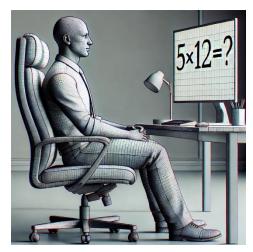**MASTER THESIS / JOB OFFER**

"Algorithms to analyse eye-tracking data for understanding problem solving strategies"

Background: Eye tracking has been widely employed across various research fields, providing insights into attentional processes and underlying cognitive mechanisms. While its application to number processing is still in its infancy, it shows great promise in this research area. By analyzing eye movements during arithmetic tasks, researchers can gain valuable insights beyond reaction times (RTs) and accuracy, such as real-time attentional shifts, the use of specific arithmetic procedures, and problem-solving strategies. This study is part of the NeuroTrain Project, an international collaboration aimed at deepening our understanding of arithmetic learning through interdisciplinary approaches.

Data: Forty participants completed a five-day training program focused on two sets of novel arithmetic problems, with accuracy and RTs measured throughout. One set of problems was learned by applying a newly invented procedure (strategy condition), while the other set required memorization of problem-solution associations (memory condition). Immediately after completing each training condition, participants were asked to solve the trained problems while eye-tracking data were recorded using a Tobii Pro system at 300 Hz. In this task, the problem to be solved appeared at the top of the screen, while a cue was displayed at the bottom. Participants were instructed to solve the problem without looking at the cue, if possible.

Aim and task of the student: The primary aim of this analysis is to examine the eye-tracking data, focusing on the comparison between the two training conditions and across training days. The student will be involved in designing novel algorithms to analyse paths from eye-tracking data. Examples of approaches include definition of Markov models to evaluate eye movements across different regions of interests, and complexity analyses.

Prerequisites: Signal processing, machine learning.

Contacts: The project is a cooperation between the University of Innsbruck (Univ.-Prof. Daniel Baumgarten, daniel.baumgarten@uibk.ac.at), and the Medical University of Innsbruck (Assist. Prof. Laura Zamarian, laura.zamarian@i-med.ac.at, and Priv.-Doz. Matteo Cesari matteo.cesari@i-med.ac.at).

Expected start: as soon as possible

Contract: Geringfügige Beschäftigung at the Department of Neurology, Medical University of Innsbruck for 6 months.