

PRIVACY-PRESERVING DISTRIBUTED LEDGER APPLICATIONS

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Research Group: Telematics Systems Engineering Group

The Telematics Systems Engineering Group (GIST) explores the convergence of artificial intelligence, cognitive ageing modelling, and privacy-preserving distributed ledger technologies to design next-generation intelligent systems that are adaptive, secure and inclusive, spanning multiple application fields. Group activities involve the development of AI-driven platforms capable of personalizing experiences based on dynamically inferred cognitive profiles and trajectories, enabling tailored interventions for diverse populations, including older adults. At the same time, the group investigates how decentralized ledger technologies and advanced cryptographic methods can ensure the secure management of data and identities, preserve privacy while enable trust, transparency, and interoperability across systems. The work spans machine learning for longitudinal user modelling, human-centered adaptive system design, and secure distributed infrastructures, with the goal of creating robust, privacy-aware ecosystems.

Keywords: Privacy-preserving blockchain | Zero-knowledge proofs | Confidential smart contracts | Decentralized identity systems | Secure distributed applications

Research Focus:

Investigate how decentralized ledger technologies can support secure, trustworthy, and privacy-aware digital services in environments where sensitive data or transactions are involved. This research topic focuses on the design and evaluation of cryptographic protocols, distributed architectures, and secure smart contract mechanisms that enable data sharing, auditing, and coordination across multiple parties without exposing confidential information. Integration of advanced privacy-enhancing technologies - such as zero-knowledge proofs, secure multi-party computation, and confidential transactions - into blockchain-based systems. Development of scalable and interoperable frameworks for applications in domains like digital identity, healthcare data sharing, supply chains, decentralized finance and collaborative platforms. The objective is to build systems that reconcile decentralization and transparency with strong privacy guarantees, regulatory compliance, and practical deployability, contributing new methods and tools for trustworthy data management in distributed digital ecosystems.