Smarak Kanjilal

Computer Science and Engineering (M.Tech Dual Degree 5Y)
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EDUCATION

M.Tech Dual Degree - Computer Science and Engineering	IIT Kharagpur	8.85/10	2021-2026
Indian Certificate of Secondary Education(ISC)	The Modern Academy	98.4%	2021

SKILLS SUMMARY

Technical Skills: Robotics, Microcontroller Programming, Verilog, Robot Operating System(ROS), Git, Latex, MATLAB, PyTorch, OpenAI Gym
Languages: C, C++, Python, Java, Javascript, Bash, PHP, HTML, CSS, SASS
Libraries: OpenCV, Numpy, Matplotlib, Pandas, Keras, ReactJs, Redux, Scikit, Django, Express.js, AJAX, NodeJs, Tensorflow

WORK EXPERIENCE

Kharagpur RoboSoccer Student's Group | Software Team | Prof. Alok Kanti Deb *Aug 2022 - Present*
- Developed OpenAI Gym environment for Nao-v40, applying **Reinforcement Learning** algorithms (PPO, SAC), boosting low level skill execution by 30%
- Optimized inverse kinematics for soccer maneuvers using **Overlapped Layered Learning** (OLL) and **CMAES**, achieving a 25% increase in walking speed
- Integrated **ROS** with overhead camera, managing a distributed system of 5 robots, achieving **95% localization accuracy** using image segmentation
- Optimized parallel execution of robot strategy modules using **multithreading** and **mutex** locks, in order to minimise latency achieving real time execution

Mitacs Globalink Research Intern | Toronto Intelligent Systems Lab, University of Toronto | Prof. Igor Gilitschenski *May,2024 - Present*
- Developed tasks to probe 3D understanding in **Video Generative Models**(Stable Video Diffusion, VJEPA) by Novel View Synthesis, depth map estimation
- Built a robust pipeline for **distributed training** on multiple GPUs and evaluation on datasets of size upto **500GB**, handling data processing and inference
- Implemented robust model checkpointing and efficient garbage collection during training, optimizing GPU usage with **30%** reduction in memory overhead

Web Coordinator | International Relations Cell, IIT Kharagpur *Aug 2022 - Present*
- Developed a Foreign Training Application Portal streamlining the process of application for Research Internships in **50+** institutes of eminence abroad
- Created a user-friendly platform using the Django Framework, with over **220 active users**, resulting in a **40%** boost in the number of applications submitted
- Engineered a Request a Topic feature, allowing users to suggest topics and dynamically estimating demand on each topic, improving topic relevance
- Implemented **automated Git** operations and version control using **webhooks** for remote system management reducing maintenance time by 40%

Machine Learning Intern | King's College London | Prof. Ernest Kamavuako *Jan,2024 - May,2024*
- Built a **Deep Learning** and signal processing pipeline for **real-time** quantification of swallowing events in elderly adults to monitor water intake
- Augmented audio dataset by introducing artificial variations maintaining similarity in **MFCC** vectors, ensuring robust model and improved generalization
- Employed **Transfer learning** on YAMNet achieving an **accuracy of 89%** and an **F1-score of 0.7** to detect and distinguish swallowing activities

Data Science Intern | Stanford University | Prof. Pascal Geldsetzer *Jan,2023 - Aug,2023*
- Estimation of maternal and child health indicators including undernutrition, mortality, healthcare availability using **Machine Learning** on satellite images
- Reduced feature set from demographic surveys with **11,945 variables** resulting in **80%** reduction in dimensionality maintaining high predictive performance
- Implemented **Deep Learning** models, **ensemble** architectures achieving an acceptable average **RMSE score of 2.53** in predicting healthcare parameters

PROJECTS

Gender Bias Detection and Estimation in Texts
- Developed Gender Bias Detection model by finetuning **BERT** LLM, achieving an **F1 score of 0.85**, with robust performance across various text genres
- Utilized **Transfer Learning** to generate contextualized embeddings from BERT for estimation of gender bias in text files by supervised learning
- Incorporated a Lexicon-based approach to quantitatively estimate gender bias, using statistical measures of word frequency analysis and correlation measures

Data-Driven Health Risk Assessment and Personalized Recommendation Framework
- Developed an adaptive scoring model using census tract data from **85,000** locations in US, integrating transportation, healthcare, and socio-economic data
- Employed clustering algorithms (**KMeans, DBSCAN**) and probabilistic aggregation to assess the expected individual risk scores using demographic data
- Utilised **Gemini-powered** recommendation engine using **few-shot learning** for personalized health risk mitigation based on individual risk scores

COMPETITIONS

Gold Medal | Software Team | InterIIT Tech Meet 12.0 | Mphasis
Optimize passenger reallocation for disrupted flights to existing flights of limited vacancies using quantum computing methods considering priority of passengers
- Developed algorithms **10M+** reallocating passengers across **2000** flights using quantum computing and classical algorithms (**knapsack**,**flow algorithms**)
- Implemented a **C++** backend for multi-objective constrained optimization, using integer programming solvers including **Gurobi** and **CPLEX** libraries
- Built a **GRPC** pipeline to integrate **Django** and **C++** backends, creating a unified API interface for testing and comparing performance of algorithms
- Designed an intuitive user interface using **React.js** and **Tailwind** CSS framework, with visualisation of 10+ insightful metrics from uploaded input data

Humanoid Simulation League | Robocup BrazilOpen 2022
Achieved **7th** place globally in the Humanoid Simulation League at RoboCup BrazilOpen 2022, being a part of the only selected undergraduate team
- Implemented strategy modules for coordinated decision-making among bots based on dynamic field conditions in an accurately simulated soccer environment
- Developed an adaptive dribble algorithm using potential field methods, allowing robots to skillfully avoid up to **3** opponent bots with a **75%** success rate
- Enhanced team coordination plays for executing complex soccer tactics by implementing encoded audio message protocols to signal specific targeted actions

Computer Vision Challenge | EnCode: Code to Innovate by Bosch(link)
Qualified for the finals in the Encode: Code to Innovate Computer Vision Challenge organized by IIT Guwahati
- Developed multi-net model for **3D bounding box** estimation and **driving path segmentation** for autonomous vehicles with fast, real time inference
- Utilised **CSPDarknet** backbone and used **Spatial Pyramid Pooling**, **Feature Pyramid Network** for feature fusion across scales and semantic levels
- Used a grid-based approach like **YOLO** for object detection and devised a depth estimation module from monocular 2D images for **6D localisation**
- Implemented a pipeline for **Semantic Segmentation** using initial features, obtaining high accuracy in obstacle and driving path segmentation tasks

RELEVANT COURSEWORK

Computer Science: Algorithms, Software Engineering, Computer Organization and Architecture, Cryptography and Network Security, Operating Systems Machine Learning, Switching Circuits and Logic Design, Compilers, Computer Networks, CS229(Stanford), Deep Learning Specialisation(Coursera)
Mathematics: Probability and Statistics, Advanced Calculus, Linear Algebra, Linear Algebra for AI and ML

ACADEMIC ACHIEVEMENTS

- Recipient of Jagadish Bose National Science Talent Search Senior Scholarship selected among **top 10** applicants out of **1.5M** students for academic excellence
- Secured an All India Rank of **394** in JEE-Mains and All India Rank of-**794** in JEE-Advanced among **2M** candidates and **1M** qualified candidates respectively
- Secured **All India Rank 5** in ICSE among **250K+** candidates, recognized by the state government, awarded the Swami Vivekananda Merit Scholarship
- Achieved top academic standing at IIT Kharagpur in first year, ranking among **top 12** students approved for department change to Computer Engineering