

From Optimized Learning of Vocabulary to Diagnosing Memory Decline in Clinical Populations

BCN Symposium: Speak your mind

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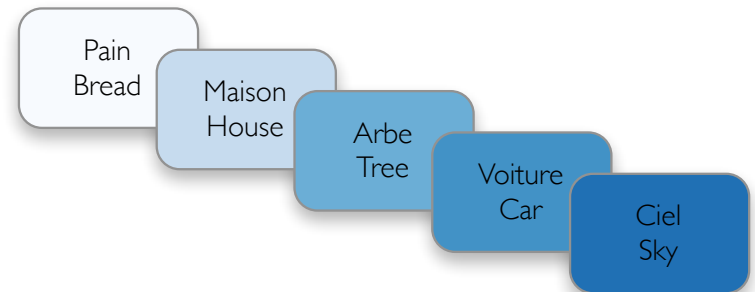
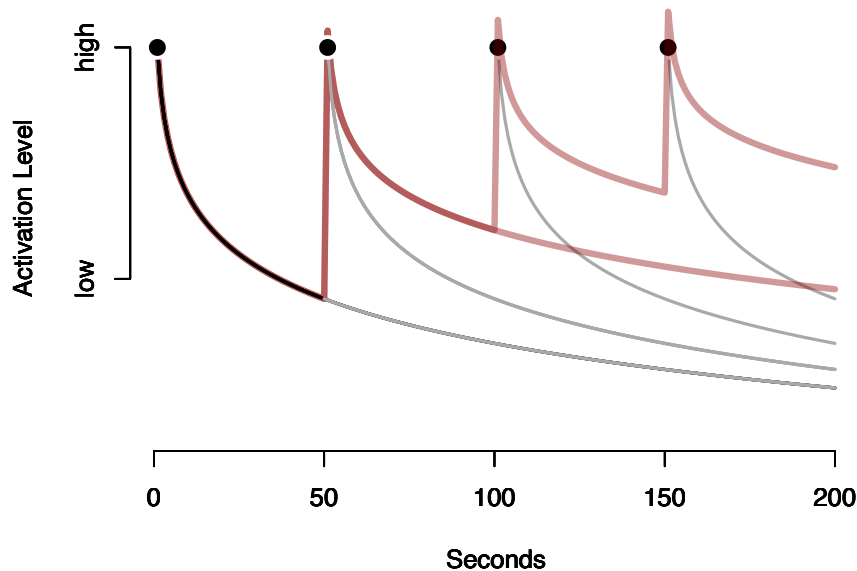
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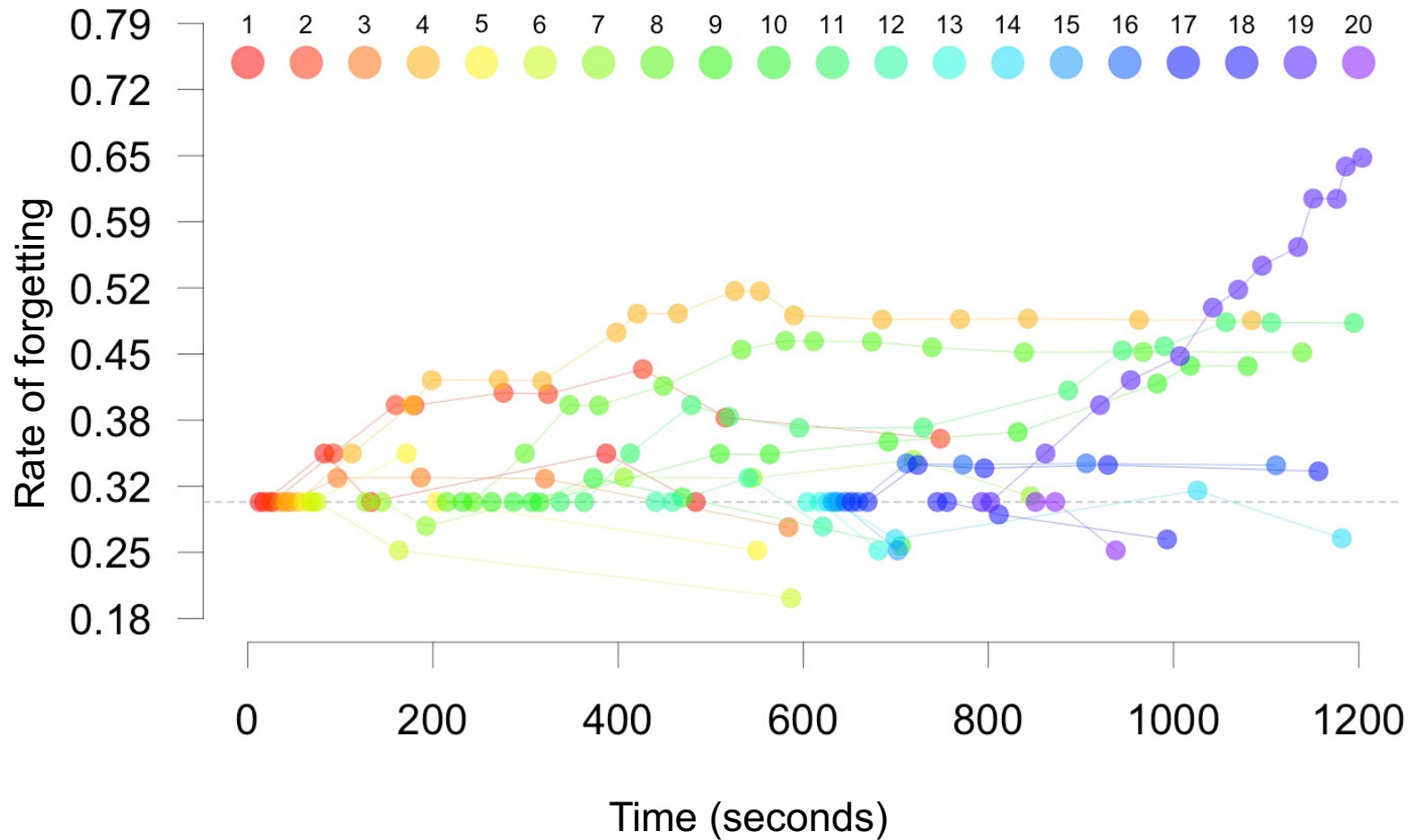
SlimStampen: Memory Theory-based Learning

- Finding optimal item repetition schedules
- ACT-R model of human declarative memory
- Estimating the **rate at which learners forget items** using accuracy and response times
- Repeating items just before they are estimated to be forgotten





Tracking Rate of Forgetting





Is the Rate of Forgetting a personal trait?

The rate of forgetting is:

- Correlated between different sessions of *similar* learning materials ($r = .8$)
- Correlated between sessions of *different* learning materials ($r = .5$)
- Correlated with resting-state EEG and MRI

- **Can we use SlimStampen model's Rate of Forgetting estimations to diagnose memory decline in clinical populations?**



Rate of Forgetting as a clinical marker (1)

- Collaboration with Deutsches Zentrum für Neurodegenerative Erkrankungen (DZNE) in Magdeburg
- 29 participants, aged 65-85
- Learning the names of German cities, using a speech-based version of SlimStampen
- Montreal Cognitive Assessment (MoCa)

- Rate of Forgetting was negatively associated with MoCA-scores (Pearson's $r = -0.49$, Bayes Factor = 9.12)



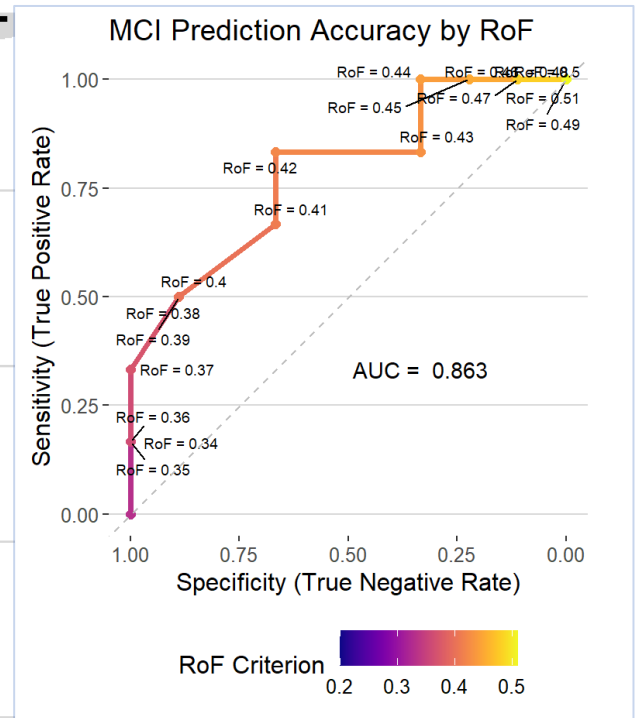
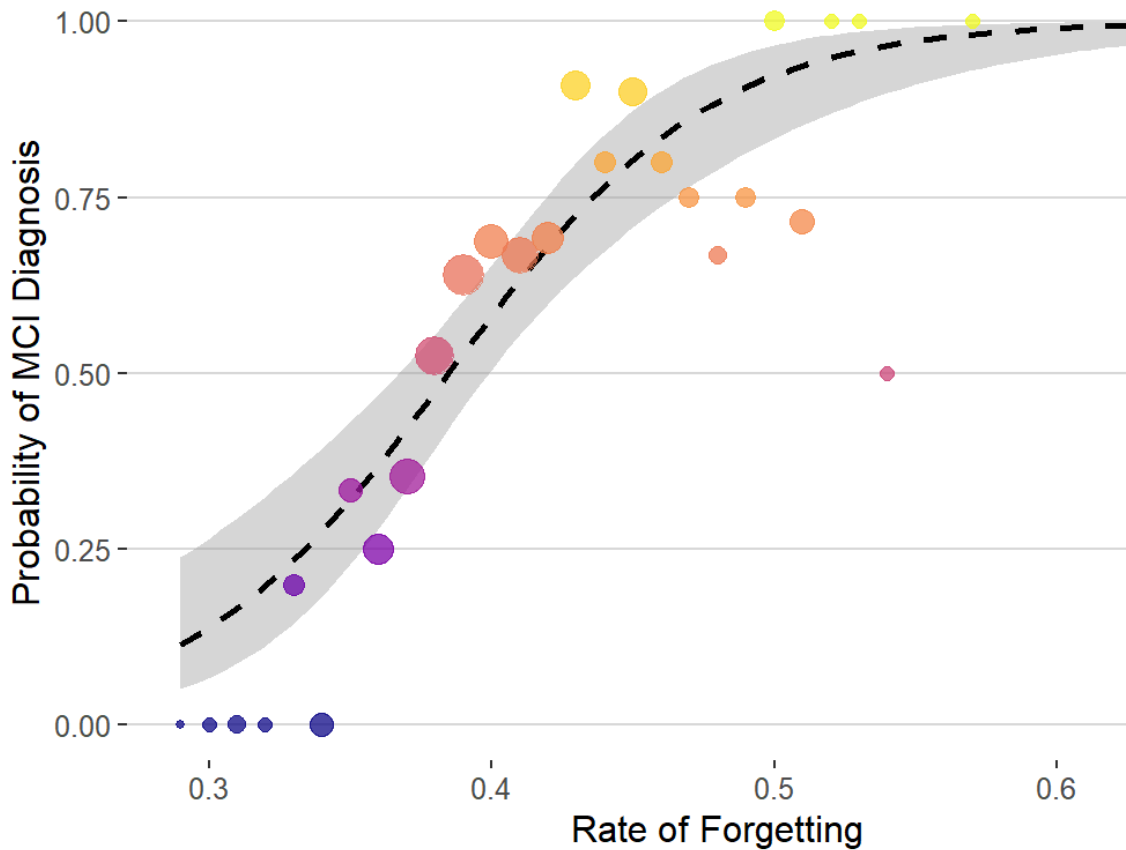
Rate of Forgetting as a clinical marker (2)

- Collaboration Alzheimer Disease Research Centre (ADRC), University of Washington, Seattle
- Intake of SCD patients by 3 neurologists (3-5 hrs)
- Probability of MCI diagnosis
 - > Health History
 - > Family Health History
 - > Clinical Dementia Rating (CDR®)
 - Six domains of cognitive and functional performance: Memory, Orientation, Judgment & Problem Solving, Community Affairs, Home & Hobbies, and Personal Care.
 - > Montreal Cognitive Assessment MoCA
 - > Neuropsychological Battery
 - Craft Story 21 Recall (Immediate)
 - Benson Complex Figure Copy
 - Number Span Test: Forward
 - Number Span Test: Backward
 - Category Fluency
 - Trail Making Test
 - Craft Story 21 Recall (Delayed)
 - Benson Complex Figure Recall
 - Multilingual Naming Test (MINT)
 - Verbal Fluency: Phonemic Test
 - > Neurological evaluation



Predicting MCI status from Rate of Forgetting

Probability of MCI by RoF

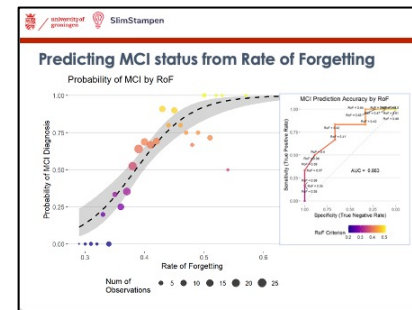
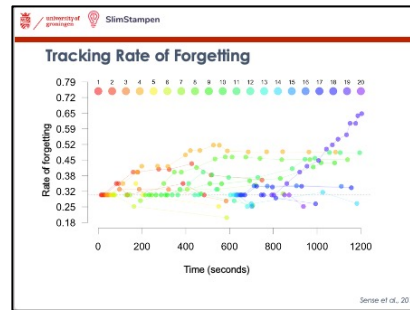
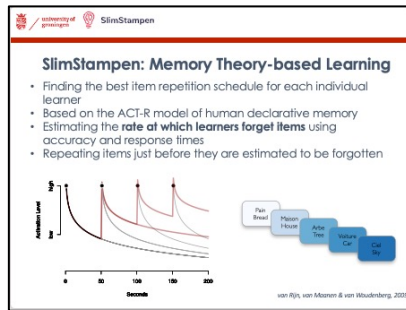




What's next?

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Thank you for your attention!



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Speech prosody-based improvements of Rate of Forgetting estimations

