

The Seminars on “Information Technology Outlook” - PhD Program in Computer Science and Mathematics



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Inside Open Source's Response to External Shocks: A Repository Mining Study of Development Patterns and Community Dynamics

Abstract

Understanding how external events impact open-source development patterns is vital for project sustainability, yet measuring these impacts systematically remains challenging. Through an extensive mining study of ten major Ethereum repositories spanning a decade (2014-2024), we examine how different types of events - from market crashes to technical upgrades - influence developer behaviour and project evolution. Our analysis reveals distinct response patterns between technical and market events, showing how different types of repositories adapt to changes in their environment.

Building on these insights, we conducted a detailed examination of Solidity, the primary programming language for Ethereum smart contracts. This analysis provides an interesting window into how a programming language evolves when developed entirely in an open environment. By developing a novel contribution index combining multiple metrics and analysing emotional dynamics in developer communications, we find patterns of contributor engagement and community evolution in this specialised technical context. These complementary studies improve our understanding of both the macro-level impacts of external events on open source development and the micro-level dynamics of developer interactions in community-driven projects.

This talk will present our methodology for studying repository dynamics at different scales, from broad event-based analysis across multiple repositories to deep emotional and behavioural patterns within a single project, offering insights for both researchers and practitioners in open source development.

Bio

Dr Giuseppe Destefanis is Associate Professor in the Department of Computer Science at University College London (UCL), where he is part of the Financial Computing & Analytics group, and Co-Head of the London SmartBridgeLab. His research covers Empirical Software Engineering, Mining Software Repositories, Large Language Models, and Blockchain technologies. He focuses on improving software quality and the developer experience, and on examining how new AI tools can support software engineering and be integrated into organisational practice. He studies software projects as socio-technical systems, applying data mining, machine learning, and time series analysis to source code and developer communications. This work yields evidence for improving productivity and software quality, and has led to collaborations with technology companies. In Blockchain, Prof. Destefanis researches smart contracts and distributed ledger technologies in finance, offering insights relevant to both policy makers and institutions considering adoption.