

# **Integration of Artificial Intelligence in Education and Software Development**

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Luna Schätzle

Florian Prandstetter

Diploma Thesis Defense – April 2025

HTL Anichstraße, Department of Business Informatics

Thesis Supervisor:

Mag. Dr. Dipl.-Ing. Albert Greinöcker

MMag.<sup>a</sup> Eva-Maria Egger, MA



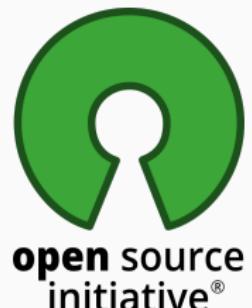
# Introduction

- **Presenter:** Luna Schätzle – Project Lead  
(AI evaluation, backend & website)
- **Objective:** Develop an open-source AI platform for education
- **Focus:** Evaluate various AI models for diverse applications
- **Platform:** Provide students with accessible AI tools
- **Motivation:** Mitigate the high resource demands of current open-source AI models



# Open Source: Impact & Approach

- **Definition:** Public, collaborative development
- **Benefits:** Cost-efficient, flexible, and secure via community review
- **Impact:** Fuels innovation and startup growth
- **Approach:** Leverage Python, Flask, and Vue.js
- **Licensing:** Released under GNU GPL-3.0



# Testing and Evaluation

- **Models Evaluated:** Llama3.2, Deepseek-r1, Gemma2, Qwen, etc.
- **Methods:** Automated testing with varied prompts via Python scripts.
- **Criteria:**
  - Response time
  - Accuracy
  - Resource utilization
  - BLEU score
  - Readability and text quality



# Evaluation Results

- **Data Visualization:** results plotted to highlight key differences
- **Performance Analysis:**
  - Distinct variations in latency, accuracy, and resource consumption
  - Compact models often yield superior efficiency
- **Key Insight:** Model size is unreliable for overall performance; holistic evaluation is essential.
- **Integration:**
  - Flexible, user-driven model selection
  - User can select the model based on their needs



# Website Platform

- Developed to provide students with an interactive AI interface.
- Technologies: Vue.js (Frontend), Flask (Backend API), and Firebase (Authentication).
- Serves as a centralized portal for accessing various AI tools.

The screenshot shows the homepage of the Luminara Schüler-KI-Plattform. At the top, there is a navigation bar with links for "Accueil", "Chat Beta", "OCR", and "OpenAI Image". Below the navigation bar, a large button says "JETZT PROBOSTRIESEN". The main title is "Luminara Schüler-KI-Plattform" with the subtitle "Deine Unterstützung beim Lernen mit leistungsfähigen KI Tools". A "Beschreibung" section provides a brief overview of the platform's purpose. Two cards below, titled "Funktionen", show "Programmierwerk" (with a code icon) and "OCR (Bild zu Mischtext)" (with a document icon). Both cards have explanatory text and small icons.



# User System

- Secure registration and login.
- User profile management.
- Firebase-based authentication.

Willkommen, Test User  
Role: student

Deine Kontoinformationen	
E-Mail:	Verbleibende Tokens:
user.test@gmail.com	94
Registriert am:	Letztes Login:
18. Februar 2025	18. Februar 2025 um 09:22

[Passwort zurücksetzen](#) [Student hinzufügen](#)

[Abmelden](#)

Dashboard

Verwendete Tokens: 0

Funktionen

- Olimex KI
- Chat
- Bilderkennung



# Chatbot Interface

- Multiple AI models available via a tabbed interface:
  - ChatGPT (OpenAI API)
  - Local models (e.g., Ollama)
  - Programming Assistant
- Vision capabilities: LLaVA, LLaMA 3.2 Vision.

The screenshot shows the Luminara AI v.1.0 interface. At the top, there is a navigation bar with links: Home, Account, Chat Bots, OCR, and OpenAI Image. Below the navigation bar, there is a sidebar titled "Luminara AI v.1.0" containing buttons for "Chat mit Ollama", "Luminara Vision Models", "Programming Bots", and "Chat GPT". The main content area is titled "Powered by Ollama and Flask-API" and includes a section for "Kommunikation mit Ollama (LLaMA-Modell)" with a dropdown menu set to "Wähle ein KI-Modell: LLaMA 3.2 - 1B (schnell)". A message at the bottom says "Bitte wähle einen Chat oder starte einen neuen.". To the right, there is a sidebar titled "Gespeicherte Chats" listing "Schule" and "Mathe" with trash can icons, and an "E-Mails" section. A blue button at the bottom right says "+ Neuer Chat".



# Image Generation

- Generate images from text prompts.
- Powered by DALL · E (OpenAI).

OpenAI Image

Bildgenerator  
Verbleibende Token: 84

Gib einen Prompt ein (z. B. 'A cute baby sea otter')

Bild generieren (5 Token)

Bild erfolgreich generiert!



# OCR ... Objective Character Recognition

- OCR capabilities using Tesseract.
- Post-processing with a large language model.
- Outputs formatted using Markdown.

OCR-Funktionalität

Lade ein Bild hoch, um den Text zu extrahieren und zu verbessern.

Datei auswählen | Keine ausgewählt

Extrahierter Text:

Bei einer Hausübung soll die Differentialgleichung  $y' = y + 4$  mittels Trennen der Variablen gelöst werden. Angelika lädt die Aufgabe folgendermaßen:

$y'$   
Praktisch  
 $\text{det} = \text{dy/dt} - Ax(y(t)) = A$

Verbesserter Text:

**Hausübung: Lösung der Differentialgleichung  $y' = y + 4$**

Bei einer Hausübung soll die Differentialgleichung  $y' = y + 4$  mittels Trennen der Variablen gelöst werden. Angelika lädt die Aufgabe folgendermaßen:

$y'$   
Praktisch  
 $\text{det} = \text{dy/dt} - Ax(y(t)) = A$

Schritte zur Lösung der Differentialgleichung

1. Trennen der Variablen: Lassen Sie  $S(y)$  und  $S(y')$  getrennt sein, um die Gleichung zu lösen.
2. Lösung von  $x$ : Die Gleichung lautet nun  $S(y)/S(y') = 15$ , was sich zu  $S(y) = 1 + Cx$  vereinfacht.

Lösung der Differentialgleichung

Die ursprüngliche Gleichung ist jedoch  $By' = y + 4B$ .



## Applications:

- Customer service & support
- Supply chain management
- Predictive analytics
- Data analysis
- Process automation

## Ethical & Social Concerns:

- Bias in training data
- Transparency & accountability
- Privacy and data protection
- Job displacement and workflow changes



# AI in Economics and Ethics: Regulatory Challenges

- Data security standards  
(GDPR [EUR-Lex: 2016/679])
- EU AI Act considerations  
[EUR-Lex: 2024/1689]
- Inconsistent global regulations



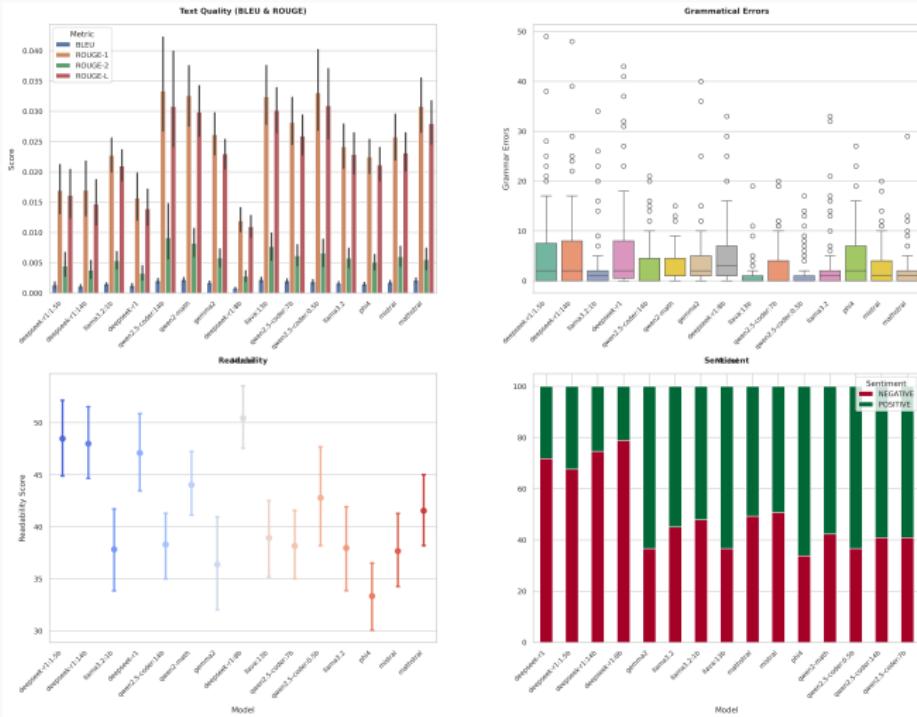


Thank You for Your Attention!

A decorative graphic consisting of nine overlapping squares arranged in a diamond pattern. The colors of the squares are light gray, yellow, light purple, orange, light green, and pink. They overlap to create a sense of depth and texture.

# Backup slides: Graphes

# Evaluation Results: Qualitative metrics



# Evaluation Results: Quantitative metrics

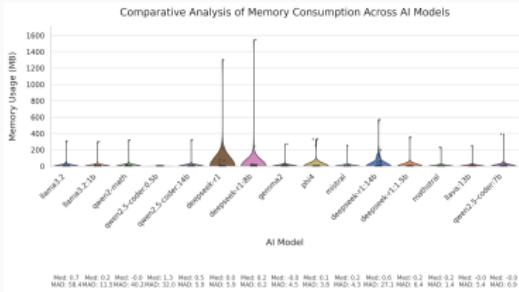
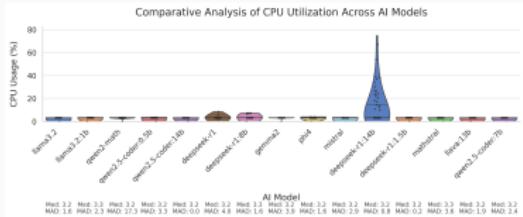


Figure 2: CPU Usage Comparison

Figure 3: Memory Usage Comparison





# Backup slides: Graphes

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- **Server Hardware:**
  - CPU: Intel Core i5-8600k
  - GPU: NVIDIA GeForce RTX 2060
  - RAM: 16GB DDR4
  - Motherboard: H370 Chipset
  - Power Supply: 500W BeQuiet
  - Storage: 512GB NVMe SSDd
- **Used Operating System:** The Server is running with the Ubuntu Server Operating System. The Operating System has been chosen due to the good CUDA support.



- **Networking:**
  - Axios: Used for server requests
  - Tailscale: VPN tunnel used for secure remote access
- **Backup and Recovery:** Regular system backups have been made to avoid data loss.



# Flask Service

- Flask as a Web Framework
- Architecture and Service Structure
- Restful Endpoints and Functionalities
- Deployment with Docker



# Visual Studio Code Extension

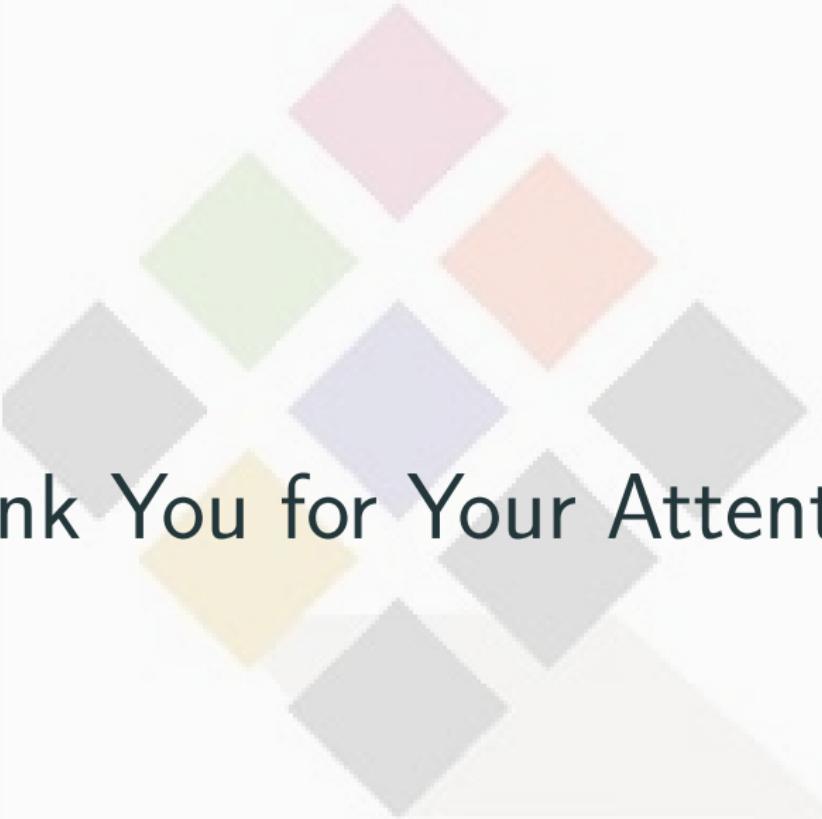
- VS Code API / Typescript
- Server Request
- Integrated Chatbot
- Status Bar Item



# Operating System Market Share

- **Competitors:** Android, Microsoft Windows, Apple and Linux hold most of the market.
- Bild
- **For Servers:** When looking at Server Operating Systems specifically The main Competitors are Red Hat and Microsoft.
- Bild





Thank You for Your Attention!