

# Mrigank Pawagi

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## RESEARCH INTERESTS

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I am broadly interested **software engineering** and **programming languages**, with a focus on software verification and quality, as well as the intersection of these areas with generative AI. I also like exploring the implications of these topics on computer science education.

## EDUCATION

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**Indian Institute of Science, Bengaluru** Oct'22 – Present  
Pursuing Bachelor of Technology in Mathematics and Computing. **GPA:** 9.9/10.0. I was a recipient of the Chander Mohini and Jeewan Kapoor Merit Prize (2022-23) for obtaining the highest CGPA in the first year. I am also a Reliance Foundation Undergraduate Scholar.

**Vishwa Bharati Public School, Noida** Apr'08 – Jun'22  
Completed secondary (99.5%) and senior-secondary (99.8%) education under CBSE. Some other examinations that I took during high school are the Joint Entrance Examination: Main (AIR 367) and Advanced (AIR 410), Kishore Vaigyanik Protsahan Yojana (AIR 134), SAT (Math: 800, EBRW: 700), and the Duolingo English Test (145/160).

## RESEARCH EXPERIENCE

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### SOFTWARE ENGINEERING

#### Whole-repository Code Translation and Validation

Under preparation. Working with Prof. Darko Marinov (UIUC) and Prof. Reyhaneh Jabbarvand (UIUC). Neuro-symbolic approach for whole-repository code translation and validation from Java to Python. I am leading the development of a validation tool that leverages untranslated tests to validate individual method-level translations in isolation, allowing continuous validation during the translation process and providing bug localization. This is done through language interoperability using GraalVM's Polyglot API. Part of this work was done during an in-person *Summer Research Internship at the Thomas M. Siebel Center for Computer Science, UIUC* (May'24 – Jul'24).

#### GlueTest: Testing Code Translation via Language Interoperability

Appearing at *ICSME NIER 2024*. Second author among 17, with Prof. Darko Marinov (UIUC) and Prof. Saikat Dutta (Cornell). Technique for validating code translation by running untranslated tests on translated code using language interoperability with GraalVM's Polyglot API. We demonstrate our approach on Apache Commons CLI and Apache Commons CSV, translated from Java to Python. I led the translation of the libraries, development of the interoperability code, and writing scripts for coverage analysis. Another paper detailing our collaborative research model is under preparation.

#### GuardRails: Automated Suggestions for Clarifying Ambiguous Purpose Statements

Presented at *COMPUTE 2023*. Co-authored with Prof. Viraj Kumar (IISc). Automated approach for suggesting test cases to clarify ambiguous purpose statements for functions using Large Language Models. Released with a benchmark dataset, and a VSCode extension.

## PROGRAMMING LANGUAGES

#### Deriving Performance Benchmarks from Python Applications

Working with Prof. Ben Greenman (UUtah) as a *Summer of Reproducibility '24* fellow funded by UCSC OSPO. We are extracting performance benchmarks from real Python applications to analyse the impact of shallow and advanced typing on the performance of Meta's Cinder python.

## COMPUTER SCIENCE EDUCATION

#### Probeable Problems: Encouraging Students to Ask Clarifying Questions

Presented at *ICER 2024*. Co-authored with Prof. Viraj Kumar (IISc). Methodology for training students to identify and resolve ambiguities in specifications by asking clarifying questions. "Probeable Problems" are code-writing tasks with intentionally incomplete specifications. I led the evaluation of the study by writing scripts for analyzing submitted code and questions, and interpreting the results.

## OTHER PROJECTS

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### **PropertyEval: Benchmarking LLM Code Generation using Property-Based Testing**

Presented as a poster at *ISEC'24*. Work with Prof. Viraj Kumar (IISc). We present property-based testing as a more thorough approach than existing methods for benchmarking LLM code-generation, and also provide a semi-automated approach for creating property-based tests. Enabled several open-source contributions to the *EvalPlus* benchmark.

### **VSCode Extension for Prutor**

Work with Prof. Amey Karkare (IIT Kanpur) and Prof. Viraj Kumar (IISc). Developed a VSCode extension for Prutor, an intelligent tutoring system for programming used for CS1 courses in IISc and IIT Kanpur. Allows students to access and submit programming assignments from within VSCode, and collects important telemetry.

## LEADERSHIP

### **Automatically Generating Refute Exercises (AGReE)**

Guided a group of 3 junior students in developing a tool for using LLMs to automatically generating refute-exercises for programming assignments, with advice from Prof. Viraj Kumar (IISc).

### **HinglishEval: LLM Code Generation Benchmarks Based on Native Languages**

Guided a group of 6 junior students in benchmarking code generation from LLMs from prompts in *Hinglish*, with advice from Prof. Viraj Kumar (IISc). Helped write a paper on the project, which is currently under review.

### **International Genetically Engineered Machine (iGEM)**

I led a group of around 10 students in the Dry Lab of IISc's iGEM'23 team. We presented our work in-person at the iGEM 2023 Grand Jamboree at Paris, France. I later proposed and secured funding for an iGEM'24 team dedicated to software projects, and now act an advisor to the team.

## OTHER TOOLS

### **PBT4Automata**

Python tool for testing finite automata and context-free grammars for equivalence with regular expressions or python functions. Uses property-based testing and provides counter-examples in case of mismatches.

## RECOGNIZED PRODUCTS

**Kronologue** Web application for optimizing everyday-life schedules using an evolutionary algorithm.

**EcoGo** Platform for supporting local eco-friendly businesses and encouraging consumers to purchase sustainably.

**LocalQueue** Virtual marketplace to help digitalize local businesses.

**TattleGEN** Crowdsourced platform for fact-checking.

**WebME** Simulation-based game for cybersecurity awareness.

## SELECTED TALKS

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- Guest Speaker in CoderDojo India's meetup, and in CoderDojo India's information session for Coolest Projects.
- Panel member for discussion on "Is Mobile Humane?" at mBillionth Awards South Asia 2018, DEF India.

## SERVICE AND TEACHING

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- Student Volunteer, AI-ML Systems '23
- Designed and delivered *Hands-on Python* (HoP101), a hands-on python programming course for beginners, to around 10 rising sophomores in IISc.
- Tutor at Schoolhouse.world for middle and high school mathematics and science. Conducted nearly 50 sessions impacting over 50 students from 9 countries. Received over 90 positive ratings.