murugadas

Software Engineering Intern

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PROFILE

As a Computer Engineering student passionate about Software Engineering, I seek an internship to leverage my coding skills in real-world projects. With a strong foundation in software development principles and hands-on experience with frameworks like Spring Boot and Flask, I am eager to contribute to innovative and scalable solutions. My commitment to continuous learning and ability to solve complex problems make me an ideal candidate for software engineering roles.

EDUCATION

- **University of Peradeniya** — Kandy, Sri Lanka
  Bachelor of Science of Engineering Honours (BScEngHons) specializing in Computer Engineering — Mar 2021 - Present
  - CGPA - 3.35/4.0.

- **Kokuvil Hindu College** — Jaffna, Sri Lanka
  High School (Secondary Education) — Jan 2011 - Aug 2019
  - G.C.E A/L : Physical Science Stream - 3A - Z-Score: 2.017

RELEVANT COURSEWORK

- Software Engineering
- Data Structures and Algorithms
- Software Construction
- Network and Web Application Development
- Advanced Database Systems
- Machine Learning and Data Mining

CERTIFICATIONS

- Machine Learning Specialization - Stanford University (Coursera)
- Neural Networks and Deep Learning - Stanford University (Coursera)
- Generative AI with Large Language Models - Stanford University (Coursera)

TECHNICAL SKILLS

- **Software Development:**
  - **Programming Languages:** Python, Java, SQL
  - **Frameworks & Libraries:** Spring Boot, Flask, Flutter (beginner)
  - **Databases:** MySQL, MongoDB
  - **Cloud Services:** AWS (EC2, IoT Core, Cognito)
  - **Version Control:** Git

- **Machine Learning & Data Science:**
  - **Algorithms and Techniques:** Supervised and Unsupervised Algorithms, Neural Networks, Deep Learning (CNNs, RNNs, LSTMs), Data Preprocessing, Model Evaluation, Regularization Techniques
  - **Tools:** Scikit-Learn, TensorFlow, PyTorch, Keras, NumPy, Pandas, Matplotlib

PROJECTS

1. Automatic Grass Cutter | *Spring Boot*, *React Native*, *MongoDB*, *AWS* – Group   Document| git | ProjectPage

- Developed a mobile application for automating lawnmowers, reducing time and labor for individuals maintaining large grassed areas.
- Contributions:
  - Developed and implemented the backend API using **Spring Boot**, handling device authentication, user management, and MQTT communication.
  - Integrated **MongoDB** for efficient data storage and retrieval, ensuring seamless interaction between the mobile app and backend services.
  - Deployed the application on **AWS EC2**, ensuring scalability and reliability.
  - Implemented user authentication and management using **AWS Cognito** for sign-up, sign-in, and secure user data handling.
  - Ensured secure device authentication using hashed passwords and JWT-based authentication, enhancing security and user management.
  - Utilized **AWS IoT Core** for managing device communications and real-time data processing.

2. **Plants Disease Detection** | *Flask*, ***Spring Boot with MySQL***, *Flutter* ,***EfficientNet*** – Group   [git]

- Developed a mobile application to help Sri Lankan farmers identify plant diseases, addressing issues of low yields and food insecurity.
- Integrated the deep learning model into a mobile application using Flask and Spring Boot to provide information on likely diseases based on uploaded plant images.
- Contributions:
    - Developed the backend API using **Spring Boot**, handling user authentication (sign-up, sign-in) using **JWT**, and data retrieval.
    - Created a Flask API for image processing and disease prediction, integrating it with the Spring Boot backend for seamless communication.
    - Implemented secure data storage and retrieval with **MySQL**.
    - Utilized **Flask-CORS** for handling cross-origin requests and integrating the backend with the mobile app.
    - Built the model using the **pre-trained EfficientNet** architecture.
- Project demonstration video available on [YouTube].

3. **Image Segmentation using PyTorch** | ***PyTorch***, ***OpenCV***, ***Segmentation Models*** – Individual   [colab]

- Developed an image segmentation model to detect humans in images using a **U-Net** architecture with a pre-trained **EfficientNet-B0** encoder.
- Preprocessed the dataset by resizing images and masks, applying horizontal and vertical flips for augmentation.
- Implemented a custom PyTorch Dataset class to load and augment the training and validation datasets.
- Trained the model using **Adam optimizer** with a learning rate of 0.003 for 25 epochs, achieving significant accuracy improvements over baseline models.
- Evaluated model performance using **Dice Loss** and Binary **Cross-Entropy Loss**, and saved the best model based on validation loss.
- Applied the model to validation images to generate segmentation masks and visualize the results.

4.**Maternal Health Risk Analysis (ongoing)** | ***Pandas***, ***NumPy***, ***Scikit-learn***, ***Classifier*** – Group   [git]

- Building a machine learning model to predict pregnant women's health risks, aiding healthcare prioritization in rural areas with limited maternal care.
- Contributions:
    - Preprocessed the data to handle missing values and outliers.
    - Conducted univariate, bivariate, and multivariate analyses to understand data distributions and correlations.
    - Built and evaluated several classification models including **Random Forest**, **SVM**, **XGBoost**, and **Logistic Regression**.
    - Performed hyperparameter tuning to optimize model performance.

RESEARCH EXPERIENCE

Dimensionality Reduction and Clustering of Coral Microbiome Data   [Documentation]

University of Peradeniya
November 2023 – Present
Supervised by Dr. Damayanthi Herath, Senior Lecturer, Department of Computer Engineering, UoP, Sri Lanka

- **Objective:** Analyze microbial diversity in coral species using dimensionality reduction and clustering techniques.

- **Methods:**

    - **Data Preprocessing:** Normalized data for accurate analysis, centering and scaling to have a mean of 0 and a standard deviation of 1.

    - **Dimensionality Reduction:** Applied PCA (captured significant variance), t-SNE (visualized distinct microbial clusters), and UMAP (preserved local and global data relationships).

    - **Clustering:** Used GMM (probabilistic classification) and DBSCAN (identified dense clusters and noise points).

- **Results and Impact:**

    - Identified distinct microbial clusters, enhancing the understanding of coral ecosystems.

    - Developed methods to facilitate future coral health research.

EXTRA-CURRICULAR ACTIVITIES & LEADERSHIP

- Volunteered at NENATHAMBARA, training over 100 students in Arduino programming (2024).

- Coordinated the Yarl IT Hub Innovation Festival, showcasing projects from the University of Peradeniya (2024).

REFERENCES

Prof. Roshan G. Ragel   —   [roshanr@eng.pdn.ac.lk]
Head of Department, Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Sri Lanka

Dr. Isuru Nawinne   —   [isurunawinne@eng.pdn.ac.lk]
Senior Lecturer, Department of Computer Engineering, Faculty of Engineering, University of Peradeniya, Sri Lanka