Mid-Term Talk

Simulation of EEG-Activity Based on Sequential Sampling Models

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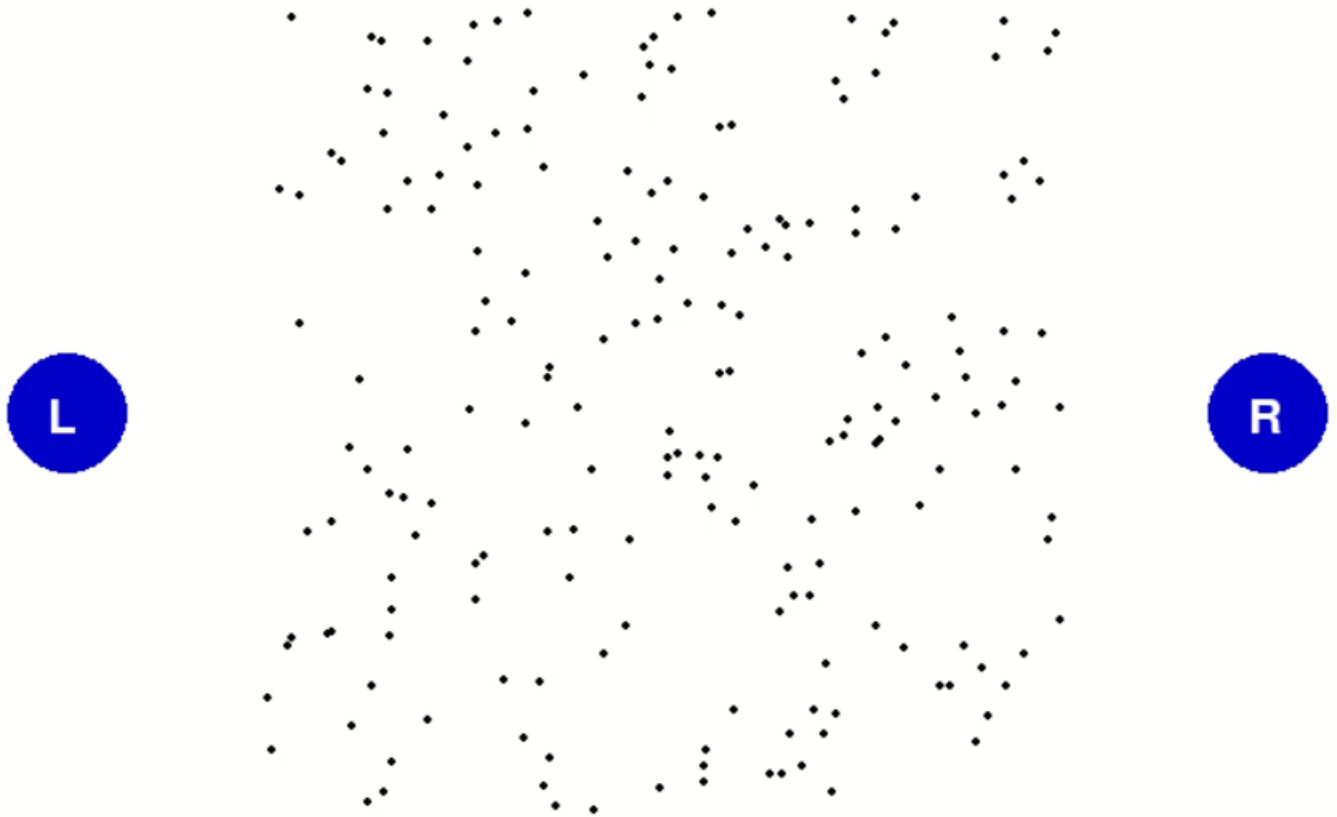
Table of Content

Motivation Recap

Changing coherence moving dots Experiment



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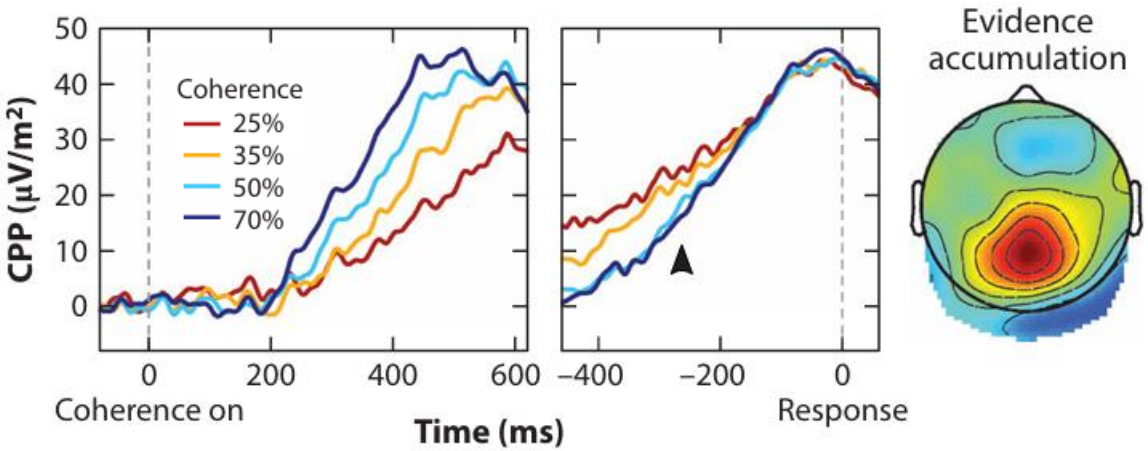
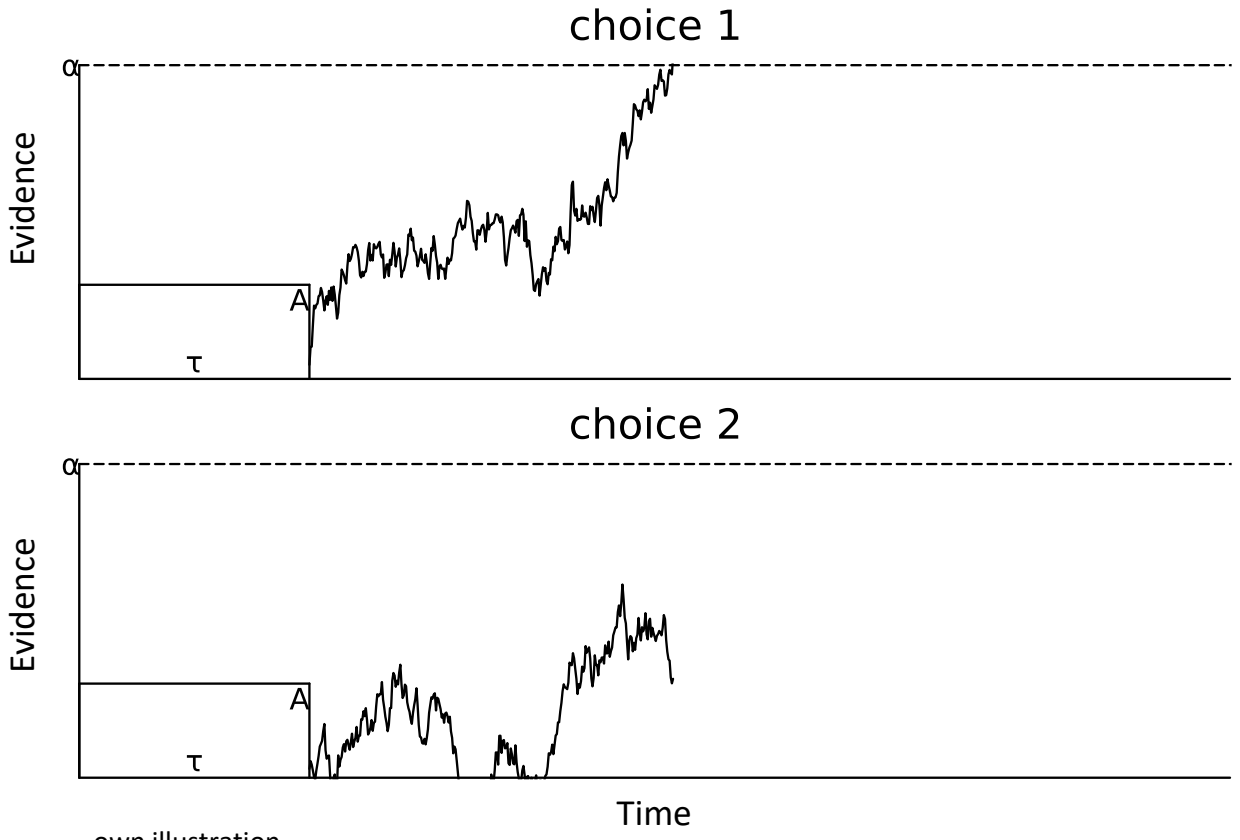
Motivation Recap

Evidence-dependent structural dynamics of the component centroparietal positivity (CPP) in the brain



Kelly et al. Neurophysiology of Human Perceptual Decision-Making 2021 [1]

Sequential sampling models (SSM) depict the decision-making process in the brain



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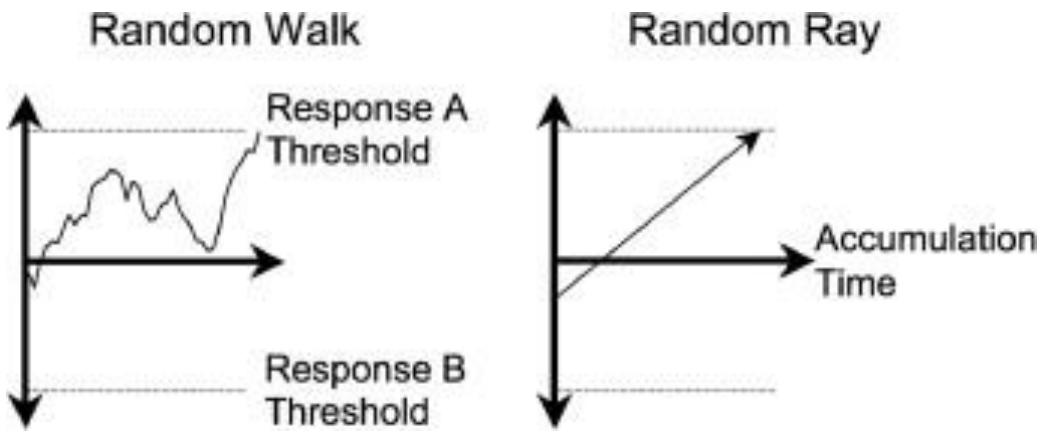
Approach

1. Theoretical Description of Sequential Sampling Models

   Selection of the Models:

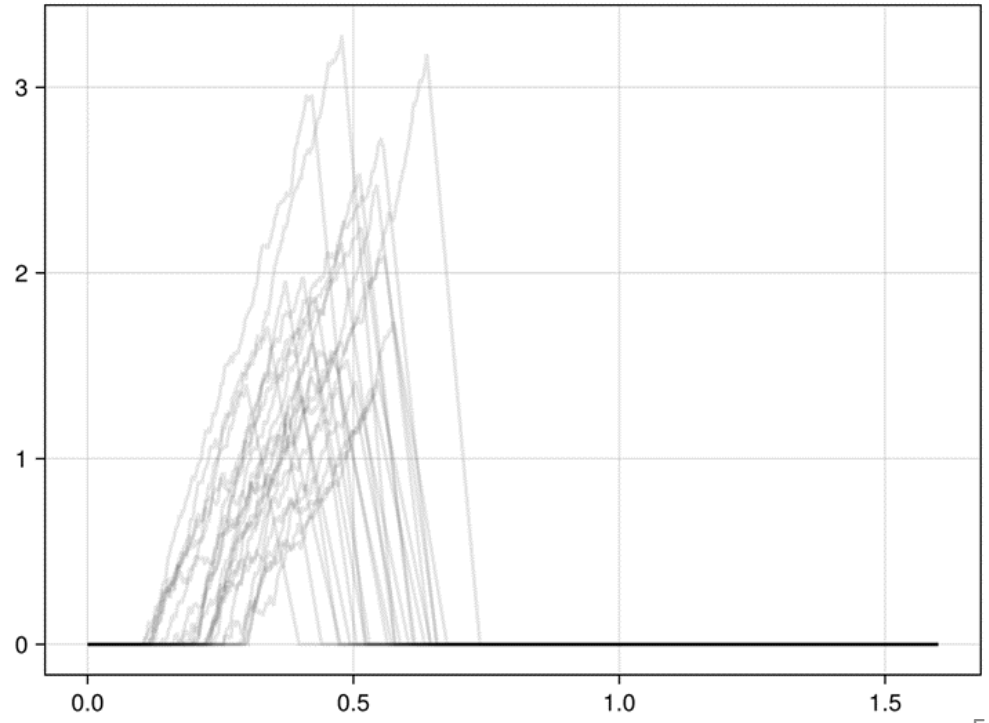
drift-diffusion model (DDM)

linear ballistic accumulator (LBA)



Brown et al. The simplest complete model of choice response time: Linear ballistic accumulation 2008 [2]

Kelly et. al Model of neural activity



Own illustration based on Kelly et al. Code converted to Julia

Approach

2. Reimplementation of the Kelly et. al Model of neural activity

- Understanding the code
- structured and methodical Reimplementation
- Code and parameters Documentation

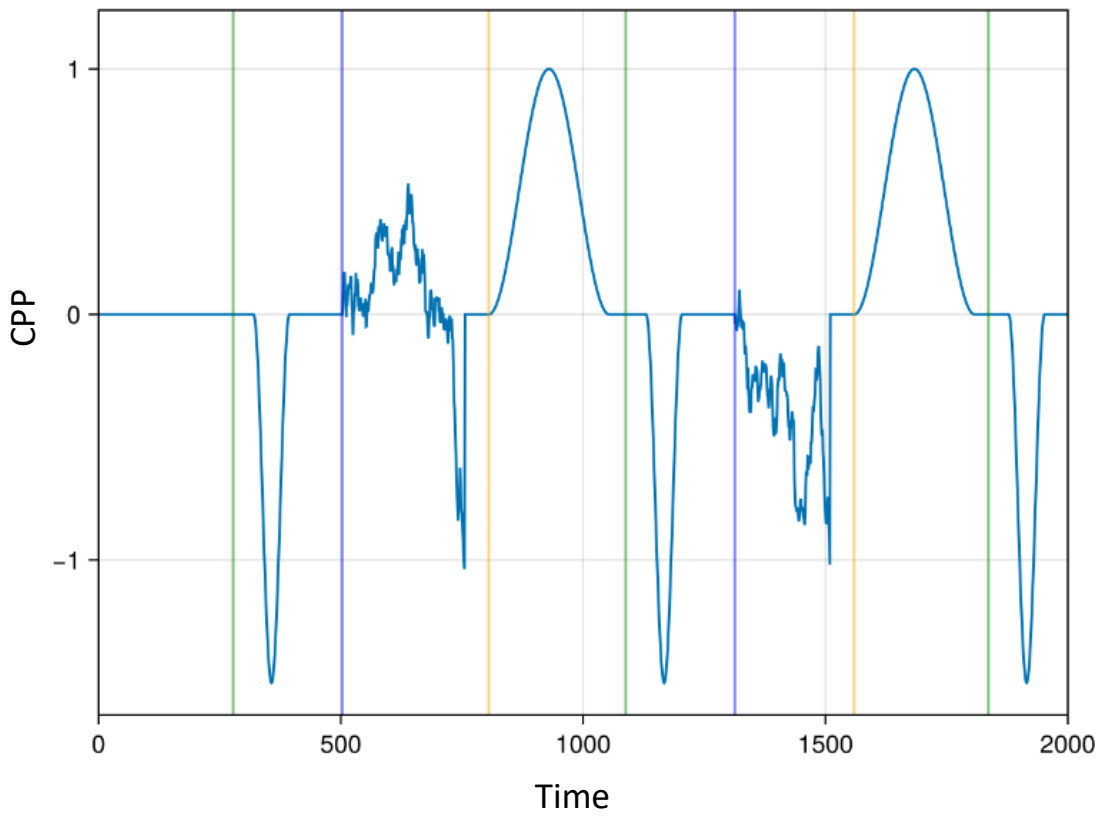
3. Integration into UnfoldSim (Ongoing…)

- Introduction to UnfoldSim usage
- Adapting implementation to package paradigms
- Splitting functionalities and documenting code.

Preliminary results - DDM

Legend

Stimulus(S) Component(C) Response(R)



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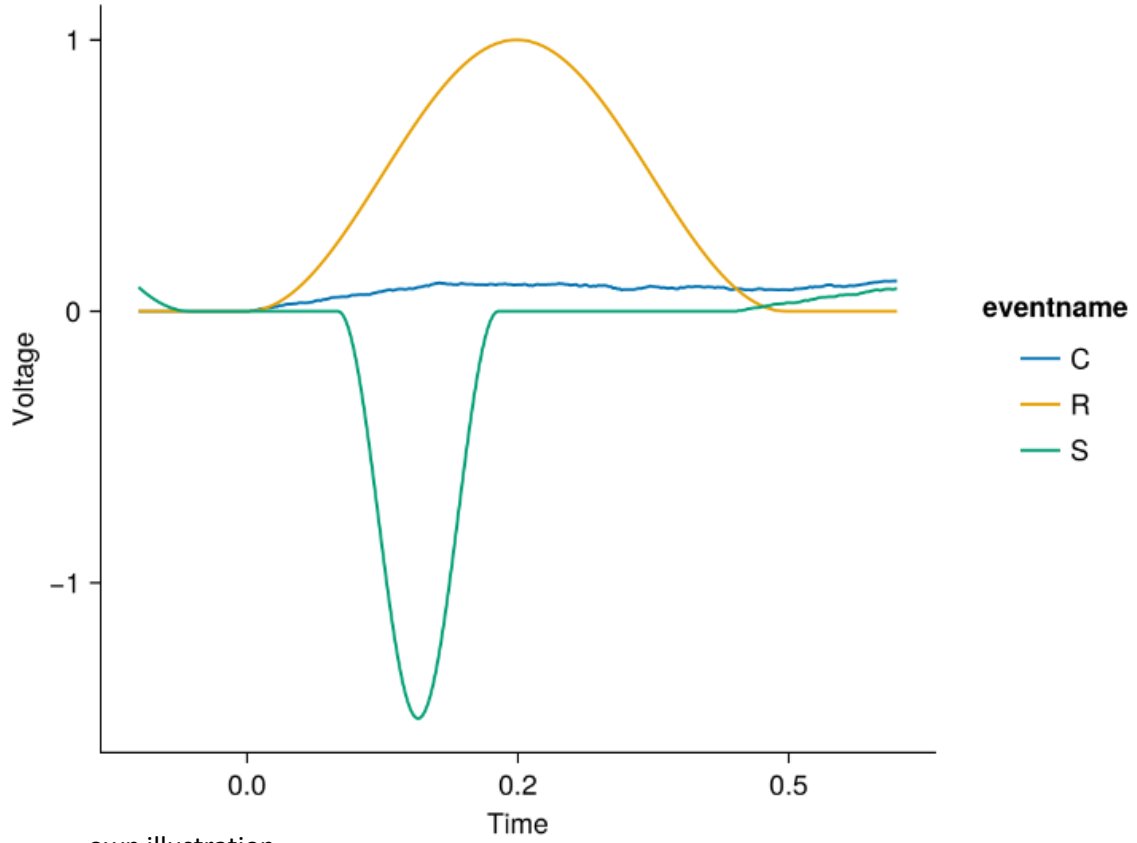

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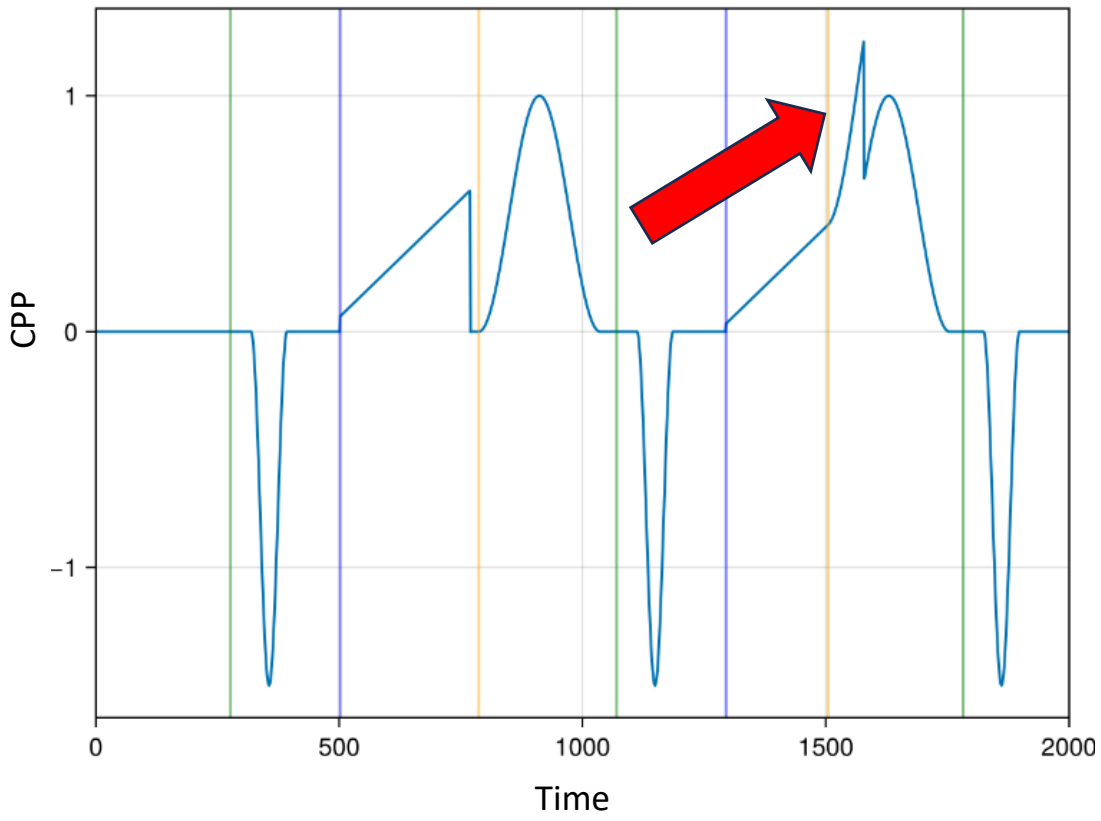
Preliminary results - LBA

Legend

Stimulus(S) Component(C) Response(R)



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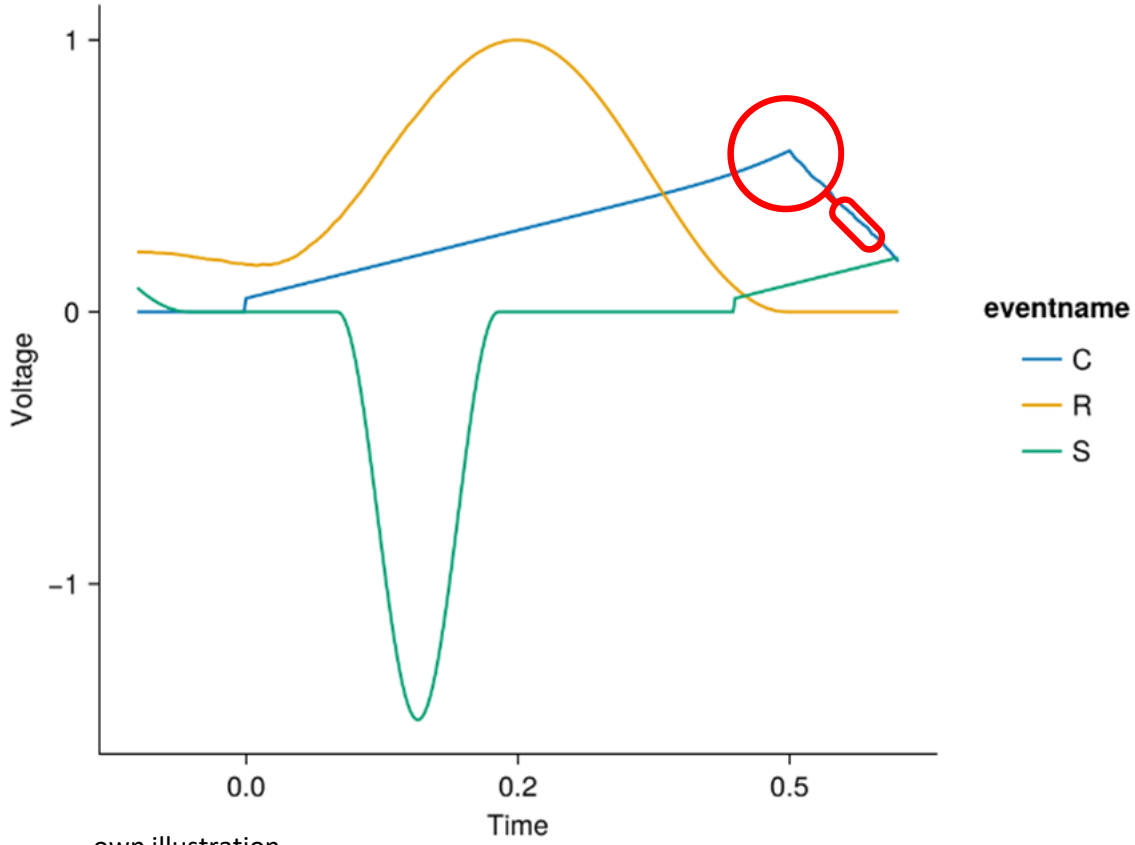

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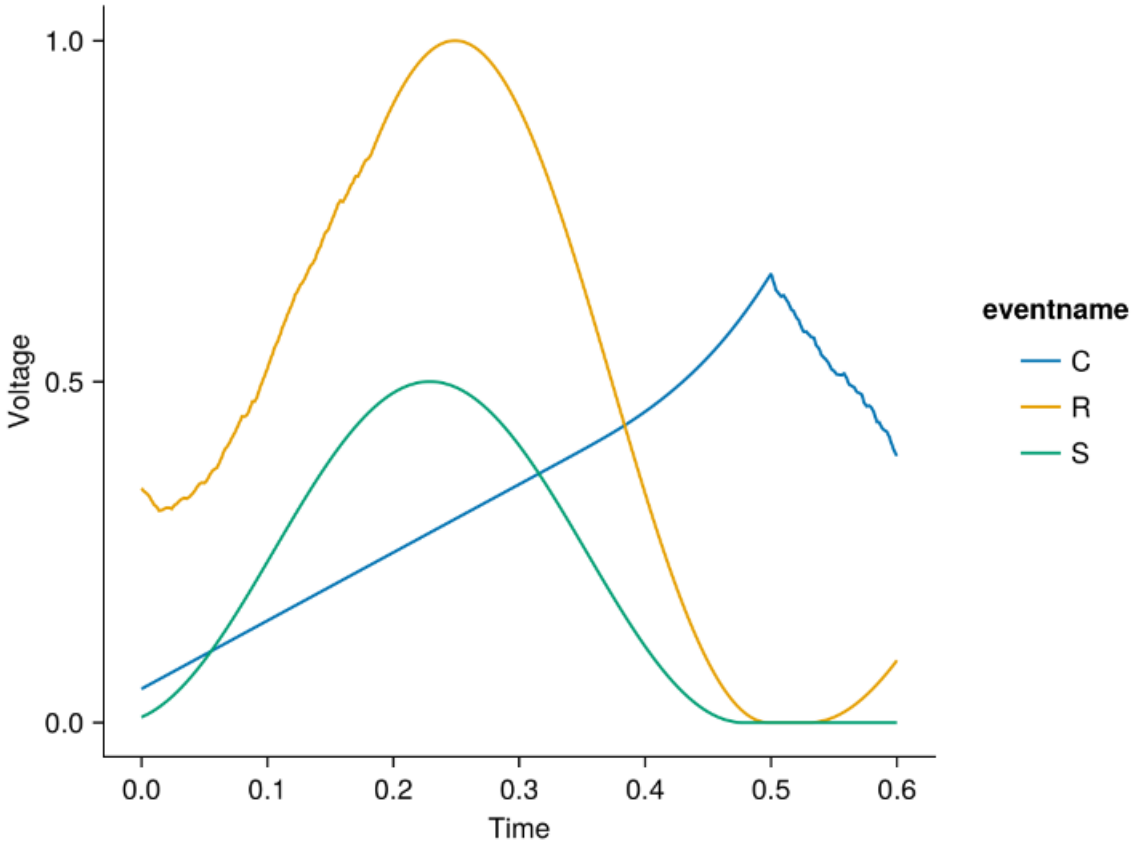
Preliminary results - Overlap

ERP



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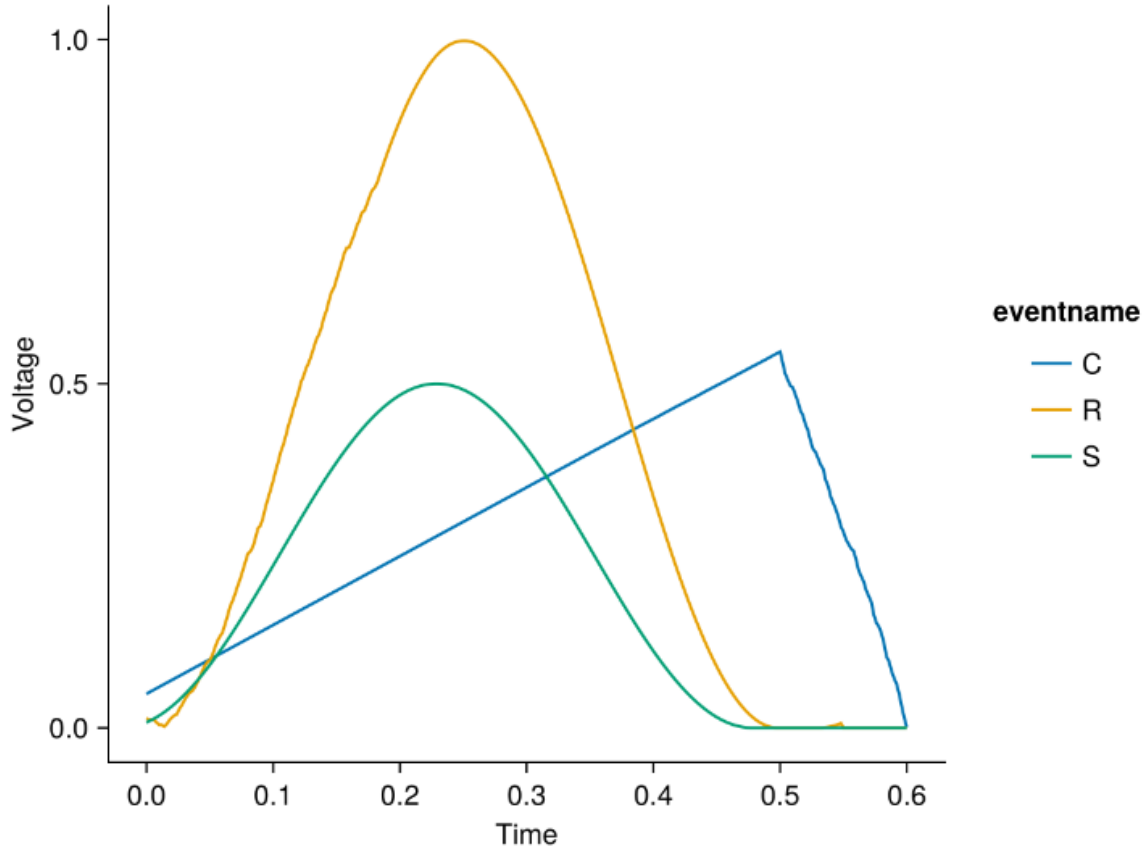
DECONV



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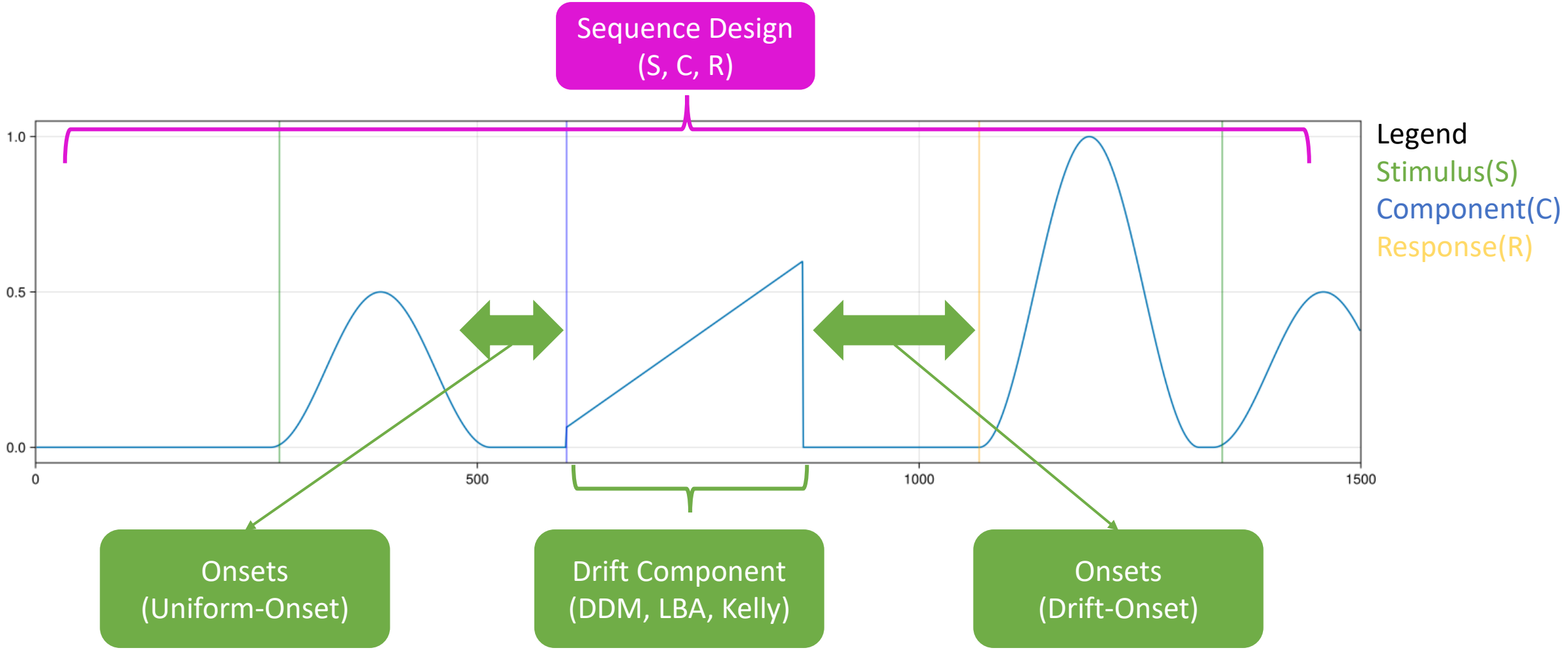
Preliminary results - UnfoldSim.jl

THE EEG SIMULATION TOOLBOX



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Schedule for the next steps

Timeline between 22.01. until 31.03.

1. Finish the Implementation and Documentation
2. Overall test of the implemented functionalities, especially edge cases
3. Integrate into UnfoldSim on a feature Branch
4. Write the thesis
5. On Top: Comparison of Models

Questions?

Literature

[1]: Redmond G. Connell and Simon P. Kelly. Neurophysiology of human perceptual decision making. Annual Review of Neuroscience, 44(Volume 44, 2021):495–516, 2021.

[2]: S. D. Brown and A. Heathcote, “The simplest complete model of choice response time: Linear ballistic accumulation,” Cognitive Psychology, vol. 57, no. 3, pp. 153–178, 2008, doi: https://doi.org/10.1016/j.cogpsych.2007.12.002.