Working Title: Applied Machine Learning In Aging Neuroscience

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Abstract

This is my abstract aim: apply ml to question in aging Neuroscience methods: supervised and unsupervised methods in different settings results: novel data driven insights coclusion: ml rocks

Introduction

- ML as the next frontier in science

- Open questions in aging neuroscience

- What can ML tell us?

- Age related changes occur at different scales and are manifestet at several levels.

- There is a wide variety in how this changes occur

- Changes are e.g. neural dedifferentiation and compensatory mechanisms (see Reuter Lorenz et al. 2010) and are noticable brain network level and dynamics

- NOTE: Check what EEG studies said about this...

- The idea is to model these changes with tools from datascience to answer questions in aging neurosci

- First study is about detecting dedifferentiated and compensatory mechanisms with EEG

- Tools used are DMD and Machine learning

- Main idea: Study classification performance as proxy for age related changes in different motor control tasks

- Expertise as possible way of builing a reserve:

- Higher individuality

- Dynamics of dedifferentiation and how do they relate to fitness

- Basic for targeted interventions

- How much and what (relate to Julia)

- Background of ML

- ML as tool

- novel insights

- Problem: Data is multidimensional and we have often limited data

- Solution: Use DMD to reduce Complexity and "model" evolution of signal

- Dynamic Mode Decompsition

- DMD extracts coupled spatio-temporal modes and is able to kind of model the evolution of the signal

- Backgrouund + Papers

- Mathematical Formulation

- What can ML tell us?

- ML applied in aging Neuroscience

- Formulating Aims and goals

- Formulation expectred outcomes

Theoretical Background and Current State of Research

Chapter ideas:

1. Datascience in Neuroscience -¿ Neural data science

   (a) Dimensionality Reduction

   (b) Machine Learnning

   (c) Applications to EEG

2. Age related changes in the brain

   (a) Dedifferentiation, Compensation etc.

   (b) Neurophysiological Correlates

   (c) Theories of cognitive aging