🧬 Study Project: Developing a Simulator for Temporal scRNA-seq Data

Summary:
Analyzing temporal single-cell RNA sequencing (scRNA-seq) data requires new computational methods—and reliable **ground truth datasets** to test them. Since such data are often unavailable or infeasible to collect experimentally, simulation becomes essential.

In this project, you will contribute to the **development of a Python-based simulation tool** that generates temporal scRNA-seq data. The model uses an **agent-based framework** to represent cell proliferation and death, combined with **Langevin dynamics** to simulate differentiation as movement in a transcriptomic potential landscape. This approach enables the creation of complex, realistic datasets for testing new analysis pipelines.

You will help to implement and refine the core simulation logic in **Python**.
Furthermore you will help to improve performance and flexibility of the tool itself as well as the downstream analysis. The goal is to create ready-to-use Python package including documentation and version control (GitLab).

Requirements:

- Solid programming skills in **Python**
- Interest in **computational biology**, **agent-based modeling**, or **systems biology**
- Familiarity with stochastic processes, Langevin dynamics, or single-cell biology is a plus
- Experience with Git/GitLab and writing clean, modular code is welcome

Details:

- Duration: ~8–12 weeks (flexible)
- Level: Advanced Bachelor’s or Master’s project
- Compensation: Unpaid; suitable for thesis or academic credit