Kaustav Ghosh

Curriculum Vitae

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LinkedIn

Interests

Computer Science, Artificial Intelligence and Robotics

Education

2018–2022 **Bachelor of Technology in Computer Science & Engineering**,
Manipal Institute of Technology, Manipal.
Specializing in Computational Intelligence

Work Experience

Robotics Internships

Jul'20-Aug'20 **ROS Engineer Intern**, QBOTICS LABS, India.
CEO and Mentor : Lentin Joseph (author of 8 ROS books). **Project:** Repository.

- Constructed a Differential Drive with caster wheel from scratch using URDF and XACRO files and mounted the same with laser scanner , Inertial Measurement Unit and Velodyne Puck VLP-16 Lidar.
- Simulated the differential drive in Gazebo and wrote ROS Subscriber script to get laser scan reading from sensor messages for obstacle range detection
- Interfaced the differential drive with Google Cartographer with localisation and mapping of the robot using lua config files.
- Modelled a 4 wheeled drive and also an environment for experimentation of various controllers for the vehicle in Webots 3D Robot Simulator
- Wrote individual C++ controllers for the teleoperation using keyboard,laser scanner,GPS,IMU & Linear Actuator
- Wrote Markdown documentation for the entirety of the Internship for beginners to understand concepts and replicate results

AI internships

Apr-Jun'20 **Machine Learning Intern**, MICROSOFT STUDENT PARTNERS, India.
ML Certificate. ***Python Foundations* Certificate.** ***Team Repository***.

- Guided a team of 10 individuals to collaborate and accomplish a Regression task of price prediction of used cars
- Performed Feature Engineering to extract the most important attributes of the data-set using Uni-variate and Multi-variate Filtering techniques, Mutual Entropy Gain Filtering and also feature selection using RMSE Regression and ANOVA Test
- Performed basic Data wrangling and processing using Numpy and Pandas and visualized it using Matplotlib and Seaborn and finally built the machine learning model using an XGboost Regressor
- Also completed a Mini Project on extensive Data Visualization and Analysis using Mat-plotlib and Seaborn to gather useful insights of the data

Mini Project ***Feature Engineering Notebook***. ***Model Notebook***. ***EDA Notebook***

May'20 **Data Analytics Intern**, TAKENMIND TECHNOLOGIES, India.

- Scripted a personal version of Numpy and Pandas Documentation
- Performed Exploratory Data Analyis techniques using Matplotlib and Seaborn
- Creating several box-plots,count-plots,heat-maps of several data-sets

Ongoing **Deep Learning with Masters in Computer Vision and NLP**, INEURON INTELLIGENCE, India.

- Currently learning CNNs and RNNs

Achievements

2021 Secured a GPA of **9.28** in 5th Semester

2020 Among **top 4 out of 370** students in Competitive Coding contest to secure internship at **Samsung Research Institute**, Summer '21

2020 Secured a GPA of **9.14** in 4th Semester

Research Projects

Nov'20-Ongoing **Samsung PRISM** Intelligent Ranking for Dynamic Restoration in Next Generation Wireless Networks

Academic Projects

Compiler Design **Front End of a Compiler**

- Coded a **Lexical Analyser** that extracts tokens from a C source file and a **Symbol Table Generator** to store information of identifiers and functions.[**Code**]
- Coded a **Recursive Decent Parser** that semantically parses the *grammar for subset of C-Language* by analysing the tokens generated by the Lexical Analyser and reports syntactic & semantic errors [**Code**]

Algorithms & Data Structures **Backtracking Algorithms**

- Coded a **Crossword Solver** that takes a 10*10 grid and word list and outputs a grid with the words accurately filled into the slots.[**Code**]
- Coded a **Sudoku Solver** that takes a partially filled 9*9 sudoku grid and outputs a solution so that every row, column and nine 3x3 subgrids contains exactly 1 instance of the digits from 1 to 9. .[**Code**]

Machine Learning **Finland Labs in association with NSS IIT Roorkee - Covid-19 Data Analysis, Time Series Forecasting and Web Scraping**

Link to Certificate : Certificate. **Link to Code :** Repository.

- Prepared a complete Data Analysis report on the World-wide COVID-19 attack statistics and used the Facebook's fbprophet Time-series Forecasting library to speculate the number of active corona victim cases in the upcoming days.
- Also used a corona data-set of my country and the Python folium package for the binding of data to a map for choropleth visualizations. Further used Beautiful Soup and Requests HTTP library for Web Scraping of live corona stats.
- Implemented code snippets for the pre-processing of data & data wrangling and visualized the data via several Matplotlib and Seaborn tools
- Created neural networks from scratch which facilitated in implementing a machine learning model to recognize the function of an XOR gate without explicitly being programmed.
- Trained a Deep Learning model with TF2 and Keras API for MNIST Handwritten digit Recognition

ROS-Gazebo **Food Labs Robotics Startup Interview**

Models and Simulations : Repository & videos. **Final Project Report:** Final Report.

- Designed, modelled, constructed and assembled a plethora of sensors and Robots across multiple software platforms like FreeCad, Blender, Gazebo and also fabricated a hotel from floor-plan using Gazebo World Editor
- Created an SDF model of the Velodyne HDL-32 sensor,improved the model's appearance and data output,added Mass/Inertia to the model,used FreeCad software to acquire Meshes, Blendr software to refine the metric system and Gazebo model editor to model the Velodyne Lidar structure.
- Implemented Hokuyo Fake Laser Scanner and Noisy Camera in Gazebo, tweaked the mean & standard deviation of the Gaussian Noise Distribution in the scan & image samples for higher fidelity outputs.
- Simulated the ROBOTIS waffle-pi or burger TurtleBot3 and constructed a vehicle in Gazebo Model editor and loaded it with a Depth Camera Sensor for surveillance

Solidworks **Analysis of Selective Compliance Assembly Robot Arm and Modelling of T3R Robot**

- Computed Denavit-Hartenberg parameters for the SCARA robot and used it to formulate the Forward and Inverse Kinematics of the robot arm
- Used Lagrange Euler Formulation to compute the torque/dynamics of the robot and further also planned an arbitrary trajectory for the manipulator
- Using Solidworks modelled a T3R robot (1 twisting joint and 3 revolute joints) and as bonus task i am trying to interface the Soliworks model with Matlab Simscape

SCARA : SCARA Analysis. **T3R :** Solidworks Model. **T3R animation :** mp4 video.

Positions of Responsibility

Jan'20 - Present: Local Committee Member of IOSD (International Organization of Software Developers)

Technical Section

Software: Anaconda,AutoCAD,Matlab,Keil,Altera MaxPlus 2,VirtualBox,Vm Ware,Oracle SQL,VS Code

Programming Languages: Fluent in C/C++,Familiar with Java and Python,Verilog,LaTeX,Linux Shell Scripting, fair acquaintance with ARM assembly programming*(NXP LPC 1768)*

Libraries and Frameworks: *Python*-Numpy, Pandas, SciPy,Scikit-Learn,Matplotlib, Keras, Tensorflow *C++*-Standard Template Library(STL) *Java*-JavaFX GUI

Robotics: ROS middleware, Gazebo, Ignition, MoveIt!, Point Cloud Library

OS used: *Windows*-XP,Vista,7,10 *Linux*-Ubuntu

Courses Taken

College Curriculum

Engineering Mathematics, Data Structures, Object Oriented Programming with Java, Digital System Design with Verilog, Computer Organization and Architecture, Database Systems, Theory of Computation, Embedded Systems, Algorithms, Operating Systems, Computer Networks, Compiler Design, Software Engineering, Robotics, Smart Sensors

Off-Campus Academies and Online Courses

Coding Ninjas: Intro to C++ programming with Data Structures and won Top Performer Certificate of Excellence

- Link to Completion Certificate
- Link to Top Performer Certificate
- Link to Cpp, Data structures and Algorithms Repository

Early Years

- Pulled an all nigther in 7th grade to construct a **LEGO Mindstorms EV2 Humanoid Robot** and programmed it using the NXT-G GUI interface that could walk,talk and identify colors in its environment and showcased it in a Science exhibition.
- Won Gold medal for 200m sprint and 2 bronze medals fro 100m and 400m in 8th grade.
- Won **1st Prize** Trophy at state Level Abacus Competition in 5th grade
- Won **2nd Prize** Trophy at state Level Abacus Competition in 4th grade
- Won multiple gold, silver and bronze medals at the **School Level** Science and Maths Olympiads conducted by **Science Olympiad Foundation**

Hobbies

- Running
- Anime
- Music