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Hands On Session

AI-Spielplatz

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What‘s it all about?

💭 **Intro to Materials & Resources**

(own) **Setup and how to start**

...no worries: it can be overwhelming first but we‘ll do this together and be sure you‘ll learn a lot

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🧮 What we'll do in this 1st Hands On Session...

- Intro to general setup, resources, software
  - Login to PC, WiFi, Cloud-Folder

- Overview of software we'll use:
  - Msty (your connection to LLMs that are here to help)
  - Jupyter/Colab (place where you can program stuff)
  - GitHub Repository (here you'll find materials & resources)

- Overview over hardware we'll use:
  - What is a Raspberry Pi? How to start & connect via VNC...
  - How to apply a sensor?
    - Which Sensors do we have?
    - Audio
    - Camera

[1/2]

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🧮 What we'll do in this 1st Hands On Session...

- Hands-On:
  - Let's build our first simple project together

  - Try or tutorials:

  Beginners:
  - What is GitHub, Python?
  - How to use Jupyter/Colab?
  - What is an API?

  Advanced
  - Interact with OpenAIs API
  - Attach a Sensor to RPis GPIO

- Dream Big:
  - First ideas of what you could do? Let's discuss!

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Short Question ✋

...how do you feel today [handsign: 👍 | 👌 | 👎],

...who tested ai and for what? 👨‍🎓

💻 Getting started...

Laptop Login: *open one of the Laptops and login please*
User: scadsai
Password: scadsai

WLAN: *check & change now and set to auto-connect*
SSID: ai-spielplatz
Password: ai-spielplatz

Cloud Link:
https://cloud.scadsai.uni-leipzig.de/index.php/s/8TWEMX32KgfrrwF

→ *Share Projects, Data, etc.*
→ *Link expires end of May*

💾 Software we‘ll use:

What‘s **prepared** on the **Laptops**,
what could **you install on your hardware**...

Msty

Why Msty
Pro / Contra

🔗 msty.app

What is Msty?

- Msty is a modern **AI-Chat-UI**, you can use to interact with diverse LLMs – locally as well as online/remote
    - we have a LLM-Engine installed locally that is called ***ollama***
    - as LLM provider we use ***OpenAI*** (GPT-4o & 4o-mini are available)

- Simple usage of local and remote models

- **Offline-First, Online-Ready**: Msty is optimized for offline-usage

- **Great model compatibility**: compatible with models from HuggingFace, Ollama, Open Router, etc.

- **Data Privacy (**offline mode!**)**: Personal information & chat data won‘t leave the device

Msty

Why Msty
Pro / Contra

🔗 **msty.app**

✅ **Pros**

✓ **Flexible** – use local & remote AI-models
✓ **Data Privacy** (offline mode!) – Data won‘t leave the device
✓ **Features,** like **RAG** (Chat with Documents), **Websearch**, etc.

❌ **Cons**

✕ **Freemium:** „always free“ Version for private usage and premium-subscriptions
✕ **Closed Source** – not an Open-Source-Project

https://docs.msty.app

Short Demo 📺

...repeating is learning 🧠

Jupyter

Why Jupyter
Pro / Contra

🔗 jupyter.org

🧠 **What is Jupyter?**

- Jupyter is a powerful **interactive coding environment**
- Works **locally on your machine** – perfect for offline experimentation
- Write and run **Python code in cells** with immediate output
- Great for **data analysis**, **machine learning**, and **AI prototyping**)

✅ **Pros**

✓ **Full Control** – runs on your own system, no internet needed
✓ **Flexible** – integrate any local tools, models, or datasets
✓ **Beginner-Friendly** – clear cell-by-cell execution

❌ **Cons**

✕ **Setup Required** – you need to install Python and Jupyter
✕ **Limited Collaboration** – not cloud-based unless manually configured

Google Colab

Why Colab
Pro / Contra

🔗 colab.research.google.com

🧠 **What is Google Colab?**

- Colab is a **cloud-based Jupyter Notebook platform** by Google
- No installation needed – runs entirely in your **browser**
- Comes with **free GPU support** for AI/ML experiments
- Perfect for **sharing code**, **collaborating**, and **quick starts**

✅ **Pros**

✓ **Instant Start** – works directly in the browser
✓ **Free Hardware Acceleration** – GPU/TPU for heavy AI models
✓ **Easy Collaboration** – share notebooks like Google Docs

❌ **Cons**

✕ **Online Only** – requires internet access
✕ **Session Timeouts** – limited runtime for free version
✕ **Data Privacy** – data is stored on Google's servers

Short Demo 📺

...repeating is learning 🧠

Git-What?

Why GitHub
Pro / Contra

🔗 github.com

🧠 **What is GitHub?**

- GitHub is a **platform for sharing and managing code**
- Enables **version control** using Git – track changes, collaborate easily
- Ideal for **team projects**, **open-source sharing**, and **code backups**

✅ **Pros**

✓ **Collaboration-Friendly** – work together on shared code
✓ **Version History** – track every change over time
✓ **Public or Private** – control who sees your work
✓ **Integrated with Colab & Jupyter** – open notebooks directly

❌ **Cons**

✕ **Learning Curve** – Git/GitHub can be confusing at first
✕ **Requires GitHub Account** – to contribute or manage projects

Our Repo:

Ai Spielplatz

🔗 github.com/IvaroEkel/AI-Spielplatz

🗂️ **Repository Structure [** 💡 … important **]**

📁 **Warming-Up/**
Introductory exercises to get started with AI concepts.

📁 **Tutorials/**
Step-by-step guides for various (*AI*) projects. 💡 most important to start

📁 **Projects/**
Your AI projects.

📁 **Data/**
Datasets used in tutorials and projects.

📁 **Other_Resources/**
Additional materials and references. *Not relevant…*

📁 **Slides/**
Presentation slides used during the workshop. 💡 always check back here

📁 **website/**
Files related to the workshop's informational website on GitHub. *Not relevant…*

🛠️ Hardware we prepared:

What‘s **hardware** is prepared,
how to start where?

🛠️ Hardware we prepared:

Disclaimer:

Don‘t worry: you can‘t break anything but
if 💩 happens, it‘s **no** problem.
You are here to try & learn.

Also: we tried to prepare everything in detail but it happens that we missed something.
Feel free to inform us if anything isn‘t working.

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Raspberry Pi?

What is it &
How to start...

🔗 raspberrypi.com

🧠 **What is Raspberry Pi?**

- Raspberry Pi is a **small, affordable single-board computer**
- Originally designed for **learning programming & electronics**
- Perfect for **AI experiments**, robotics, sensors, and creative projects
- Runs Linux (e.g. Raspberry Pi OS) – can be used like a tiny PC
- Can be used with Python, Jupyter, and local LLMs

✅ **Pros**

✓ **Low Cost** – powerful but super affordable
✓ **Beginner-Friendly** – huge community & tons of tutorials
✓ **Flexible Use** – AI, smart home, media server, etc.
✓ **Offline & Portable** – ideal for secure, mobile AI setups

❌ **Cons**

✕ **Basic Setup Needed** – install OS on SD card and connect peripherals
✕ **Limited Power** – not suitable for very large AI models or heavy compute tasks

Raspberry Pi?

What is it &
How to start...

🔗 raspberrypi.com

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Raspberry Pi?

What is it &
Applying electronics

🔗 raspberrypi.com

Connectors (for Cameras and so on...)

Raspberry Pi?

What is it &
Applying electronics

🔗 raspberrypi.com

GPIO Pins (*General Purpose Input/Output*)

➕ What about GPIOs?

- **GPIO Pins** allow the Raspberry Pi to **interact with the physical world**
  → You can connect **LEDs, sensors, motors**, buttons, etc.

- Ideal for learning about **electronics & physical computing**
  → Combine AI + hardware: e.g. control a light with a model prediction

- Easy to start with Python libraries like *gpiozero* or *RPi.GPIO*

→ We will apply e.g. the audio-hat here. 🎵

Raspberry Pi?

What is it &
Applying electronics

🔗 raspberrypi.com

GPIO Pins (*General Purpose Input/Output*)
➕ Pro Tip: always double check power connectors!

Raspberry Pi?

Let‘s start it and connect

🔗 raspberrypi.com

Plug-in the power cable:
No credentials needed
sudo password: rpi5a,b,c or d

How to connect:
We‘ll use VNC (Virtual Network Computing) to login remotely to the Pi via the workshop laptops. Check for the icon of RealVNC in the taskbar.

What you need to connect:
- IP-address (see next slide)
- Credentials: rpi5a,b,c or d

Troubleshoot
- Check if you are in the correct network (ai-spielplatz)

Raspberry Pi?

Let‘s start it and connect

IP-Addresses:

rpi5a - inet 192.168.0.136

rpi5b - inet 192.168.0.149

rpi5c - inet 192.168.0.188

rpi5d - inet 192.168.0.113

...Cool! Now we should have remote access to our RPis

Any problems so far? How is the pace?

🛠️ ...speaking Sensors:

Which Sensors do we have?

🛠️ ...speaking Sensors:

Audio Hat

🛠️ ...speaking Sensors:

Audio Hat

Waveshare WM8960 Audio HAT 🎧
Hi-Fi Stereo Sound Card for Raspberry Pi

🧠 **What is it?**
- A compact, low-power **audio expansion board** for Raspberry Pi
- Enables **high-quality stereo playback and recording**
- Ideal for **AI voice assistants**, **audio processing**, and **audio recognition**

🔧 **Key Features**
- **WM8960** stereo CODEC with I2S audio interface
- **Dual MEMS microphones** for stereo recording
- **3.5mm headphone jack** and **dual speaker outputs**
- Compatible with Raspberry Pi's 40-pin GPIO header

⚙️ **Setup Requirements**
- Install drivers provided by Waveshare [Wiki]
- Utilize **I2C** for control and **I2S** for audio data
- Supports libraries like pyalsaaudio for using it with python

🛠️ **...speaking**

Sensors:

RPi Camera

🛠️ ...speaking Sensors:

RPi Camera

Raspberry Pi Camera Module 3 📷
High-Quality Imaging for AI Projects

🧠 **What is it?**

- A compact, high-resolution camera designed for Raspberry Pi
- Features a **12MP Sony IMX708 sensor** with **HDR** and **autofocus**
- Ideal for **Computer Vision, machine learning** (data collection / inference)**, object detection, robotics** & **automation** tasks

🔧 **Key Features**

- **12MP resolution** (4608 × 2592 pixels)
- Connects via **15-pin MIPI CSI-2 interface**

⚙️ **Setup Requirements**

- Compatible with all Raspberry Pi
- Utilizes the libcamera library for image capture and control, usable with opencv-python

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Now...
What about *AI*?

AI Cheatsheet 🧠
Best Practices & Practical Trade-Offs

📌 **Core AI Principles**

- **Start simple** → Test ideas with basic models first
- **Data > Model** → High-quality data beats fancy algorithms
- **Avoid overfitting** → Your model should generalize, not memorize
- **Evaluate properly** → Always use training **and** test sets
- **Explainability matters** → Know **why** your model makes decisions

- **Keep it reproducible & document it** → Use version control, and logging

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Now…
What about *AI*?

📊 **Typical Trade-Offs**

✅ Do This	❌ Instead of This	Why?
Use Pretrained Models	Build from Scratch	Saves time & compute
Clean & Label Data Well	Add More Data Unfiltered	Quality > Quantity
Use Baseline Model First	Jump to Deep Nets	Know your baseline!
Simpler, Interpretable Models	Complex, Black-Box Models	Easier debugging & trust
Open-Source Tools (e.g. scikit-learn, Hugging Face Transformers, pytorch)	Custom from Scratch	Faster development & better support incl. pretrained model support

💡 **Pro Tip:**
Don't aim for perfection first. **Fail fast, learn faster**, then iterate with better models and cleaner data.

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A day in the life of an *AI model*

Core AI Concepts 🔁
From Data to Inference – How AI Works

📊 **1. Data Collection**
- Everything starts with **data** – images, text, numbers, sensors...
- The better the data, the better the model

🧹 **2. Data Preprocessing**
- Clean, structure, and prepare the data
- Remove noise, fill missing values, normalize formats

🧠 **3. Model Training**
- The model **learns patterns** from labeled data
- Adjusts **internal parameters** to reduce errors
- Example: "This is a cat" vs. "This is not a cat"

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A day in the life of an *AI model*

Core AI Concepts 🔁
From Data to Inference – How AI Works

🔍 **4. Model Testing / Validation**
- Check performance on **unseen data**
- Helps detect overfitting or underfitting
- Use separate **validation and test sets**

🎛️ **5. Model Tuning**
- Adjust settings like learning rate, architecture, etc.
- Called **hyperparameter tuning**

📈 **6. Evaluation**
- Use metrics like **accuracy**, **precision**, **recall**, **F1-score**
- Helps understand real-world performance

🚀 **7. Inference**
- Final model is deployed to make **predictions** on new data
- Fast and efficient – runs in apps, servers, or on edge devices like Raspberry Pi

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So then, let‘s go!

Learning by do-ing

1. Ask your Question(s)! **Discuss**... 🗣️
2. You can‘t break anything, **no worries**! 🖇️
3. **Have Fun** 🎉

Let‘s get **practical**!

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Dream Big...

Let‘s discuss ideas.