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

2025 **Safety of Database Backend Stores**, *ICDT*, (Preprint)
2025 **Local-First Distributed Property Graphs**, *PaPoC*, (Preprint)
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