**Master thesis project at Vironova AB in image analysis and machine learning**

**Convolutional neural networks for classification of transmission electron microscopy imagery**

Convolutional neural networks (CNNs) have played a major part in the recent success story of the neurobiologically inspired machine learning field of deep learning used in today’s state of the art systems for image recognition. This thesis project aims at investigating, evaluating and comparing CNNs for detection and classification of objects imaged with transmission electron microscopy (TEM). Different CNNs will be investigated regarding classification performance, speed, amount of training data required etc. on several different problems e.g., gene/drug delivery particle classification (left figure below), and lipsome lamellarity or “layeredness” (right figure below). The suitability for Vironova’s purposes of libraries offering CNNs will also be evaluated regarding implementation language, supported platforms, GPU-possibility, community, degree of maturation etc.

Vironova is an innovative company bringing new solutions to the field of sub-visible particle analysis based on electron microscopy. By combining expertise in electron microscopy, virology, mathematics and image analysis, Vironova has developed a unique offering of services, hardware and software products. Our tools are used in development and quality control of particles for vaccines, drug and gene delivery as well as viral safety testing and material quality control.

For more information contact

Vironova: Max Pihlström, [max.pihlstrom@vironova.com](mailto:max.pihlstrom@vironova.com) (supervisor)

Vi2: Ida-Maria Sintorn, [ida.sintorn@it.uu.se](mailto:ida.sintorn@it.uu.se) (co-supervisor/examiner)

