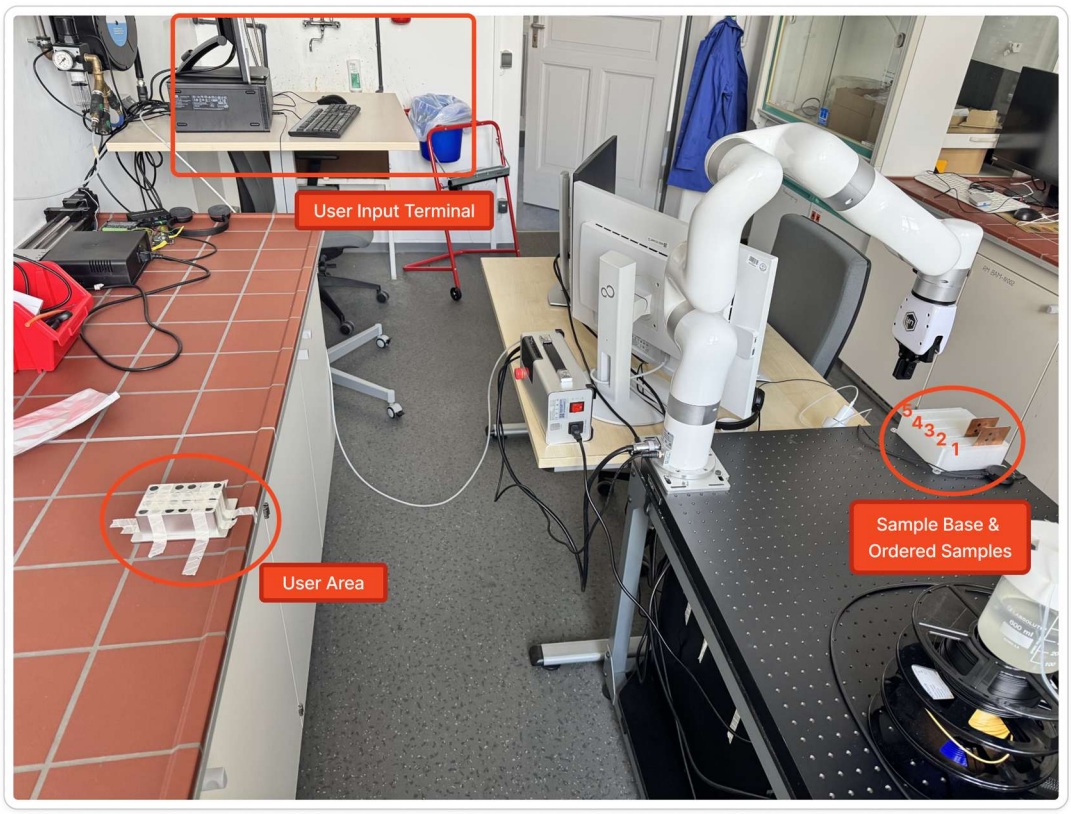
Self-Driving Laboratory (SDL) Agent — Introduction Sheet

The SDL Agent is an AI-driven laboratory assistant developed to operate and coordinate the experimental workflow in the Self-Driving Laboratory. It interprets natural-language instructions, executes robotic and measurement actions, and provides a unified interface between human operators and the automated lab infrastructure.

System Layout

- **User Input Terminal:** Where users communicate with the Agent via text.
- **Sample Base:** Contains five labelled samples (1 – 5) used during the tests.
- **User Area:** Physical point for sample exchange between user and robot.
- Robot & Measurement Setup: The robotic arm performs movements; measurement commands trigger automated OCP, CV, or CA processes.



What the SDL Agent Can Do

1. Understand and execute natural-language commands.
2. Perform measurement actions. (User needs to specify which sample he wants to measure)
    - OCP (Open Circuit Potential)
    - CA (Chronoamperometry)
    - CV (Cyclic Voltammetry)
3. Handle sample logistics.
    - Bring sample to user area. (User needs to specify which sample he wants)
    - Collect sample from user area. (User needs to specify which slot the sample needs to be put in)
4. Control robot state.
    - Send robot to home/base position.
5. Interpret ranges and sequential logic.
    - Understands “1–3,” “first and second,” “then,” “after,” etc.
6. Ensure safe, ordered execution.
    - Executes tasks step-by-step with feedback after each action.

What the SDL Agent Cannot Do

- Cannot perform tasks outside the defined toolset (e.g. heating, weighing, microscopy, data analysis).
- Cannot interpret vague or unrelated conversation (“What’s the weather?” or “How are you?”).
- Cannot correct experimental parameters, executes as instructed; user is responsible for correctness.
- Cannot interact with hardware beyond the defined setup (only robot movement, sample handling, and three measurement modes are enabled).
- Cannot operate without explicit, clear input; ambiguous or incomplete sentences may be ignored.

Interaction Procedure

1. Approach the User Input Terminal.
2. Enter a command in plain.
3. Observe the robot and measurement system perform the requested actions.
4. Wait until the Agent confirms: “Done.”
5. Proceed with the next command or end the session.

Evaluation Focus

During the experiment, please assess:

- Ease of understanding the Agent’s behaviour.
- Clarity of interaction and feedback.
- Perceived intelligence and reliability.
- Comfort level when delegating physical control to the AI system.