Spatial aspect of the inter cellular communication of muscle stem cells.

Cells in tissue communicate with each other through a variety of methods, in order to maintain tissue integrity or to respond to tissue external queues. One, well studied, way of cell-to-cell communication is the Delta Notch signaling pathway, in which the membrane embedded Notch receptor recognizes the Delta ligand on the surface presented by the neighboring cell.
Muscle stem cells MSCs use the Delta-Notch-Signaling pathway to communicate, in particular to transduce information of the cell state. After an injury or during muscle development the muscle stem cells have to proliferate, i.e. to increase in numbers, as well as to differentiate and eventually form new myofibers.

In your study you will help to understand how the cell-to-cell communication helps the muscles to respond to an injury an orchestrate the and balance the differentiation and renewal of MsCs.

Building on an existing computational model created with the [Morpheus](), you will test the impact of the spatial arrangement as well as of crucial parameter on the multicellular communication. And if needed improve the mathematical model.

Requirements

- Background in **computational biology**, **bioinformatics**, **biophysics**, or a related field.
- **Strong programming skills in Python** (NumPy, SciPy, Matplotlib, etc.).
- Basic knowledge of **systems biology**, **cell signaling**, or **developmental biology**.
- Experience with **mathematical modeling** and/or **Morpheus** (or willingness to learn).
- **Curiosity** for mathematical models of biological processes

Project Details

- **Level**: Suitable for advanced Bachelor's or Master's students
- **Duration**: 8–12 weeks, flexible part-time commitment
- **Start Date**: Flexible (e.g., upcoming term or semester)
- **Compensation**: Unpaid; can be credited as a thesis, seminar project, or academic credit