Subhajit Paul

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Research Interests

My research lies at the intersection of **Formal Verification** and **Artificial Intelligence**, where I work towards making hardware design and verification more reliable, explainable, and autonomous. I am particularly drawn to **agentifying verification workflows in Electronic Design Automation (EDA)** through Large Language Model (LLM) driven agents, and to studying coordinated decision-making via **Reinforcement Learning in Multi-Agent Environments**.

Education

The Neotia University
B.Tech. in Computer Science & Engineering — *Sep 2020 – Jun 2024*
CGPA: 9/10

Jhapardah Duke Institution
HS Education with PCM — *Jan 2018 – Feb 2020*
Percentage: 82

Experience

Indian Statistical Institute — **Kolkata, India**
Research Engineer — *Jul 2024 – Present*
- Developed a novel framework to generate SystemVerilog Assertions using LLMs as a backbone to support reliable RTL development.
- Researched the usefulness of LLMs in Model Reconciliation for robotic path planning.
- Researching the application of the Agentic workflow in EDA for verification environment generation.

Xetalabs India — **Guwahati, India**
ML Engineer Intern — *Jan 2024 – Jul 2024*
- Created an LLM-powered chat application for "Northeast Frontier Railway" to enable quick QA on their notice database.
- Developed an OCR-to-vectorization pipeline for automated information retrieval from document images.

Publications

Formal Verification and Agentic AI

LISA: LLM-Informed SystemVerilog Assertion Generation — **Indian Statistical Institute, Kolkata**
Subhajit Paul, Ansuman Banerjee, Sumana Ghosh — *2025*
Accepted at IEEE Computer Society Annual Symposium on VLSI (ISVLSI 2025).

SuperSAGA: A Supervisor-Subordinate Agent for Assertion Generation — **Indian Statistical Institute, Kolkata**
Subhajit Paul, Ansuman Banerjee, Sumana Ghosh — *2026*
Accepted at 31st Asia and South Pacific Design Automation Conference (ASP-DAC Special Sessions 2026).

VISTA: An Agentic Workflow for Formal Verification Environment Synthesis — **Indian Statistical Institute, Kolkata**
Subhajit Paul, Ansuman Banerjee, Sumana Ghosh — *2026*
Under Review and Submitted to the ACM Journal on Emerging Technologies in Computing Systems.

LLMs in Robotics

LLM-Guided Reconciliation for Explainable Robotic Path Planning — **Indian Statistical Institute, Kolkata**
Subhajit Paul, Ansuman Banerjee — *2025*
Accepted at IEEE Autonomic Computing and Self-Organizing Systems (ACSOS 2025).

Ongoing Research Work

Multi-Agent Reinforcement Learning

Exploring cooperative and competitive learning among autonomous agents, focusing on coordination, credit assignment, and emergent behaviour in complex multi-agent settings.

LLM-based Agentic Systems

Building tool-augmented, supervisor-subordinate LLM agents that plan, reason, and self-correct to automate formal verification and environment synthesis within EDA pipelines.

Projects

LISA: LLM Informed SystemVerilog Assertion Generation **2024 – 2025**

- A framework that uses LLMs and RAG to automatically generate, analyze, and iteratively refine SystemVerilog Assertions (SVAs).
- Tools: OpenAI API, Anthropic Claude API, Ollama, Cadence Jaspergold, ChromaDB
- Programming Languages: Python, SystemVerilog.
- **GitHub:** https://github.com/Subhajit-Paul/LISA

KG: Knowledge Graph Construction for Hardware Verification **2025**

- Built a domain-specific Knowledge Graph (KG) pipeline that ingests hardware RTL and design specifications
- This framework can extract entities, relationships, and structural design context
- Tools: GraphRAG, pyverilog, OpenAI API.
- Programming Languages: Python.
- **GitHub:** https://github.com/Subhajit-Paul/KG