Seminar: Cognitive Models for Human Decision Making

Blockseminary 09.06.-10.06.2017 09:00-17:00 (**SR 00-010/014, Building 101;** Technical Faculty)

First meeting (assignment of topics): **28.04.2017 at 17:00** (**SR 02-017, Building 52;** Technical Faculty)

Everyone attending the course will have to study the following papers:

Schwenk, C. R. (1984). Cognitive simplification processes in strategic decision making. *Strategic management journal*, *5*(2), 111-128. http://www.jstor.org/stable/2486171

Gigerenzer, G., & Gaissmaier, W. (2011). Heuristic decision making. *Annual review of psychology*, *62*, 451-482. http://pubman.mpdl.mpg.de/pubman/item/escidoc:2099042/component/escidoc:2099041/GG_Heuristic_2011.pdf

Dawes, R. M. (1979). The robust beauty of improper linear models in decision making. *American psychologist*, *34*(7), 571. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.188.5825&rep=rep1&type=pdf

Requirements:

(1) Study the introductory articles

(2) Prepare a presentation based on a seleceted paper

i. Define the decision-making task (as formal as possible!)
ii. Present the experimental and/or behavioral data from the paper
iii. Present the cognitive model
iv. Show strengths and weaknesses of the approach

Send everything to Lukas Elflein (elfleinl@informatik.uni-freiburg.de) by **20.05.2017 (later submissions are not accepted)**

(3) Form a group of three students and develop and implement your own cognitive model for human decision making. Data can be findings from one of your selected papers OR search for behavioral data of human decision-making (use Google or Open Science Framework, e.g., https://osf.io/kzw9q/ or https://www.nature.com/articles/sdata2016127, or others). Models can be Bayesian, multinomial process trees, ACT-R, mathematical equation, etc. in preferably R or Python.

Send model code and a self-explanatory brief presentation (slides) of your cognitive model to Lukas Elflein (elfleinl@informatik.uni-freiburg.de) by **01.06.2017**

(4) Present (2) and (3) during the seminar. Presentation for (2) approx. 20 minutes per student.

Topics

Topic 1: One reason decision making (2 Presentations)

- Hilbig, B. E., Erdfelder, E., & Pohl, R. F. (2010). One-reason decision making unveiled: A measurement model of the recognition heuristic. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *36*(1), 123. https://scholar.google.de/scholar?output=instlink&q=info:aoz-NQ3hZ8oJ:scholar.google.com/&hl=de&as_sdt=0,5&scillfp=16004371190723976476&oi=lle
- Hilbig, B. E., Erdfelder, E., & Pohl, R. F. (2012). A matter of time: Antecedents of one-reason decision making based on recognition. *Acta Psychologica*, *141*(1), 9-16. https://www.researchgate.net/profile/Benjamin_Hilbig/publication/229436477_A_matter_of_time_Antecedents_of_one-reason_decision_making_based_on_recognition._Acta_Psychologica_141_9-16/links/00b7d5308744093fed000000.pdf
- Erdfelder, E., & Buchner, A. (1998). Decomposing the hindsight bias: A multinomial processing tree model for separating recollection and reconstruction in hindsight. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *24*(2), 387. https://scholar.google.de/scholar?output=instlink&q=info:3Kd_QnpfGQgJ:scholar.google.com/&hl=de&as_sdt=0,5&scillfp=12659221854330581129&oi=lle
- Erdfelder, E., Küpper-Tetzel, C. E., & Mattern, S. D. (2011). Threshold models of recognition and the recognition heuristic. *Judgment and Decision Making*, *6*(1), 7. http://sjdm.cybermango.org/journal/11/rh13/rh13.pdf

Topic 2: Decision Field Theory and quantum decision making

- Busemeyer, J. R., & Townsend, J. T. (1993). Decision field theory: A dynamic-cognitive approach to decision making in an uncertain environment. *Psychological review*, *100*(3), 432. http://www.academia.edu/download/42539/19kk5321vm0tfuwpmw6d.pdf
- Busemeyer, J. R., Wang, Z., & Lambert-Mogiliansky, A. (2009). Empirical comparison of Markov and quantum models of decision making. *Journal of Mathematical Psychology*, *53*(5), 423-433. http://www.thedocc.com/wp-content/uploads/2015/02/J7.-Busemeyer-Wang-LM-2009-Markov-and-quantum-models-of-decision.pdf
- Busemeyer, J. R., Wang, J., & Shiffrin, R. M. (2012). Bayesian model comparison of quantum versus traditional models of decision making for explaining violations of the dynamic consistency principle. *Foundations and Applications of Utility, Risk and Decision Theory, Atlanta, Georgia.[arEMP]*. http://excen.gsu.edu/fur2012/fullpapers/jbusemeyer.pdf

Topic 3: Instance based learning

- Gonzalez, C., Lerch, J. F., & Lebiere, C. (2003). Instance-based learning in dynamic decision making. *Cognitive Science*, *27*(4), 591-635. http://repository.cmu.edu/cgi/viewcontent.cgi?article=1031&context=sds
- Gonzalez, C., & Lebiere, C. (2005). Instance-based cognitive models of decision-making. http://repository.cmu.edu/cgi/viewcontent.cgi?article=1084&context=sds
- Lebiere, C., Gonzalez, C., & Martin, M. (2007). Instance-based decision making model of repeated binary choice. *Department of Social and Decision Sciences*, 88. http://repository.cmu.edu/cgi/viewcontent.cgi?article=1083&context=sds

Topic 4: Selecting strategies

- Rieskamp, J., & Hoffrage, U. (2008). Inferences under time pressure: How opportunity costs affect strategy selection. *Acta psychologica*, *127*(2), 258-276. https://www.researchgate.net/profile/Joerg_Rieskamp/publication/6197244_Inferences_under_time_pressure_How_opportunity_costs_affect_strategy_selection/links/0fcfd5124a08f384aa000000.pdf
- Rieskamp, J., & Otto, P. E. (2006). SSL: a theory of how people learn to select strategies. *Journal of Experimental Psychology: General*, *135*(2), 207. http://www.academia.edu/download/41908419/SSL_A_Theory_of_How_People_Learn_to_Sele20160202-30232-6oa6g5.pdf
- Rieskamp, J., Busemeyer, J. R., & Mellers, B. A. (2006). Extending the bounds of rationality: evidence and theories of preferential choice. *Journal of Economic Literature*, *44*(3), 631-661. http://www.jstor.org/stable/30032347
- Rieskamp, J. (2008). The probabilistic nature of preferential choice. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *34*(6), 1446. https://www.researchgate.net/profile/Joerg_Rieskamp/publication/23447804_The_Probabilistic_Nature_of_Preferential_Choice/links/0fcfd50e6b77c68018000000.pdf

Topic 5: Heuristics (2 Presentations)

- Gigerenzer, G., & Goldstein, D. G. (1996). Reasoning the fast and frugal way: models of bounded rationality. *Psychological review*, *103*(4), 650. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.137.3432&rep=rep1&type=pdf
- Lee, M. D., Zhang, S., Munro, M., & Steyvers, M. (2009). Using heuristic models to understand human and optimal decision-making on bandit problems. In *Proceedings of the Ninth International Conference on Cognitive Modeling—ICCM2009. Manchester, UK*. http://www.cogsci.ucsd.edu/~s6zhang/publications/paper174.pdf
- Gigerenzer, G. (1991). How to make cognitive illusions disappear: Beyond “heuristics and biases”. *European review of social psychology*, *2*(1), 83-115. https://pdfs.semanticscholar.org/98ac/08e8055a04c8ec629b2887bc9b46d645e9b4.pdf
- Newell, B. R., & Shanks, D. R. (2003). Take the best or look at the rest? Factors influencing" one-reason" decision making. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*(1), 53. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.467.7264&rep=rep1&type=pdf
- Gigerenzer, G., & Brighton, H. (2009). Homo heuristicus: Why biased minds make better inferences. *Topics in Cognitive Science*, *1*(1), 107-143.http://onlinelibrary.wiley.com/doi/10.1111/j.1756-8765.2008.01006.x/full

Topic 6: The adaptive toolbox

- Scheibehenne, B., Rieskamp, J., & Wagenmakers, E. J. (2013). Testing adaptive toolbox models: A Bayesian hierarchical approach. *Psychological review*, *120*(1), 39. https://archive-ouverte.unige.ch/unige:76435/ATTACHMENT01

- Pohl, R. F., Erdfelder, E., Hilbig, B. E., Liebke, L., & Stahlberg, D. (2013). Effort reduction after self-control depletion: The role of cognitive resources in use of simple heuristics. *Journal of Cognitive Psychology*, *25*(3), 267-276.

Topic 7: Bayesian estimation

- Nilsson, H., Rieskamp, J., & Wagenmakers, E. J. (2011). Hierarchical Bayesian parameter estimation for cumulative prospect theory. *Journal of Mathematical Psychology*, *55*(1), 84-93. http://ejwagenmakers.com/2011/NilssonEtAl2011.pdf

Topic 8: Information redundancy and capacity limitations (2 presentations)

- Dieckmann, A., & Rieskamp, J. (2007). The influence of information redundancy on probabilistic inferences. *Memory & Cognition*, *35*(7), 1801-1813. https://kops.uni-konstanz.de/bitstream/handle/123456789/27938/Gaissmaier_279384.pdf?sequence=1&isAllowed=y
- Rieskamp, J., Busemeyer, J. R., & Laine, T. (2003). How do people learn to allocate resources? Comparing two learning theories. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*(6), 1066. https://www.researchgate.net/profile/Joerg_Rieskamp/publication/9005088_How_do_people_learn_to_allocate_resources_Comparing_two_learning_theories/links/00b4952813fb3d666a000000.pdf
- Gaissmaier, W., Schooler, L. J., & Rieskamp, J. (2006). Simple predictions fueled by capacity limitations: When are they successful?. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *32*(5), 966. https://kops.uni-konstanz.de/bitstream/handle/123456789/27938/Gaissmaier_279384.pdf?sequence=1&isAllowed=y

Topic 9: Neuromodeling

- Frank, M. J., & Claus, E. D. (2006). Anatomy of a decision: striato-orbitofrontal interactions in reinforcement learning, decision making, and reversal. *Psychological review*, *113*(2), 300. http://ski.clps.brown.edu/papers/FrankClaus06.pdf

Topic 10: Differences in decision-making

- Stout, J. C., Busemeyer, J. R., Lin, A., Grant, S. J., & Bonson, K. R. (2004). Cognitive modeling analysis of decision-making processes in cocaine abusers. *Psychonomic bulletin & review*, *11*(4), 742-747. http://link.springer.com/content/pdf/10.3758/BF03196629.pdf
- Cokely, E. T., & Kelley, C. M. (2009). Cognitive abilities and superior decision making under risk: A protocol analysis and process model evaluation. *Judgment and Decision Making*, *4*(1), 20. http://pubman.mpdl.mpg.de/pubman/item/escidoc:2099809/component/escidoc:2343741/az0901989.pdf