Early characterization of stroke using video analysis and machine learning

Bakgrund

Stroke is one of the world’s major causes of chronic disability and the third cause of death in Sweden. Stroke is a disruption of blood flow through the brain caused by a bleeding called hemorrhagic stroke (15%) or an occlusion of a vessel called ischemic stroke (85%). A subtype of stroke is called large vessel occlusion (LVO), and it accounts for 24–46% of ischemic strokes. Stroke is also considered as the most expensive condition treated by the Swedish healthcare. It requires the longest hospitalized days/year in Sweden and approximately 3–4% of healthcare expenditures.

Time is the most important factor in the diagnosis and treatment of stroke, and “time is brain” is an expression often mentioned in combination with stroke care. This expression is used to highlight the importance of reducing the time from symptom onset until care is provided.

Thrombectomy is a type of treatment that was introduced in recent years. It is used to cure LVO patients by mechanically removing the clot and is only available at Sweden’s university hospitals. Smaller clots in the brain are best treated by thrombolysis, using a clot-dissolving drug. These treatments are time-critical and should be provided to the patient within few hours after stroke onset. The main challenge to provide the best possible care for stroke patients is to improve the accuracy in characterizing stroke and its subtypes before arrival to the hospital (in ambulances) to decrease time to the most suitable treatment (in the most suitable hospital). Patients that need thrombolysis should be transported to the closest hospital providing stroke care, and patients who need thrombectomy should be transported directly to the closest university hospital if the transportation time is tolerable (e.g., < 45 min). Characterizing stroke and LVO patients in prehospital settings remain challenging, and many patients that could benefit from thrombectomy do not receive it because time window for the treatment runs out.

Stroke is identified today by using stroke scales, which are symptom-based tests that assess the patient’s capabilities such as facial expression, eye tracking, arm and leg movements, speech eligibility, etc. The score of these tests aid in where the patient should be transported. Artificial intelligence (AI)/machine learning (ML) has the potential to be used as decision support for patient assessment and treatment. There is a high interest in investigating whether an AI model can improve the accuracy of stroke characterization and assessment for prehospital settings.

In the ASAP Stroke project (Figure 1), we are working on creating an AI-based decision support system that is used in ambulances to collect data from different data sources,
such as stroke scales, video, medical history, vital signs, microwave diagnostic techniques (Strokefinder), etc. and integrate these data to detect what type of stroke the patient has and transport the patient to the right hospital to get the right treatment without delays.

Figure 1: ASAP Stroke concept

**Problembeskrivning**

This bachelor thesis project focuses on collecting and analyzing video data using ML algorithms. The project consists of three parts:

1. Performing a literature review to see for what type of diseases video analysis is used, and how it could be leveraged to stroke patients.
2. Recording video data while mimicking stroke symptoms.
3. Performing video-analysis using ML algorithms to investigate what symptoms can and cannot be detected and test the accuracy of the system.

**Målgrupp:** TKMED, TKDAT, TKITE

**Gruppstorlek:** 3-6

**Antal grupper:** 1

**Förkunskapskrav:** Basic knowledge in Python and machine learning is desirable.

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**Projekt Rapport:** Svenska / Engelska