2531cc1043

Specification- and Verification-First Human-in-the-Loop Software Factories with Agentic AI

EPSRC theme	Information and Communication Technologies
Principal supervisor name	Justyna Petke
Principal supervisor UCL profile website	https://profiles.ucl.ac.uk/38058-justyna-petke
Host faculty and host department	Engineering Sciences Computer Science
Lead department website	https://www.ucl.ac.uk/engineering/computer-science
Department PGR administration email	cs.researchdegrees@ucl.ac.uk; cs.phdadmissions@ucl.ac.uk
Standard or collaborative project	Collaborative project
Restrictions for candidates applying	Home and International fees candidates may apply
Partner name	Bloomberg
Additional partner stipend enhancement (per year)	£2,400

Project summary

Why this research is important
Modern software development is undergoing a massive shift with the rise of generative AI and Large Language Models. However, relying on AI to write code straight from open-ended natural language prompts often results in subtle bugs, hallucinations, and security vulnerabilities. This PhD project tackles that challenge head-on by pioneering a next-generation engineering framework: autonomous multi-agent software factories anchored by formal specifications and automated verification.

Who you will be working with
- Prof. Justyna Petke and Prof. Federica Sarro from UCL Computer Science, globally recognized for their pioneering work in Search-Based Software Engineering (SBSE), automated testing, and code optimization.

- Dr Serkan Kirbas from Bloomberg London and collaborating closely with engineers working at the cutting edge of massive, ultra-reliable financial software systems. You will benefit from a direct bridge between world-class academic research and real-world industrial deployment.

What you will be doing
- Design and orchestrate multi-agent software architectures where specialised AI agents collaborate (acting as architects, developers, testers, and reviewers).
- Develop specification-driven pipelines that ensure AI agents generate code conforming to formal properties and safety guarantees.
- Integrate Automated Program Repair and Genetic Improvement techniques to allow the software factory to

autonomously self-heal bugs and optimise non-functional-properties (like latency and memory).
- Evaluate your frameworks on complex, industrial-scale codebases provided by Bloomberg, bridging theory with practice.

Who we are looking for
We are seeking a highly-motivated PhD candidate with:
- A strong background in Computer Science, Software Engineering, Artificial Intelligence, or a closely related quantitative discipline.
- Solid programming skills and a keen interest in applying machine learning, automated reasoning, or search-based optimisation to software engineering problems.
- Curiosity about the intersection of generative AI, multi-agent systems, and formal methods.
- Strong communication skills and a desire to collaborate closely with both academic peers and industry engineers.