

Lady Linux: A Human-Centered Operating System with Integrated Language Intelligence

Abstract

Lady Linux is a proposed open-source operating system designed as a senior capstone project that integrates a native Large Language Model (LLM) directly into the operating system to improve user data literacy, system transparency, and human-centered control over computing environments. The project addresses a growing gap between increasingly complex digital systems and the limited ability of non-technical users to understand, manage, and secure their data.

Modern operating systems and consumer devices obscure critical mechanisms such as permissions, cookies, sessions, storage, and background processes, leaving users unable to make informed decisions about how their data is created, stored, shared, or exploited. Lady Linux proposes a language-based companion assistant that can inspect system and application behavior, explain it in meaningful terms, and guide users through configuration decisions using natural language while maintaining human-in-the-loop oversight.

The system is organized around several core technical pillars. First, students will evaluate existing Linux distributions or build directly from the kernel to create a minimal, purpose-built operating system with carefully selected libraries, utilities, and security fundamentals. Second, a locally hosted LLM will be integrated and fine-tuned on technical documentation and system data to support insight-driven interaction rather than autonomous control. Third, an abstraction layer, initially prototyped using Python and FastAPI, will mediate access between the LLM and system resources, enforcing least-privilege access, approval workflows, and reversible system changes.

Additional development areas include a robust data management framework that treats user-generated activity as first-class data, a strong security model that mitigates risks of automated agents, and a human-computer interaction (HCI) focused graphical interface designed for accessibility, teachability, and transparency. The interface will include interactive tutorials and onboarding tools that help users develop practical data literacy alongside system use. Hardware considerations span desktop and laptop prototyping with exploratory research into mobile platforms, emphasizing repairability and sustainability in contrast to modern locked-down consumer devices.

As a senior capstone, Lady Linux offers students hands-on experience across operating systems, artificial intelligence, cybersecurity, software architecture, user experience design, and ethical computing. The project's open-source foundation encourages collaboration, experimentation, and long-term extensibility. Ultimately, Lady Linux aims to demonstrate how intelligent systems can empower users rather than obscure control, positioning the operating system as a transparent, teachable, and user-aligned computing platform.