Make sure your R and RStudio (if you use it, we will) are up to date, install the EMC2 R package and make sure its dependencies are up to date.

NB: EMC2 only has limited multi-core ability under Windows. If at all possible, install some sort of Linux and use that as it will be much faster.

EMC2 Schedule

Wednesday	Lecturer/Topic	
09:00 - 10:30	Heathcote & Stevenson: Introduction to Race Models	Broad introduction from the reading, then cover LBA, RDM and LNR both conceptually and in EMC2, create and play with simulated data, **READING**: Heathcote, A., & Matzke, D. (2022). Winner takes all! What are race models, and why and how should psychologists use them? Current Directions in Psychological Science, 31, 383-394. https://doi.org/10.1177/096372142210958
10:30 - 11:00	Break	
11:00 - 12:30	Heathcote & Stevenson: Fitting individual participants in EMC2	Designs and priors, simulating and fitting data from the DDM, LBA, LNR and RDM, examining convergence.
12:30 -14:00	Lunch	
14:00 - 15:30	Heathcote & Stevenson: Interpreting individual model fits	Posterior predictives, model fit checks, model comparison, parameter inference.
15:30 - 16:00	Break	
16:00 - 17:30	Stevenson & Matzke: Hierarchical modelling	Designs and priors, simulating and fitting data, spurious hierarchical correlations. **READING**: Stevenson, N., Donzallaz, M.C., Innes, R., Forstmann B., Matzke, D., & Heathcote, A. (2026). Bayesian hierarchical cognitive modeling with the EMC2 package. Behavior Research Methods, 58, 35. https://doi.org/10.3758/s13428-025-02869-y
Thursday		
09:00 - 10:30	Stevenson & Heathcote: Interpreting Hierarchical model fits	Posterior predictives, model fit checks, model comparison, parameter inference
10:30 - 11:00	Break	
11:00 - 12:30	Complicated designs	**READING:** Strickland, L., Boag, R. J., Stevenson, N., & Heathcote, A. (accepted 17/2/2026). A practical guide to expressing psychological theories in evidence accumulation models, Behavior Research Methods https://osf.io/u7da4/
12:30 -14:00	Lunch	
14:00 - 15:30		Project discussion
15:30 - 16:00	Break	
16:00 - 17:30		Group Work

Background readings

Original references for LBA/LNR/RDM race models:

Brown, S. D., & Heathcote, A. (2008). The simplest complete model of choice response time: Linear ballistic accumulation. *Cognitive Psychology*, *57*(3), 153–178.

Heathcote, A., & Love, J. (2012). Linear deterministic accumulator models of simple choice. *Frontiers in Cognitive Science, 3*, 292. doi: 10.3389/fpsyg.2012.00292.

Tillman, G., Van Zandt, T., & Logan, G. D. (2020). Sequential sampling models without random between-trial variability: The racing diffusion model of speeded decision making. *Psychonomic Bulletin & Review, 27*(5), 911–936. https://link.springer.com/article/10.3758/s13423-020-01719-6

Statistical pitfalls and estimation challenges in evidence-accumulation models (EAMs):

Donzallaz, M.C., Stevenson, N., Heathcote, A., & Matzke, D. (2025). Disentangling within- and between-subject correlations in cognitive models: The essential role of hierarchical estimation. *Manuscript submitted for publication*.

Boehm, U., Marsman, M., Matzke, D., & Wagenmakers, E.-J. (2018). On the importance of avoiding shortcuts in applying cognitive models to hierarchical data. *Behavioral Research Methods, 50,* 1614-1631.

Ly, A., Boehm, U., Heathcote, A., Turner, B.M., Forstmann, B., Marsman, M., & Matzke, D. (2018). A flexible and efficient hierarchical Bayesian approach to the exploration of individual differences in cognitive-model-based neuroscience. In A.A. Moustafa (Ed.), *Computational models of brain and behavior* (pp. 467-480). Wiley Blackwell.

Boehm, U., Annis, J., Frank, M.J., Hawkins, G.E., Heathcote, A., Kellen, D., …, Matzke, D., & Wagenmakers, E.-J. (2018). Estimating across-trial variability parameters of the Diffusion Decision Model: Expert advice and recommendations. *Journal of Mathematical Psychology, 87,* 46-75.

Lüken, M., Heathcote, A., Haaf, J., & Matzke, D. (2025). Parameter identifiability in evidence-accumulation models: The effect of error rates on the diffusion decision model and the linear ballistic accumulator. *Psychonomic Bulletin & Review*, *32*, 1411-1424. https://doi.org/10.3758/s13423-024-02621-1

Experimental design for EAMs:

Boag, R.J., Innes, R.J., Stevenson, N., Bahg, G., Busemeyer, J.R., Cox, G.E., Donkin, C., Frank, M.J., Hawkins, G.E., Heathcote, A., Hedge, C., Lerche, V., Lilburn, S.D., Logan, G.D., Matzke, D., Miletic, S., Osth, A.F., Palmeri, T.J., Sedeberg, P.B., Singmann, H., Smith, P.L., Stafford, T., Steyvers, M., Strickland, L., Trueblood, J.S., Tsetsos, T., Turner, B.M., Usher, M., van Maanen, L., van Ravenzwaaij, D., Vanderkerckhove, J., Voss, A., Weichart, E.R., Weindel, G., White, C.N., Evans, N.J., Brown, S.D., & Forstmann, B.U. (2025). An expert guide to planning experimental tasks for evidence accumulation modelling. *Advances in Methods and Practices in Psychological Science, 8*, 1-41. https://doi.org/10.1177/25152459251336127

General intro Bayes and priors for EAMs

Wagenmakers, E.-J., Marsman, M., Jamil, T., Ly, A., Verhagen, A.J., Love, J., …, Matzke, D., et al. (2018). Bayesian inference for psychology. Part I: Theoretical advantages and practical ramifications. *Psychonomic Bulletin & Review, 25*, 35-57.

Tran, N.-H., van Maanen, L., Heathcote, A., & Matzke, D. (2021). Systematic parameter reviews in cognitive modeling: Towards robust and cumulative models of psychological processes. *Frontiers in Psychology: Quantitative Psychology and Measurement, 11*:608287.

Model comparison for EAMs:

Boehm, U., Evans, N.J., Gronau, Q.F, Matzke, D., Wagenmakers, E.-J., Heathcote, A. (2024). Inclusion Bayes Factors for mixed hierarchical diffusion decision models. *Psychological Methods, 29,* 625-655. https://doi.org/10.1037/met0000582

Gronau, Q.F., Heathcote, A., & Matzke, D. (2020). Computing Bayes factors for evidence-accumulation models using Warp-III bridge sampling. *Behavioral Research Methods, 52,* 918-937.

Good practices in cognitive modeling:

Lee, M., Criss, A.H., Devezer, B., Donkin, C., Etz, A., Leite,F., Matzke, D., …, Vandekerckhove, J. (2019). Robust modeling in cognitive science. *Computational Brain & Behavior, 2,* 141–153.

Vandekerckhove, J., White, C.N., Trueblood, J.S., Rouder, J.N., Matzke, D., Leite, F.P., …, Lee., M.D. (2019). Robustness and diversity in cognitive modeling. *Computational Brain & Behavior, 2,* 271–276.

Heathcote, A., Brown, S.D. & Wagenmakers, E.-J. (2015). An introduction to good practices in cognitive modeling. In B. U. Forstmann, & E.-J. Wagenmakers (Eds.), *An introduction to model-based cognitive neuroscience* (pp. 25-48). Springer: New York.