UDITYA LAAD

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PROJECTS

Package for 4 different Symbolic Execution Engines in WLANG – (Explore SymEX) **Jun 2022 – Aug 2022**

- Created Symbolic Execution Engines for – **Classical** Symbolic Execution, **Selective** Symbolic Execution (2 Versions), and **Dynamic** Symbolic Execution; using WLANG as the artifact.
- Compared and analysed how each one fares against the other and where their specific utility may be applicable.

Tech Stack: Python, WLANG, TatSu, z3 Solver

Repo: https://github.com/udityalaad/Explore_SymEx

GPS Based, Real-Time Accident Management System – (Stay Safe) **Jul 2018 – Jul 2019**

An IoT project providing a collaborated solution for accident prevention, accident detection and rescue/aid – using a blend of Cross-platform applications, Microservices & Embedded Technology.

- Created a real time, multi-platform application - with unique dynamic functionalities for 3 sets of users.
- Created Black Box Device to automatically detect accident of vehicles & integrated it with user application.
- Created Web Services to implement algorithms & performed Data Analytics to provide better responses.

Tech Stack: Node.js, Cordova, Raspberry Pi, Python, Web Development, Firebase, Cloud Messaging, Cloud Functions, Android Application Development, Data Analytics

Repo: https://github.com/udityalaad/GpsBased_RealTime_AccidentManagementSystem

A novel approach to System Design for Machine Learning – (Travel Genius) **Feb 2023 – Apr 2023**

- Created a short-term accommodation portal to demonstrate an innovative approach to System & DB Design, Query Optimization, Scalability, Data Mining and utilization of Machine Learning & LLMs in modern applications.
- 3 major components include – Data Store, Client Application & leveraging Neural Networks to derive valuable insights.

Tech Stack: MySQL, Node.js, Express.js, React.js, Python, Tensorflow, Jest

Repo: https://github.com/udityalaad/TravelGenius

Asynchronous Meal-Service Application with Model Optimization – (FoodBell) **Jan 2022 – April 2022**

'FoodBell' is an asynchronous solution for facilitating subscription-based (recurring) meal services – using a dedicated application, secure micro-service architecture and CI/CD approach.

- Created an optimal 'vendor-consumer' model & leveraged it to design the user application with targeted functionalities.
- Architected a secure Micro-service model, with a Gateway facilitating 3 different services (consumer, vendor, auth).
- Allowed real time communication between vendor & consumer platforms; used Cron jobs to facilitate automated changes.

Tech Stack: Spring Boot, MySql, Node.js, React, Java, Junit, Integration Test Framework (in react), Selenium.

Repo: https://github.com/udityalaad/FoodBell

Optimizing Vertex-Cover Problem & Comparison with Other Methods **Mar 2022 – April 2022**

- Implemented and analysed 2 polynomial-time & 1 NP-complete algorithm for solving the minimum vertex-cover problem.
- Optimized the existing encoding of CNF-SAT solver (NP-complete) to provide most optimal result at > 60 % faster rate.

Tech Stack: C++, UNIX.

Repo: https://github.com/udityalaad/OptimizingVertexCoverProblem

Sentiment Analysis using CNN **Jul 2022**

- A Convolutional Neural Network to perform Natural Language Processing (NLP) on varying input spaces, achieving > 80% accuracy in majority of cases; without the involvement of any word representation packages like word2Vec or Glove.

Tech Stack: Python, TensorFlow

Repo: https://github.com/udityalaad/Sentiment_Analysis_Using_CNN

Automated Program Verification Engine for Imperative Languages – (VeriCross) **Jul 2022 – Aug 2022**

- Created a custom Program Verification engine to prove correctness using specifications & constructs like loop invariants.
- The tool made deductive analysis possible with over 97% accuracy, as proved for over 10 test programs.

Tech Stack: Python, IMP, TatSu, z3 Solver

Repo: https://github.com/udityalaad/VeriCross

KSOM based Recurrent Neural Network – (ClustReduce) **Jun 2022**

- Created a custom Kohenen Self-organising Map from scratch, to cluster inputs & reduce dimensionality of input space.
- Analysed the network's performance with increasing number of epochs for different configurations of the network.

Tech Stack: Python

Repo: https://github.com/udityalaad/Clust_Reduce

Fuzzing Tool for Doom Video Game – (Doom Fuzz) **May 2022 – Jun 2022**

- Created a fuzzing tool that tests and covers over 80% source code in Doom Video Game.
- Used specialized techniques to create an effective entry point that ensures maximum reachability and coverage.

Tech Stack: C++, Linux, Sanitizers, CMake, Ninja

Repo: https://github.com/udityalaad/Doom_Fuzz

Market Prediction using RNN **Jul 2022**

- Created Recurrent Neural Network for prediction of market stocks, achieving > 80% accuracy for over 5 sets of data.

Tech Stack: Python, TensorFlow

Repo: https://github.com/udityalaad/Stock_Market_Prediction_Using_RNN

RBF Neural Network for Map Approximation **May 2022 – Jun 2022**

- A custom-configurable closed-form Radial Basis Neural Network to approximate mappings for interpolation purposes.
- Analysed the network's performance for different methods of center-approximation, with focus on significance of 'spread'.

Tech Stack: Python

Repo: https://github.com/udityalaad/RBF_NN_for_Map_Approximation

Feed-forward MLP classifier based on Gradient Descent **May 2022**

- Created a supervised feed-forward neural network for classification purposes, allowing over 50 custom options of configuration; with the ability to achieve over 85% accuracy for majority of viable configurations.

Tech Stack: Python

Repo: https://github.com/udityalaad/FeedForward_MLP_Classifier

Street Specifications Generator & Optimal Path Finder – using Multiprogramming **Jan 2022 – Mar 2022**

- Designed street generator to create valid specifications in less than 10 unsuccessful attempts (further converted to graph).
- Dynamically generated trails for specifications & facilitated communication between processes using multiprogramming.

Tech Stack: Python, C++, UNIX.

Repo: https://github.com/udityalaad/StreetSpecificationsGenerator_and_OptimalPathFinder

Practical Implementer & Stepwise Analyzer for CCNS Techniques – (Cyber Solve) **Mar 2019**

- Developed an application to generate simplified results for complex techniques and algorithms used in 'Computer Cryptography and Network Security (CCNS)'.
- Also provided the option of detailed analysis, by allowing step-by-step tracing of each implementation.

Tech Stack: Java

Repo: https://github.com/udityalaad/Cyber_Solve

Intelligent Analyzer & Suggestions Builder, cum E-Commerce Platform – (The Shoe Rack) **Apr 2018**

- Developed and implemented coherent algorithms to perform efficient cost and feature analysis, in order to generate dynamic comparison of products.
- Created a Web App. - to display best-to-worst results, and also act as an E-Commerce portal (for shoes).

Tech Stack: Java, Web Development (JSP, HTML, JavaScript, CSS), SQL (Oracle Database), Apache Tomcat.

Repo: https://github.com/udityalaad/The_Shoe_Rack

Applications for Simple Mini-Games **Feb 2018**

- Created applications for simple games like Ball Bounce (with smart Obstacles Generator), Maze Game ('Self play' + 'Automated - with intelligent Path Decoder'), and Tic-Tac-Toe ('v/s Player' + 'v/s Computer').

Tech Stack: Android application development, C, C++

Repo: https://github.com/udityalaad/Applications_for_Simple_MiniGames

Simple Reservation System for Airlines – (Go Fly) **Oct 2017**

- Created an easy-to-use application for flight reservation and payment, using Java & SQL (Oracle Database).

Tech Stack: Java, SQL

Repo: https://github.com/udityalaad/Go_Fly