

# Examensarbete 30 hp i Medicinsk Teknik

## *Automatic arterial plaque segmentation in ultrasound images*

Medicinsk teknik FoU är en forsknings- och utvecklingsavdelning vid Centrum för Informationsteknik och Medicinsk teknik på Norrlands universitetssjukhus, Region Västerbotten. Avdelningen bedriver internationell forskning, utveckling och utbildning inom det medicintekniska området, med kompetens inom exempelvis sensorer och mätsystem, bild- och signalanalys och biomekaniska modeller. MT-FoU står också bakom kompetenscentret AI for Medicine in Northern Sweden, AIM North, som stöttar kliniska forskningsprojekt med teknisk metodkompetens inom maskininlärning och AI.

## Background

Ultrasound imaging is a common medical examination at the hospital; however, it is a modality that still requires extensive operator training and skills. Computer Assisted Diagnosis (CAD) techniques would provide great value by minimizing this operator dependency and allowing more robust and reproducible measurements.

Atherosclerosis (åderförkalkning) is a cardiovascular disease that may cause stroke or infarct. In the early phase of the disease, plaques – local aggregations of fatty tissues in the arterial wall – start to build-up. For early treatment these are important to detect. In a recent study by our group in the Lancet, we showed that such information can improve the cardiovascular riskfactors among the population. Therefore, a broad implementation of the ultrasound imaging technique at healthcare centers (hälsocentraler) throughout the county, would significantly improve the cardiovascular public health. However, ultrasound image scanning requires extensive training and is operator dependent, a skill which is not present at the healthcare centers and a skill that would be expensive to train and maintain.

## Aim

In this project, we aim to develop computer decision support systems for ultrasound image scanning, as well as image interpretation, that would significantly minimize the role of the operator and making the scans more robust and reproducible – allowing for a more equal health care for the patients.

## Work description

Develop and evaluate a machine learning/AI model/pipeline for automatic segmentation of atherosclerotic plaques in the carotid arteries. Apply explainable AI (XAI) techniques to explain what the trained model have learned. (Explainability is an important aspect to get acceptance in medical applications).

## References

[1] Näslund et al., The Lancet, 2018

### Handledare vid Medicinsk teknik FoU

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