The Ethical Requirements Stack: Operationalizing Adaptive Ethical Requirements with Human-AI Collaboration and GPT-based LLMs

About

This study introduces the Ethical Requirements Stack (ERS), a structured framework designed to translate high-level ethical principles into concrete development tasks for AI systems. Using a design science research methodology, the paper demonstrates a collaborative workflow where humans and GPT-based Large Language Models (LLMs) work together to elicit, decompose, and manage these ethical requirements in an Agile-inspired environment.

Problem

Software development teams often struggle to convert abstract ethical principles like fairness and transparency into specific, actionable requirements. This leads to an accumulation of "ethical debt," where unresolved ethical issues create risks of reputational harm, regulatory penalties, and loss of stakeholder trust.

Study Outcome

- The study introduces the Ethical Requirements Stack (ERS), a practical framework for breaking down broad ethical themes into actionable Epics, Features, and Stories.
- Human-AI collaboration was shown to be highly effective; AI generated a high volume of potential ethical requirements, while human experts provided crucial contextual nuance, critical judgment, and strategic direction.
- AI tended to generate more granular, story-level requirements, whereas humans focused on higher-level strategic themes, demonstrating complementary strengths.
- The iterative process of refining AI-generated outputs with human oversight significantly improved the clarity, relevance, and actionability of the ethical requirements.
- The ERS framework provides a dynamic method for managing and reducing ethical debt by integrating ethics into the software development lifecycle from the start.

Keywords

Ethical Requirements Stack • Human-AI Collaboration • Large Language Models (LLMs) • AI Ethics • Requirements Engineering • Ethical Debt • Agile Development