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?

Theoretical Background and Current State of Research

Chapter ideas:

- 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 (NOTE DEFINETELY CHECK LITERATURE ON DIFFERENT CONCEPTS) and are noticable brain network level and dynamics - Check what EEG studies said about this... - The idea is to model these changes with tools from datascience to answer...

... questions in aging neuroscience - Aging and Motor Control - 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 - Dynamics of dedifferentiation and how do they relate to fitness

- 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

1st study: Interdependence of ML algorithms and age related changes of the brain

–¿ identified dedifferentiation and frontal shift as influencing factors

2nd study: Not equal among elderly, fitness status might play role

3rd study: Does Expertise influence? But first what can ML tell us about Expertise? Study of Expertise –¿ no differences in classification performance BUT higher individuality

4rd study: Can we model cognitive Status based on EEG? Is the interdependence linear or complex if complex can we use NN to study this nonlinearity?