Hardik SILOIYA

Fourth Year Undergraduate | Computer Science and Engineering | IIT Bombay

https://www.cse.iitb.ac.in/ hardiksiloiya
github.com/hardiksiloiya
hardiksiloiya@cse.iitb.ac.in
+91 99692 07651

My research interests include Algorithms and Complexities, Games, Operating Systems, Distributed and Cloud Computing, and Implementation of Databases. Currently, I am working on topics including fault-tolerance in Distributed systems and designing efficient algorithms for Combinatorial Games.

Education

2019 – 2023 **Indian Institute of Technology Bombay**
B.Tech in Computer Science and Engineering
GPA : 8.36/10

2017 – 2019 **Delhi Public School**
High School Diploma
GPA : 96.6%

Research Experience

Grundy numbers for Two level Poset games — Autumn 2022 (Ongoing)

B.Tech Thesis, Professor Rohit Gurjar

- Researching on developing efficient algorithms for computing Grundy Numbers for general two level Poset games and adapting them to solve similar impartial games

Exact algorithms for 5-Graph coloring — Autumn 2022 (Ongoing)

R&D Project, Professor Sundar Vishwanathan

- Researching on designing exact algorithms which work efficiently on NP-hard problem of 5-coloring in graphs

Self-stabilizing algorithm for Grid architecture — Spring 2022

R&D Project, Professor Rushikesh K. Joshi

- Developed an algorithm for stabilizing a distributed system in the form of a grid network, achieving fault recovery from arbitrary state and converging in quadratic order using mutual exclusion

Animal Detection in videos — Summer 2021

Summer Undergraduate Research Project, Professor Prabhu Ramachandran

- Built an object detection framework for accurate detection of animal species in videos
- Implemented the feature of adding multiple classes to an existing model, with only retraining the model on a subset of the previous data using Active Learning

Publications

- **Hardik Siloiya**, Rushikesh K. Joshi, "A Self-Stabilizing Mutual Exclusion Algorithm for Elevator-embedding in Grid Architecture" in preparation.

Internships

May 2022 – July 2022 | **Wells Fargo, Remote, India**
Software Engineering Intern

- Deployed a real time emotion detection chatbot obtaining an accuracy of 95% using fine-tuning the BERT model
- Implemented a low-latency suggestion generator in the chatbot using heuristic algorithms on queries and ML models to give real-time suggestions to executives from a dictionary
- Implemented a feedback loop allowing customers to rate messages, facilitating active learning of neural network

May 2021 – July 2021 | **MindWorks Global, Remote, India**

- Implemented a Faster RCNN based object detection framework via Detectron2, and fine-tuned it for accurate detection of headline and body in images of news articles, obtaining a mAP of 90%
- Used the Tesseract Optical Character Recognition model to obtain the textual information from the the objects detected by Faster RCNN
- Used HTML heuristics to accurately get the dates of the web articles from their links

</> Key Projects

Spring 2022 — SCLP : Compiler for C-like language, Compilers Lab, IIT Bombay
- Developed a **compiler and interpreter** for subset of C supporting functions, scope levels and control sequences
- Used **Lex** for tokenizing, **Yacc** for parsing and **constructed ASTs** to **generate MIPS assembly code**

Compilers | Automata Theory | Yacc | Lex | C

Autumn 2020 — Online Development Environment (ODE) , Software Systems Lab, IIT Bombay
- Developed an **online development platform** with an **isolated environment** supporting User Registration and Code saving APIs using a **code directory** storage system
- Used **Django and SQL databases** for efficient and secure management of user data
- Implemented **compiler support** for **C++, python, and Java** including their library support
- : github.com/hardiksiloiya/405-Found

Software Development | Online development | File storage | Django | Python

Spring 2021 — Multi Cycle Processor, IITB-Proc, Digital logic design lab, IIT Bombay
- Designed a **16-bit architecture**, having a **point-to-point communication infrastructure** in **VHDL**
- Implemented an architecture that supports **predicated instruction execution**, **ALU operations**, and **multiple load and store executions**
- : github.com/hardiksiloiya/IITB-Proc

Virtual Processor | ALU | 16-bit architecture

Spring 2022 — Covid Analyzer, Database Systems lab, IIT Bombay
- Developed a react application which allows users to **view and compare** various **covid statistics** from countries around the world by querying data from a **time series database** using **influxQL**
- Implemented **user groups** giving access to certain users to add data into the database and global data
- : github.com/hardiksiloiya/Covid_analyzer

Databases | influx | user groups | data visualization

Autumn 2020 — Quad Tree, Data Structures lab, IIT Bombay
- Implemented the **quad tree** data structure used for **efficiently storing sparse binary matrices** allowing compression of such images and matrices with functions to perform **binary operations** such as XOR, AND, OR
- : github.com/hardiksiloiya/Quad-Tree

Data Structures | C++

Autumn 2021 — Image Splicing Detection, Digital Image Processing, IIT Bombay
- Implemented a technique to **identify tampered images** leveraging inconsistencies in **local noise variance**
- : github.com/hardiksiloiya/Image-Splicing-Detection

Image Processing | Statistical inference

Autumn 2021 — Reinforcement Learning, Foundations of Intelligent agents, IIT Bombay
- Implemented algorithms for sampling the arms of **stochastic multi-armed bandit** including **UCB** and **KL-UCB**
- Implemented a **MDP solver** which finds the optimal policy from any state for **Anti-Tic-Tac-toe**

Reinforcement Learning | Multi-armed bandits | MDP solver | Python

Summer 2021 — Data Science, Summer of Science | Maths & Physics Club, IIT Bombay
- Undertook a detailed study on the various **Machine Learning algorithms** and investigated various practices for **extracting information from structured and unstructured data**
- Drafted a report on various Machine Learning algorithms for Data science and methods for data manipulation, and gave a presentation on **Kernel Methods**
- : github.com/hardiksiloiya/SoS-DataScience

Machine Learning | Statistics

Summer 2021 — Generative Models, Self Project, IIT Bombay
- Implemented several generative models including **RNN** and **MuseGAN** for music generation, Chatbot using a **LSTM network**, **CycleGANs** for image translation, and **Variational Autoencoder** for image compression and restoration
- : github.com/hardiksiloiya/GANs

Machine Learning | GANs | Python

Academic Achievements

2019 Secured **99.8% percentile** in **JEE Main** out of **1.4 million** candidates
2019 Secured **99.1% percentile** in **JEE Advanced** (IIT-JEE) out of **240,000** candidates
2019 Received Certificate of Merit for being among the **top 0.1%** candidates in **Chemistry** and **Computer Science** in the **All India Senior School Certificate Examination** (AISSCE)
2019 Awarded Certificate of Merit for outstanding performance and for obtaining **Grade 'A1'** in all five subjects in **AISSCE**
2018 Secured **State Rank 11** and **International Rank 207** in **International Science Olympiad** conducted by SOF
2017 Secured **State Rank 32** and **International Rank 465** in **International Mathematics Olympiad** conducted by SOF

Technical Skills

Programming Languages	C++, Python, C, Bash, Java, Sed, Awk, BASIC
Web Development	HTML5, CSS, JavaScript, Django
Software Skills	Git, MATLAB, LaTeX, MySQL, AutoCAD, SolidWorks, Android Studio

Key Courses Undertaken

Computer Science	Database Systems and Lab, Automata Theory, Compilers and Lab, Discrete Structures, Computer Architecture and Lab, Operating Systems and Lab, Artificial Intelligence & Machine Learning and Lab, Software Systems Lab, Design and Analysis of Algorithms, Logic for Computer Science, Computer Networks and Lab
Mathematics	Calculus, Linear Algebra, Differential Equations, Numerical Analysis

Extra Curricular

- Secured **City Rank 4** in the **Talent Hunt Exam** conducted by Career-Launcher
- Participated in the **Social Service Camp** conducted by Ryan Group of Institutions held at Daman
- Participated in the **International Children's Festival of Performing Arts** consisting of participants from over 45 countries.
- Successfully completed one year of **Guitar training** under **National Sports Organization**
- Received a special mention in **Video-Making Competition** organised by Culturals, IIT Bombay
- Hobbies : **Competitive Programming**, playing **guitar**, **E-Sports**, **football** and watching **anime**