

# Yash Sirvi

+91 8653689057 | ✉ [yashseervikk2@gmail.com](mailto:yashseervikk2@gmail.com) | [in Yash Sirvi](https://www.linkedin.com/in/yash-sirvi) | [C-12-14](https://github.com/yash-sirvi)

## EDUCATION

### Indian Institute of Technology Kharagpur

*B.Tech. in Computer Science and Engineering (CGPA: 9.31) (Transcript)*

West Bengal, India

Dec 2021 - Present

## RESEARCH INTERESTS

Algorithms

Reinforcement Learning

Robotics

Planning

## EXPERIENCE

### Research Internship – Supervisor: *Prof. Partha Pratim Chakrabarti*

*Indian Institute of Technology Kharagpur*

Kharagpur

September 2023 - Present

- Conducted a study of learning-based and non-learning-based methods for solving the Travelling Salesman Problem
- Developed a divide-and-conquer algorithm with a nearest neighbor heuristic to cluster subproblems.
- Reduced problem size through graph sparsification and used graph diffusion model for generating edge probabilities to improve candidate set selection for the Lin-Kernighan Heuristic (LKH) solver
- Achieved up to a **40x** speedup and reduced the optimality gap from 11.54% to **0.02%** on instances with  $\geq 500$  nodes
- Showed generalizability by training on small TSP instances and producing high-quality results on larger problems

### Bachelor Thesis Project – Supervisor: *Prof. Aritra Hazra and Ananye Agarwal*

*Indian Institute of Technology Kharagpur, Carnegie Mellon University*

Kharagpur

August 2024 - Present

- Extended Split and Aggregate Policy Gradients (SAPG) for Multi-Agent Reinforcement Learning (MARL) and integrated centralized training and decentralized execution (CTDE) for efficient training
- Demonstrated promising results in simple MARL environments like the OpenAI multi-agent particles environment
- Currently focused on improving stability of training and testing on more complex environments with dozens of agents

### Undergraduate Researcher – Supervisor: *Prof. Debashish Chakravarty*

*Autonomous Ground Vehicle Research Group*

Kharagpur

July 2022 - Present

- Optimized Game Theoretic Planner for F1Tenth head-to-head competitive racing with non-convex constraints [\[Code\]](#)
- Integrated MDMM solver and JAX's JIT compilation, achieving a **3x speedup** through system-level optimizations
- Participated in the Machine Learning Reproducibility Challenge (2022 and 2023), submitting two preprints to TMLR
- Mentored a team of 30 undergraduates in the field of Planning, Computer Vision, and Reinforcement Learning

### IEEE Winter Workshop

*Mentor (2023) & 1st Runner-Up (2022) [\[2023 Certificate\]](#) [\[2022 Certificate\]](#)*

March 2022, 2023

IIT Kharagpur

- Mentored 160+ first-year undergraduates on Computer Vision and Path Planning fundamentals during '23 workshop
- Secured 1st Runner-Up in '22 by implementing path planning algorithms and a Traffic Sign Recognition pipeline

### Tech Lead

*CodeClub: Computer Science and Engineering Department Society*

IIT Kharagpur

February 2022 - Present

- Participated and organized multiple hackathons and competitions in the field of competitive programming
- Helped in organizing Professor Talks about various topics of research and technology in the field of Computer Science

## PROJECTS

### TOTO Benchmark Challenge | NeurIPS Competition - 1st Position | [\[Report\]](#) | [\[Code\]](#) | [\[Award Letter\]](#) Nov 2023

- Implemented and integrated a goal-conditioned diffusion-based behavior cloning agent for efficient offline training
- Designed a novel architecture to fine-tune vision representations by aligning embeddings with the difference of current and next action-states and the final goal state, improving downstream task performance
- Conducted comprehensive testing of behavior cloning and Offline RL algorithms, performing detailed ablation studies to analyze the effectiveness of vision encoders and reinforcement learning pipelines

### Decoupled Vertical Federated Learning (DVFL) | NeurIPS SSL Workshop Paper | [\[Paper\]](#) 2024

- Contributed to algorithm design for fault-tolerant federated learning on vertically partitioned data
- Extensively experimented on tabular & multi-view datasets, analyzing performance under varying fault conditions
- Achieved better performance than state-of-the-art algorithms and comparable performance in perfect conditions

**Entity Augmentation for Efficient Classification in VFL** | IJCAI GLOW Workshop Paper | [\[Paper\]](#) 2024

- Contributed to entity augmentation technique to eliminate entity alignment in Vertical Federated Learning
- Conducted experiments on tabular, multi-view, & image datasets, showing improved performance on misaligned data
- Achieved state-of-the-art results with label interpolation, reducing computational overhead on benchmarks

**Efficient Regression Test Selection for C++** | Systems Intern at [Quadeye](#) | [\[Completion Letter\]](#) May – July 2024

- Developed a toolset for efficient regression test selection with symbol-level granularity and linkage analysis
- Worked with LLVM Intermediate Representation to create representations and analyze targets effectively
- Designed a highly efficient and parallelized pipeline to analyze the entire codebase using a single CMakeFile

**The Chandrayaan Moon Mapping Challenge – ISRO** | InterIIT Tech Meet 11.0 - 1st Position | [\[Code\]](#) Jan 2023

- Implemented deep learning models for image super-resolution of lunar surface data captured from TMC-2 module
- Fine-tuned HAT, RealESRGAN and SwinIR pretrained weights on downsampled images of the lunar surface
- Achieved 16x super-resolution going from 5m to 30cm spatial resolution similar to Chandrayaan OHRC Module

**Element Abundance Detection Using XRF Spectrum – ISRO** | Inter-IIT Tech Meet 13.0 | [\[Event\]](#) Dec 2024

- Designed an efficient Ball Tree algorithm for finding intersections and merging scan files for creating abundance maps
- Accelerated [physics model](#) by [ISRO](#) used by [XSPEC](#) by 4x using JIT compilation and loop optimizations

**Stanford: Health Monitoring in LMICs** | Foreign Training Program | [\[Report\]](#) | [\[Certificate\]](#) May - Aug 2023

- Used satellite imagery and geo-tagged data along with ground level surveys to predict maternal and child health
- Handled over 120 satellite datasets with 11k+ features and performed feature engineering and data cleaning
- Carried out ablation studies and hyperparameter tuning to achieve MCRMSE: 11.16 on 6 different health factors

**Verilog Based 32-bit RISC Processor** | *Course Project: Computer Organization Laboratory* | [\[Code\]](#) Aug - Oct 2023

- Designed and synthesized a 32-bit RISC processor in Verilog, including Instruction Set Architecture, Control Unit, Datapath, and Micro-Operations, and implemented it on an FPGA using Vivado
- Developed an assembler to convert assembly code to machine code and tested functionality using Booth's algorithm

**Compiler for tinyC** | *Course Project: Compilers Laboratory* | [\[Code\]](#) Aug - Oct 2023

- Developed a compiler for tinyC, a subset of C language, to compile C code to binary code using flex, bison and C++
- Implemented symbol tables which support nesting, type checking, intermediate code generation, and backpatching

## PUBLICATIONS

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- Avi Amalanshu, **Yash Sirvi**, and David Inouye. *Decoupling Vertical Federated Learning using Local Self-Supervision*. NeurIPS 2024 Workshop: Self-Supervised Learning - Theory and Practice. [\[Link\]](#)
- Avi Amalanshu, Viswesh Nagaswamy\*, G. V. S. S. Prudhvi\*, **Yash Sirvi**\*. *Entity Augmentation for Efficient Classification of Vertically Partitioned Data with Limited Overlap*. In: Jinyang Guo et al. (Eds.), GLOW. Springer Nature Singapore, 2024, pp. 53–65. [\[Link\]](#) (\*Equal Contribution)
- Sabariswaran Mani, Abhranil Chandra\*, Sreyas Venkataraman\*, **Yash Sirvi**\*, Adyan Rizvi\*, Soumojit Bhattacharya\*, Aritra Hazra. *DiffClone: Enhanced Behaviour Cloning in Robotics with Diffusion-Driven Policy Learning*. arXiv preprint, 2024. [\[Link\]](#) (\*Equal Contribution)

## TECHNICAL SKILLS

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**Languages:** Python, C/C++, Bash, Verilog, MIPS32, L<sup>A</sup>T<sub>E</sub>X

**Tools:** Git, ROS, Docker, Jupyter Lab, SLURM, WandB, MuJoCo, Gym, IsaacGym, LLVM, CMake

**Libraries:** NumPy, pandas, Matplotlib, PyTorch, Tensorflow, HuggingFace, OpenCV, Gurobi, cvxpy, JAX

## COURSEWORK

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- **University:**

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|-----------------------------------|---|--|
| * Deep Learning                   | * Information Retrieval                 | Analysis                                 |
| * Algorithms-I, Algorithms-II     | * Formal Language & Automata Theory     | * Stochastic Processes                   |
| * Algorithmic Game Theory         | * Software Engineering                  | * Discrete Structures                    |
| * Convex Optimization             | * Probability and Statistics            | * Computer Architecture and Organization |
| * Reinforcement Learning          | * Linear Algebra for AI and ML          | * Systems Programming                    |
| * Programming and Data Structures | * Advanced Calculus                     | * Switching Circuits and Logic Design    |
|                                   | * Linear Algebra, Numerical and Complex | * Compilers                              |

- **MOOCs/Online Courses:** CS182: Deep Learning (UC Berkeley) | CS285: Deep Reinforcement Learning (UC Berkeley) | Deepmind x UCL: RL (David Silver) | Convolutional Neural Networks, Unsupervised Learning, Recommenders, RL (deeplearning.ai/Coursera)

## ACHIEVEMENTS

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- Part of the **Gold** winning InterIIT Tech Meet Contingent 2023, in The Chandrayaan Moon Mapping Challenge event
- Participated and won **Silver** in InterIIT Cultural Meet 6.0 2023 for the Quiz event. I am an avid quizzier and have created many quiz sets of my own.