GÖTEBORGS UNIVERSITET

SAHLGRENSKA AKADEMIN
INSTITUTIONEN FÖR BIOMEDICIN

Utlysning

Project Title: Single-Cell Electrophysiology and Signal Processing
Project duration and dates: 6 months, 02/03/26-31/08/26
Application deadline: 17th February 2026
Amount: 77,000 SEK

Project

A scholarship in single-cell genomics is hereby announced at the Institute of Biomedicine, Dept. of Medical Biochemistry and Cell Biology.

Background and Purpose
High-density microelectrode arrays (HD-MEAs) enable simultaneous extracellular recordings from hundreds of electrodes, providing detailed access to cellular electrophysiology. However, individual electrodes often capture overlapping signals from multiple nearby cells, making it challenging to resolve single-cell activity.

In human pancreatic islets, resolving single-cell electrophysiology is essential for understanding cell–cell communication and how these processes fail in diabetes. Differences in spike amplitude, width, and waveform shape can be exploited to computationally separate signals from distinct cells and potentially distinguish different endocrine cell types. The purpose of this project is to develop and evaluate signal processing and machine-learning approaches for separating overlapping electrophysiological signals in HD-MEA recordings from human pancreatic islets.

Method
The project is primarily computational. The student will analyze HD-MEA recordings of human pancreatic islets and develop spike-sorting algorithms using waveform features (e.g. amplitude, width, shape). Probabilistic and clustering-based approaches will be implemented and evaluated, using co-registered imaging data for validation. Analysis will be performed in Python or MATLAB.

Work plan/Timetable
The first two months will be used to familiarize with high-density microelectrode array recordings and to set up preprocessing and feature-extraction pipelines for electrophysiological data. After that, we will develop and benchmark spike-sorting algorithms based on probabilistic and machine-learning approaches, using co-registered imaging data to define ground truth and assess performance. The last months of the project will be used to analyze the data and

summarize the results in a presentation.

Learning objectives

- Develop practical skills in signal processing and analysis of electrophysiological data from high-density microelectrode arrays.
- Gain experience applying machine-learning methods to microelectrode array data.
- Learn to work in an interdisciplinary environment, integrating computational methods with experimental biomedical data.

Applicant:

The ideal candidate:

- Holds a BSc in Electrical Engineering, Applied Mathematics, Physics, Computer Science, or a related field
- Has basic experience with Python and/or MATLAB
- Practical knowledge of signal processing, statistics, or machine learning
- Can work independently and collaboratively in an interdisciplinary environment
- Has good written and spoken English

Application:

Applications should be emailed to Dr. Joan Camuñas Soler: joan.camunas@gu.se
The application should include: Motivation letter, CV including contact info.

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