BIOMEDICAL ENGINEERING THESES AT VTI

Christer Ahlström (christer.ahlstrom@vti.se)
BIOMEDICAL ENGINEERING AT VTI

• VTI = Swedish National Road and Transport Research Institute
• Sleepiness, attention, cognition and intentions of road users
• We measure behaviour and performance in healthy participants
• Our physiology lab has access to
  • ExG, EDR, Respiration, Eye tracking
  • VR, driving simulators, experiment vehicles
• So, we have the possibility to do a lot of fun research!!
• 1.35 million people are killed in road traffic crashes every year
• the main cause of death among those aged 15–29 years
• ~20% of all fatalities in traffic are due to drowsiness and fatigue
• ~25% of all fatalities in traffic are due to inattention
THESIS 1: IMPROVED SLEEPINESS CLASSIFICATION WITH DEEP LEARNING

Keywords: Biomedical signal processing, data science, deep learning, physionet

Topic: Further development of deep learning models for sleepiness classification based on EOG and EEG. Pre-training based on sleep staging datasets.

Collaboration opportunity: Cygnify BV, the Netherlands.

THESIS 2: EEG MICROSTATES

Keywords: Biomedical signal processing, data mining, clustering

Topic: EEG microstates are transient, patterned, quasi-stable states. Does these microstates change from alert to sleepy?

Get inspired: https://doi.org/10.1016/j.neubiorev.2014.12.010
THESIS 3: MODEL-BASED SIMULATION OF DRIVER ATTENTION

Keywords: Simulation, modelling, software development, eye tracking

Topic: A gaze-based driver distraction detection detection algorithm has been developed and we need to learn more about how it behaves in different situations. A simulation tool is needed for this task.

Get inspired: [https://doi.org/10.1177/0018720816672756](https://doi.org/10.1177/0018720816672756)
WRAP UP

1. Improved sleepiness classification with deep learning
2. Data mining of EEG microstates
3. Model-based simulation of driver attention

christer.ahlstrom@vti.se