Integration of Artificial Intelligence in Education and Software Development

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Introduction

- **Presenter:** Luna Schätzle – Project Lead (AI evaluation, backend & website)
- **Objective:** Open-source AI platform for education
- **Focus:** Evaluate various AI models for multiple use cases
- **Platform:** Enable students to access and experiment with AI
- **Motivation:** Overcome high resource requirements of current Open Source AI models

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Open Source: Impact & Approach

- **Definition:** Public, collaborative development
- **Benefits:** Cost-efficient, flexible, secure via community review
- **Impact:** Fuels innovation and startup growth
- **Our Approach:** Leveraging Python, Flask, Vue.js
- **Our Application:** Open-source licensed under GNU GPL-3.0

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Testing and Evaluation

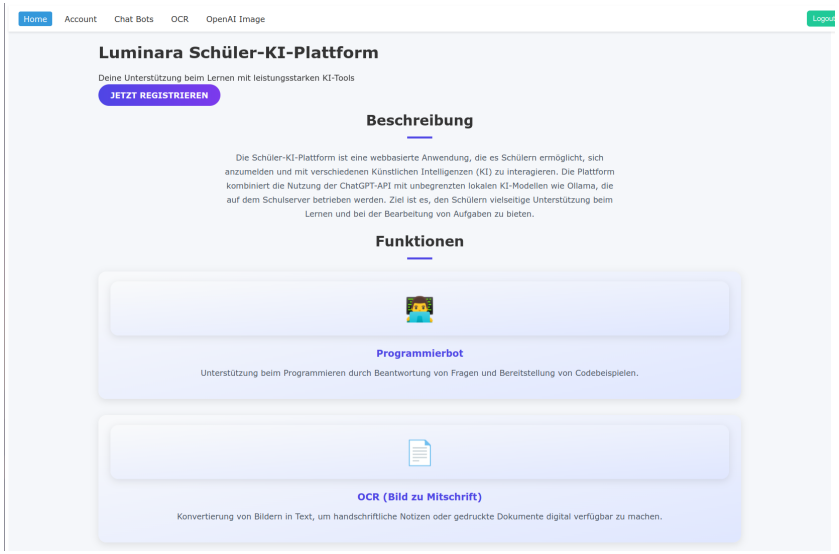
- Evaluation of models: Llama3.2, Deepseek-r1, gemma2, qwen, ...
- Testing methods: Different prompts and tasks where asked the models (automated via Python script)
- Evaluation criteria:
  - response time
  - accuracy
  - resource usage
  - BLEU score
  - readability
  - Textquality

Evaluation Results

- **Data Preparation:** Graphical analysis was conducted to elucidate patterns.
- **Model Performance:**
  - Marked differences in response time, accuracy, and resource consumption.
  - Smaller models demonstrated superior efficiency.
- **User Integration:**
  - A diverse array of models is available for selection.
  - The top-performing model is auto-recommended.
- **Key Insight:** Model size does not reliably predict quality; balanced assessments are imperative.

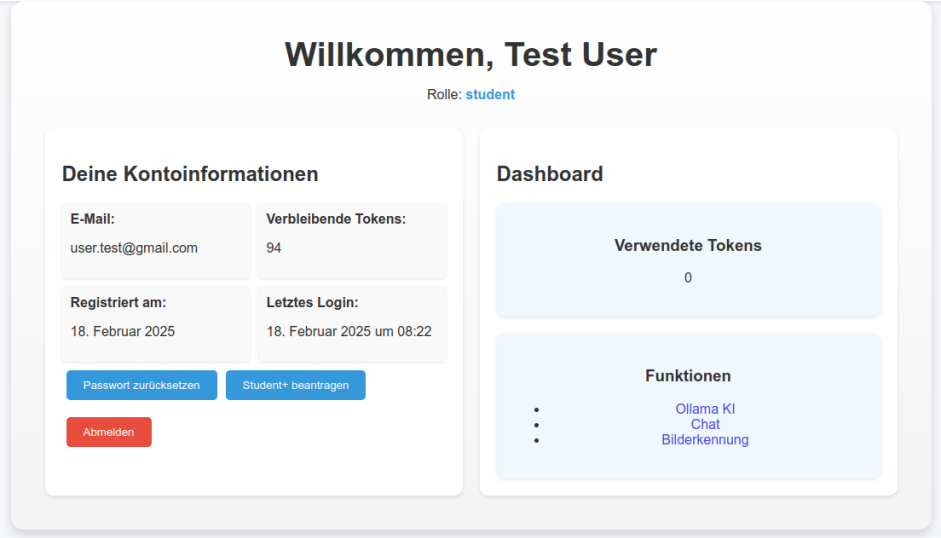
Website Platform

- Developed to make AI accessible to students.
- Built with:
  - Vue.js (Frontend)
  - Flask (Backend API)
  - Firebase (User data & authentication)
- Purpose: Central interface for interacting with various AI tools.



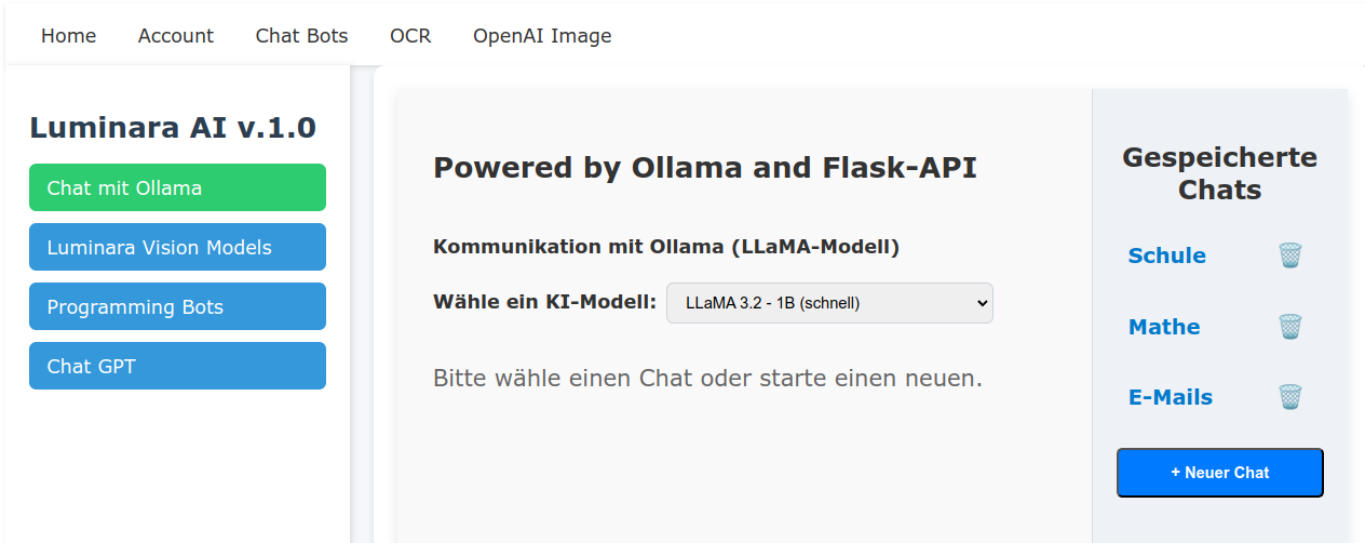
User System

- Registration and secure login
- Profile management
- Firebase-based authentication

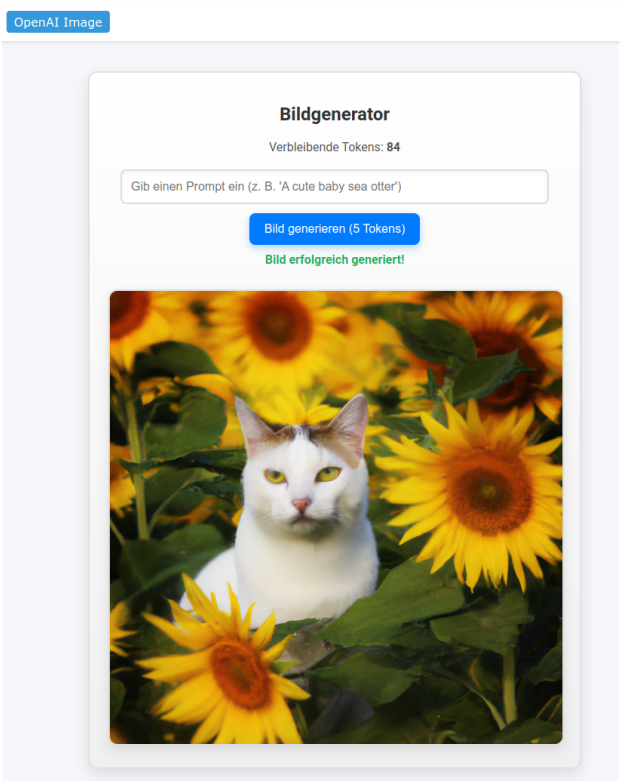


Chatbot Interface

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



- Generate images from text prompts
- Uses DALL·E (OpenAI) ¡¡¡¡¡¡¡ Updated upstream



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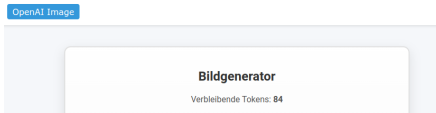
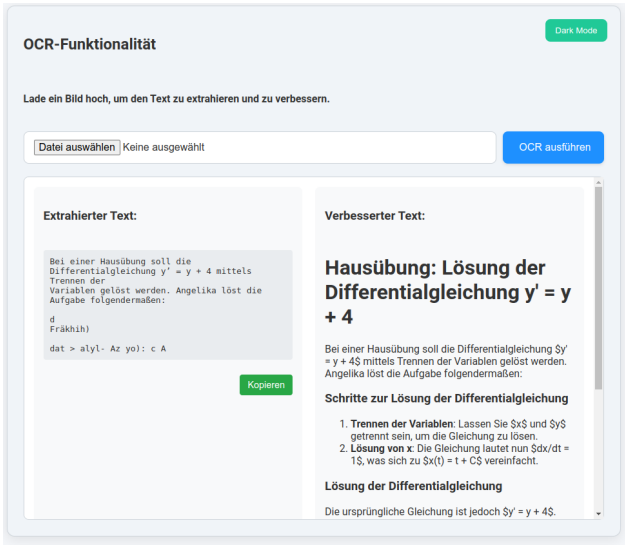
Fully integrated into frontend



OCR and Image Recognition

- OCR with Tesseract ¡¡¡¡¡¡¡ Updated upstream
- Post-processing using a large language model
- Leverages Markdown for formatting =======
- Post-processing using LLaMA 3.2
- leverages Markdown for formatting ¿¿¿¿¿¿¿ Stashed changes



AI in Economics and Ethics

Applications:

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

AI in Economics and Ethics

Ethical & Social Concerns:

- Bias in training data
- Transparency & accountability
- Privacy and data protection
- Impact on the workflow and job displacements

AI in Economics and Ethics

Regulatory Challenges:

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

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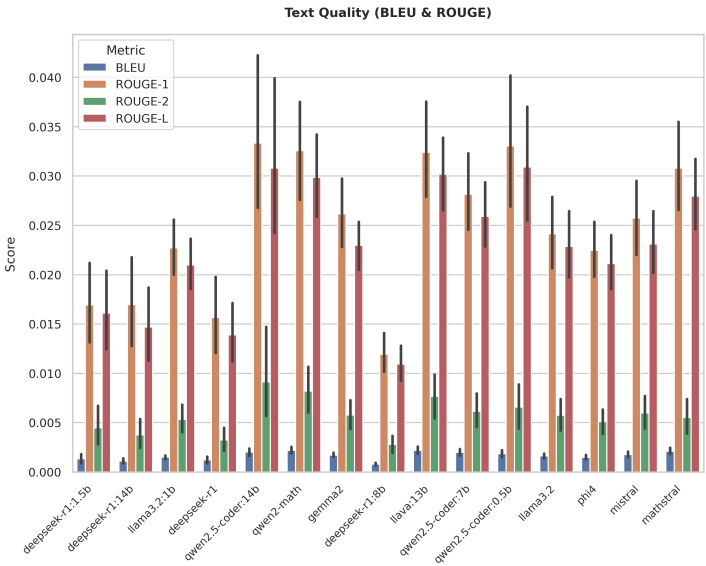
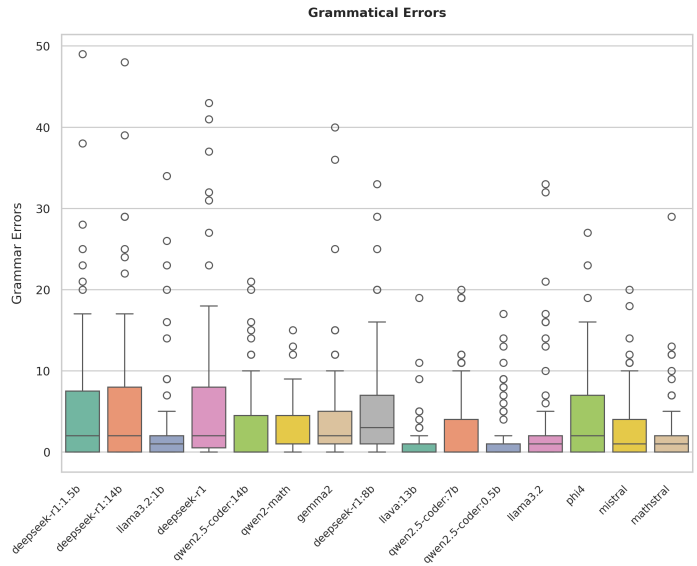
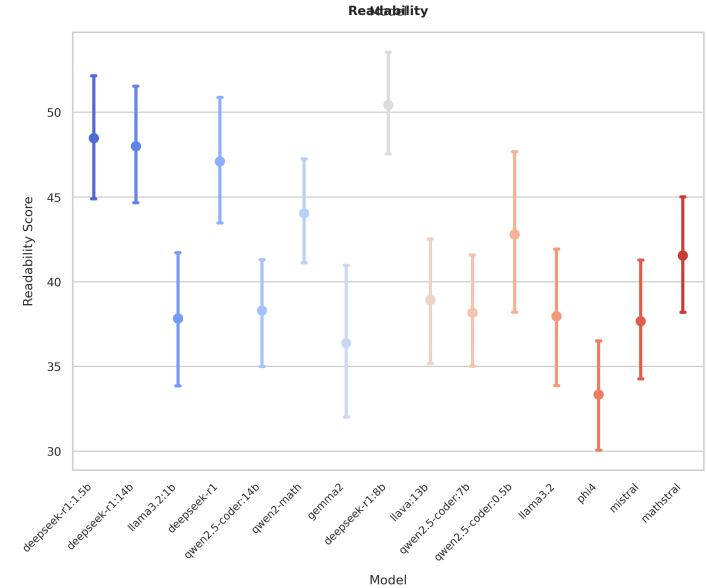
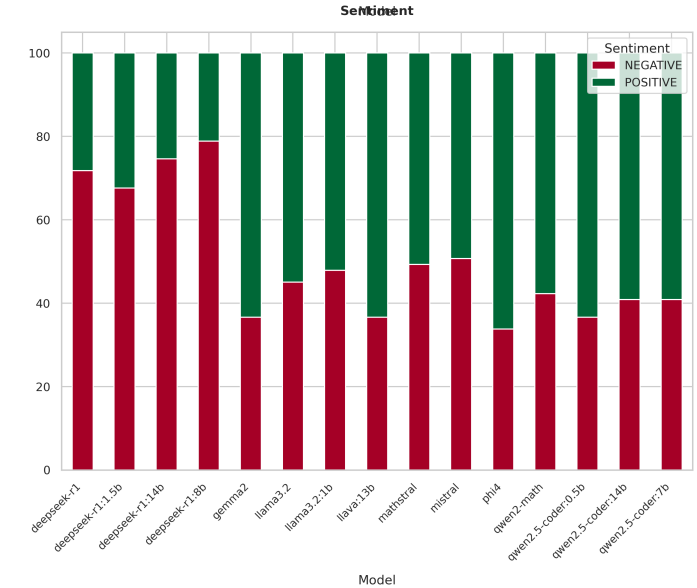
Backup slides Graphics

Evaluation Results: Qualitative metrics









Evaluation Results: Quantitative metrics

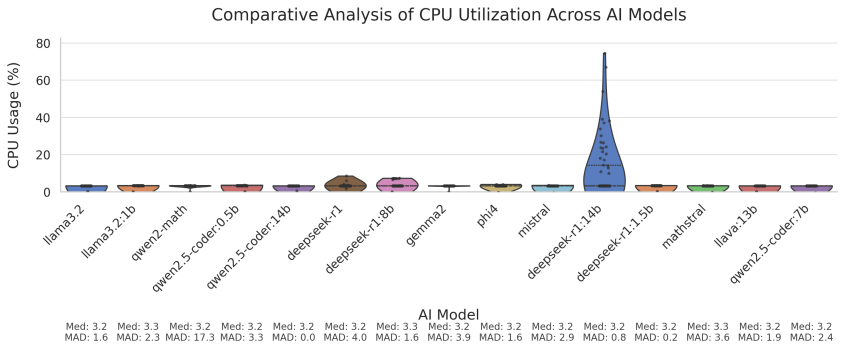


Figure: CPU Usage Comparison

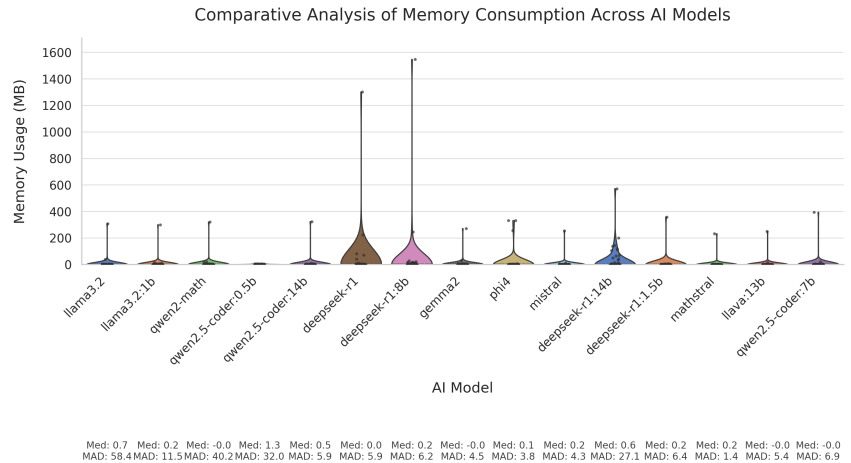


Figure: Memory Usage Comparison

Server

- **Server Hardware:**
  - CPU: Intel Core i5.8600k
  - GPU: NVIDA 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.

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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.
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Thank You for Your Attention!

Florian

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