

Ayush Pandey

Distributed Systems Researcher

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Research Interests

Distributed Systems, Consistency protocols, CRDTs, Graph Databases

My primary interest lies at the intersection of distributed systems and connected data. I am particularly interested in the design, implementation, and verification of replication and consistency protocols for distributed systems. During my PhD, I have worked on multi-granularity locking in dynamic hierarchies and developed CALock, a new locking protocol for parallel threads over hierarchical data. I am collaborating with researchers from NOVA LINCS and RPTU Kaiserslautern to specify the correctness of transactional database backends. Alongside, with Telecom Sud-Paris on designing and developing a schema-first, local-first graph system to facilitate collaborative knowledge graph editing.

Publications

- 2026 **Safety of Database Backend Stores, ICDT**, (Preprint)
- 2025 **Towards Local-First Distributed Property Graphs, PaPoC**
- 2025 **CALock: Multi-granularity locking in dynamic hierarchies, IPDPS**
- 2024 **Diversifying locks for effective synchronization in dynamic graphs, EuroSys DW**
- 2023 **Verrouillage multi-granularité dans les graphes orientés, ComPas**

Experience

- 2022-2025 **PhD Researcher, LIP6, Sorbonne Université (UPMC), Paris**
 - Thesis: **CALock: topological multi-granularity locking in hierarchies**
 - Designed, implemented and verified a new locking protocol for parallel threads over hierarchical data. CALock identifies an optimal grain size for locking in a hierarchy of data structures.
 - Implemented and verified several thread synchronization protocols in java and C++ as well graph database implementations in TinkerPop(gremlin) as proof of concept. Performed benchmarks for performance evaluation.
 - Collaboration in projects involving **industry partners and research labs**. Ongoing collaboration with Telecom sud-Paris to design, implement and formally verify a distributed graph database. Second ongoing work within LIP6 on the specification and verification of a distributed key-value store.
- 2021-2022 **Research Intern, LIP6, Sorbonne Université (UPMC), Paris**
 - **Implementation of a cache for a CRDT datastore**. Worked on designing and implementing an in memory cache and checkpoint store for AntidoteDB.
 - Undertook performance benchmarking in a distributed environment with Riak Bench.
 - Fixed several bugs in the general implementation of AntidoteDB and achieved a 40% performance improvement in the read path.
 - **Tech Report: Persisting the AntidoteDB Cache**
- 2020-2021 **Full stack Web Engineer, LernFair e.v., Remote, Germany**
 - Worked on the development of an online learning platform for school students to facilitate remote learning during Covid-19 lockdowns.
 - Implemented the frontend in ReactJS and the backend in NodeJS and GraphQL along with alpha and beta testing of features.
 - Implemented the service layer in a microservice architecture with content delivery through REST APIs.
- 2020-2021 **Research Assistant, German Center for AI (DFKI), Kaiserslautern, Germany**
 - Developed a custom tool for visual graph editing tool with automated graph structuring and enforcing P&ID constraints on nodes and edges of the graph in AngularJS and D3.js.
 - Writing test suites for performance. testing on peak loads and high data volumes with python.
- 2017-2019 **Software Engineer, Newgen Software Technologies, India**
 - Development of custom workflow, content management and business process automation solutions for major Banks, Health care providers and insurance companies.
 - Developed custom dashboards and reports for telemetry and report generation.
 - Delivered technical training and support to business clients in the asia pacific region.

Education

- 2025 **PhD in Distributed systems, LIP6, Sorbonne Université (UPMC), France**
- 2022 **Master in CS, Software Engineering, TU Kaiserslautern, Germany**
- 2017 **Bachelor of Technology, APJ Abdul kalam technical university, India**