Senior Project Proposal: Lady Linux

Project Title

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

Project Overview

Lady Linux is a proposed senior capstone project that explores the design and prototyping of an open-source Linux-based operating system with a native, integrated Large Language Model (LLM). The goal of the project is to improve system transparency, data literacy, and user agency by enabling natural-language interaction with operating system components, applications, and user-generated data.

The project positions the operating system not merely as a technical platform, but as an intelligent, teachable system that helps users understand how their data is created, stored, shared, and modified. Lady Linux aims to demonstrate how language-based interfaces can bridge the gap between complex system architectures and non-expert users while maintaining strong security and human oversight.

Problem Statement

Modern operating systems and consumer computing platforms increasingly obscure critical system behaviors and data flows. Concepts such as permissions, cookies, sessions, background processes, and storage mechanisms are difficult for non-technical users to understand or control. As a result, users often lack meaningful agency over their own data and system configurations.

At the same time, emerging AI systems are frequently designed as autonomous agents with broad system access, raising significant concerns around safety, security, and unintended consequences. There is a need for computing platforms that balance intelligent assistance with transparency, consent, and human-in-the-loop control.

This project addresses these challenges by proposing an operating system architecture in which a language model serves as an interpretive and instructional interface rather than an autonomous decision-maker.

Project Objectives

The primary objectives of the Lady Linux senior project are to:

1. Design and prototype a minimal Linux-based operating system suitable for intelligent system interaction.

2. Integrate a locally hosted Large Language Model capable of inspecting and explaining system behavior.

3. Develop an abstraction layer that mediates controlled access between the LLM and operating system resources.

4. Implement security principles such as least privilege, approval workflows, and reversible system changes.

5. Create a user interface that prioritizes accessibility, teachability, and data literacy.

6. Explore ethical and sustainability considerations related to data ownership, repairability, and user autonomy.

Project Scope

The project is exploratory and prototypical in nature. It will focus on desktop and laptop computing environments, with research-level investigation into mobile platforms. The scope includes:

- Evaluation of existing Linux distributions or construction from the kernel level

- Selection and configuration of system libraries, utilities, and security features

- Integration of an LLM using CPU-based or GPU-assisted inference

- Development of a middleware abstraction layer using Python and FastAPI

- Design of a graphical user interface and onboarding/tutorial components

- Documentation of system architecture, design decisions, and ethical implications

The project does not aim to produce a commercial-ready operating system, but rather a functional proof-of-concept demonstrating the feasibility and value of the approach.

Methodology

The project will follow an iterative, research-driven development methodology:

1. **System Research & Planning**
   Review Linux distributions, kernel options, security models, and LLM deployment strategies.

2. **Operating System Prototyping**
   Build or customize a Linux environment with minimal bloat and selected core utilities.

3. **LLM Integration**
   Deploy a local language model and fine-tune or configure it using technical documentation and system metadata.

4. **Abstraction & Security Layer**
   Implement a middleware layer that enables controlled system inspection and modification with user approval and rollback capability.

5. **User Interface Development**
   Design a human-centered interface that allows conversational interaction with the system and provides guided learning tools.

6. **Testing & Evaluation**
   Evaluate usability, security boundaries, system performance, and clarity of explanations.

Expected Outcomes

By the conclusion of the senior project, the expected deliverables include:

- A working prototype of the Lady Linux operating system

- Integrated LLM capable of system explanation and guided configuration

- Middleware abstraction layer enforcing security constraints

- Graphical user interface with interactive tutorials

- Technical documentation and architectural diagrams

- Final project report and presentation

Educational Value

This project provides students with hands-on experience across multiple domains, including operating systems, artificial intelligence, cybersecurity, software architecture, and human-computer interaction. It emphasizes ethical computing, user-centered design, and open-source development practices, making it well suited to a senior capstone experience.

Conclusion

Lady Linux represents an interdisciplinary exploration of how intelligent systems can empower users rather than obscure control. As a senior project, it offers both technical depth and societal relevance, demonstrating how operating systems can evolve to support transparency, data literacy, and responsible AI integration.