

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

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Diploma Thesis Defense – April 2025

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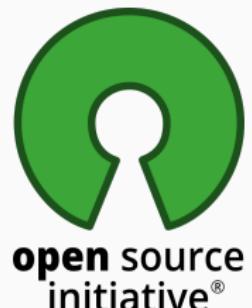
# Introduction

- **Presenter:** Luna Schätzle – AI evaluation & 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
  - Resource utilization
  - Accuracy
  - Readability and text quality



# Evaluation Results

- **Data Visualization:** results plotted to highlight key differences
- **Performance Analysis:**
  - slight 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: Education Platform

- Serves as a centralized portal for accessing various AI tools.
- Technologies: Vue.js (Frontend), Flask (Backend API), and Firebase (Authentication).

The screenshot shows a web application interface titled "Luminara Schüler-KI-Plattform". At the top, there are navigation links for "Accueil", "Chat Beta", "OCR", and "OpenAI Image". Below the title, a button says "JETZT PROBOSTRIESEN". A section titled "Beschreibung" provides a brief overview of the platform's purpose: "Die Schüler-KI-Plattform ist eine webbasierte Anwendung, die es Schülern ermöglicht, sich anhand von unterschiedlichen künstlichen Intelligenzen (KI) zu interagieren. Die Plattform kombiniert die Nutzung der ChatGPT API mit weiteren lokalen KI-Modellen wie Olmeca, die auf dem Schülereigenen Gedanken basieren. Ziel ist es, den Schülern vielseitige Unterstützung beim Lernen und bei der Bearbeitung von Aufgaben zu bieten." Below this, a section titled "Funktionen" lists two main features: "Programmierwerk" (represented by a code icon) and "OCR (Bild zu Mischtext)" (represented by a document icon). Both sections include short descriptions of their functions.



# User System

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

Willkommen, Test User  
Role: student

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](#)

Deine Kontoinformationen

Dashboard

Verwendete Tokens: 0

Funktionen

- Olimex KI
- Chat
- Bilderkennung



# Chatbot Interface

- Multiple AI models available via a tabbed interface:
  - Evaluated models (e.g. Llama3.2, ...)
  - Vision capabilities: LLaVA, LLaMA 3.2 Vision.
  - Programming Assistant
  - ChatGPT (OpenAI API)

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 this is a main content area with a sidebar on the right.

**Luminara AI v.1.0**

- Chat mit Ollama
- Luminara Vision Models
- Programming Bots
- Chat GPT

**Powered by Ollama and Flask-API**

Kommunikation mit Ollama (LLaMA-Modell)

Wähle ein KI-Modell: LLaMA 3.2 - 1B (schnell) ▾

Bitte wähle einen Chat oder starte einen neuen.

**Gespeicherte Chats**

- Schule
- Mathe
- E-Mails

+ 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 ... Optical 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

OCR ausführen

Extrahierter Text:

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

$y'$   
Fraktion!  
 $\frac{dy}{dx} = \frac{y+4}{x}$   $\Rightarrow y = \dots$

Kopieren

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:

$y'$   
Fraktion!  
 $\frac{dy}{dx} = \frac{y+4}{x}$   $\Rightarrow y = \dots$

Kopieren

Schritte zur Lösung der Differentialgleichung

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

Lösung der Differentialgleichung

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



## Applications:

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

## Ethical & Social Concerns:

- Bias in training data
- workflow changes
- Privacy and data protection



# AI in Economics and Ethics: Regulatory Challenges

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



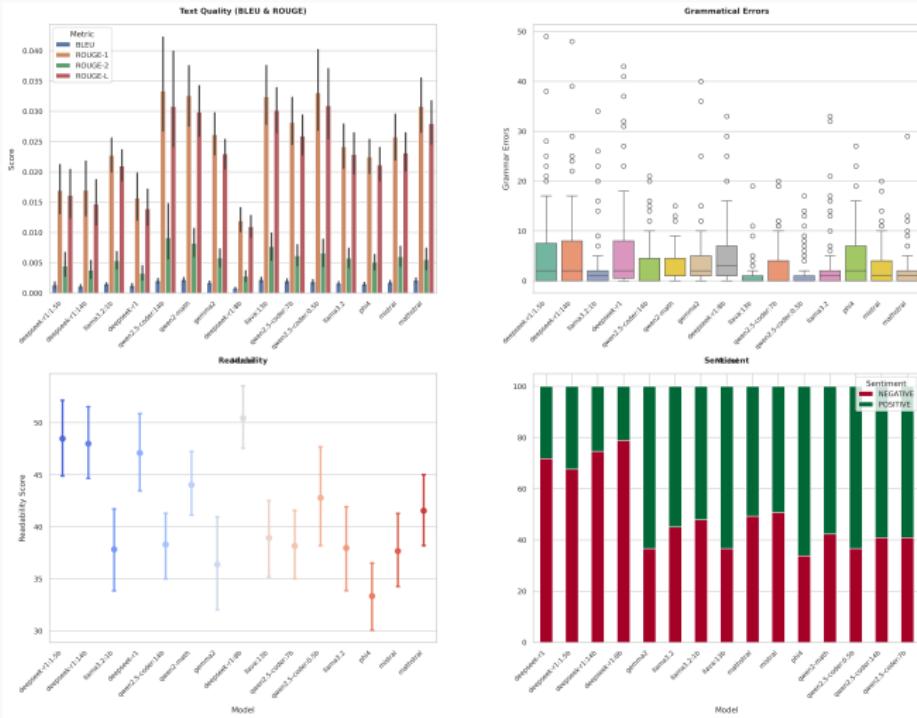


Thank You for Your Attention!

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



**Figure 1:** Evaluation Results of AI Models

# Evaluation Results: Quantitative metrics

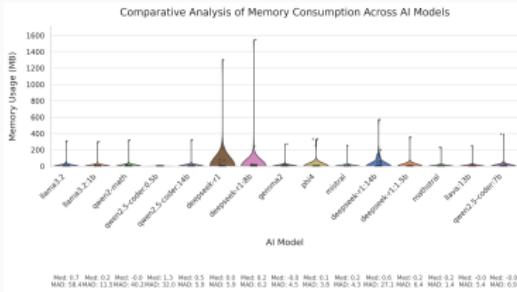
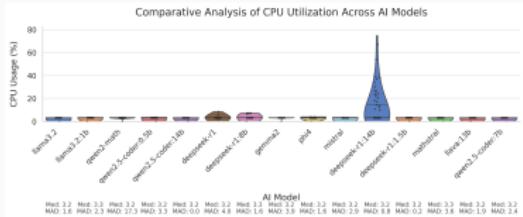


Figure 2: CPU Usage Comparison

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.



# Server

- **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

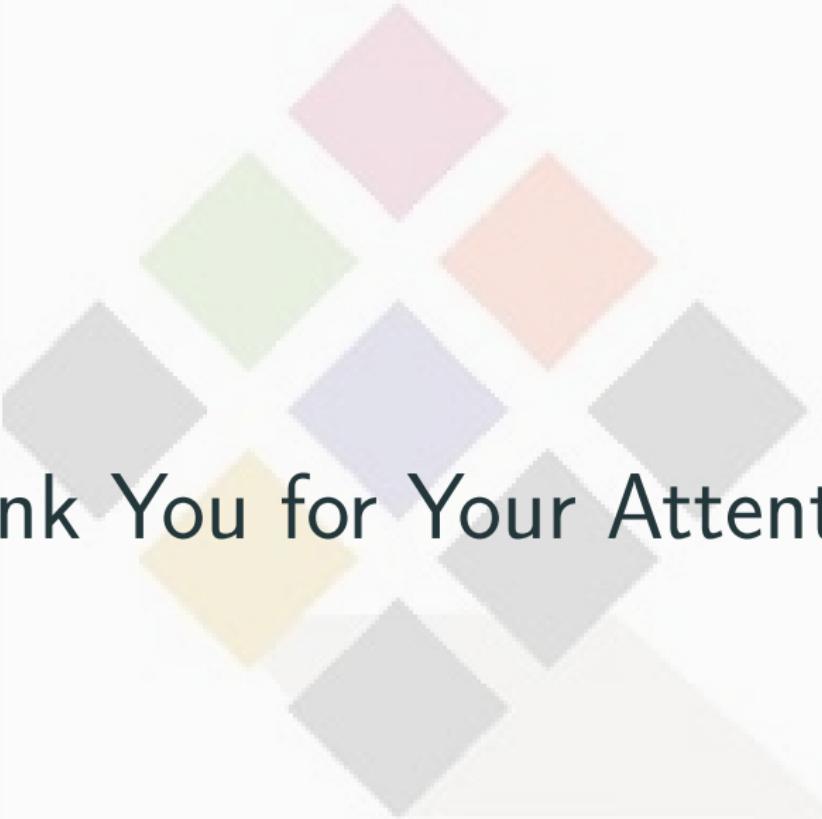
- VS Code API / Typescript
- Server Request
- Integrated Chatbot
- Status Bar Item



# 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!