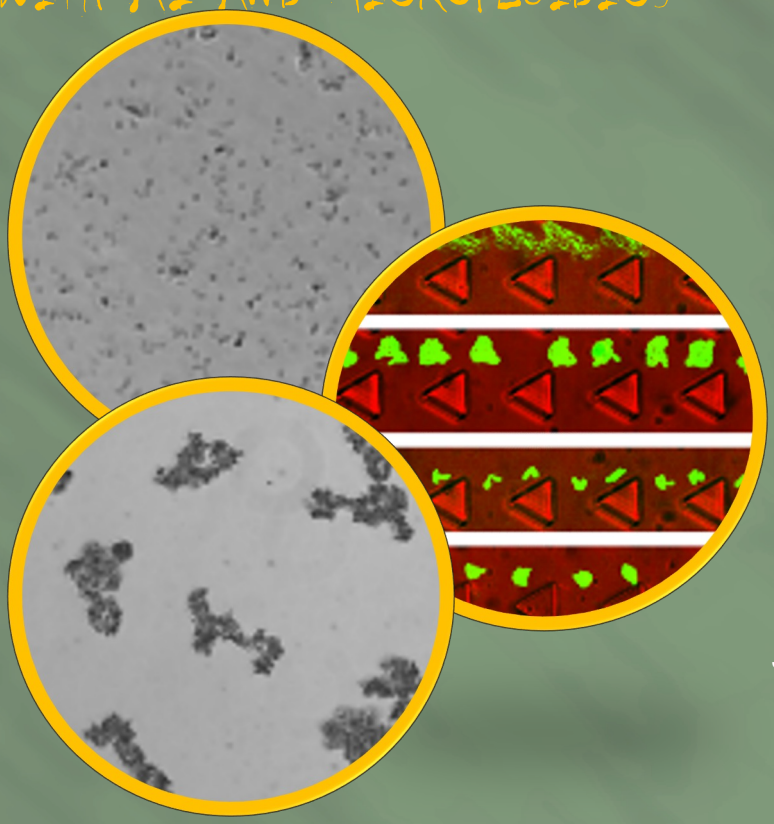
MASTER THESIS:

DEEP UNDERSTANDING OF SEPARATION OF BACTERIAL CLUSTERS WITH AI AND MICROFLUIDICS



The way bacteria organize in clusters, films or filaments is believed to have a strong influence on the chances of the host organism to fight the infection. To better understand the influence of morphology, it is important to be able to separate bacteria in subpopulations based on the size and the shape of the clusters. However, this is not trivial.

The primary focus of this project is to implement and validate deep learning techniques for detecting and tracking aggregates of bacteria in fluorescence images from microfluidic experiments.
Specifically, the task is to develop a system for estimating the static and dynamic 3D properties of the aggregates from 2D time-dependent data.

WHAT YOU'LL LEARN

- What group A staphylococcus (GAS) are and why they are interesting
- Applying machine learning techniques, particularly neural networks, to characterize clusters of GAS in microscopy images
- Simulating microscopy images and understanding bacteria-bacteria interactions
- Hands-on experience with fluorescence microscopy and imaging (if you'd like)

WHAT YOU'LL DO

- Explore different neural network architectures, optimizing them to predict 3D structure of clusters from 2D data, with both a static and a dynamic perspective
- Train and validate neural networks on simulated microscopy data.
- Collaborate closely with interdisciplinary team members from different fields such as physics, biomedicine, mathematics, and computer science.

DESIRED SKILLS

- Experience in Python/MATLAB
- Keen interest in deep learning and data analysis
- Some foundation or big interest in physics, biology, or related fields

CONTACT

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The project is a collaboration between the department of Mathematical Sciences (group of prof. Kalle Åström) and Solid State Physics (group of prof. Jonas Tegenfeldt).