STEFAN BUCHER

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Employment

Postdoctoral Researcher at Univ. Tübingen and Max Planck Institute for Biological Cybernetics, 2021-
Advisor: Peter Dayan

Education

PhD in Economics, New York University, 2015-2021
Thesis Title: *Information Constraints in Decision-Making*
Committee: Andrew Caplin, Paul Glimcher, Adam Brandenburger, Michael Woodford, Andrew Schotter, Eero Simoncelli
MPhil in Economics, New York University, 2019 (en route)
MSc in Economics, London School of Economics and Political Science, 2015
MSc in Computational Science and Engineering, ETH Zürich (Dept. of Mathematics), 2013
Semester at Ecole Polytechnique Fédérale de Lausanne (Blue Brain Project)
BSc in Computational Science and Engineering, ETH Zürich (Dept. of Mathematics), 2013
Semester at Ecole Normale Supérieure Paris (Dept. of Cognitive Science)

Invited Talks and Conference Presentations

*poster **presented by co-author

2022: ASSA Meeting
2021: NYU SoM Neuroscience Institute, Virtual Behavioral Economics Seminar**, Cosyne*, Society for Neuroeconomics*, Society for Neuroscience*, Swiss Economists Abroad
2020: Society for Neuroeconomics, NYU Economics Micro Theory Seminar, International Conference on Mathematical Neuroscience*
2019: Workshop on the Cognitive Foundations of Economic Behavior, NYU Shanghai Neuroeconomics Summer School, Society for Neuroeconomics*, Society for Neuroscience*
2018: Columbia Student Workshop in Experimental Economics Techniques, Society for Neuroeconomics*, Society for Neuroscience*, Swiss Economists Abroad

Other Professional Activities

NYU GSAS Committee on Graduate Curriculum and Financial Aid (member), 2020

Grants, Fellowships, and Awards

2020-2021	NSF Doctoral Dissertation Research Improvement Grant
2020-2021	NYU GSAS Dean's Dissertation Fellowship
2015-2020	NYU GSAS Henry M. MacCracken Fellowship
2015-2016	Fulbright Scholarship
2013	Ecole Normale Supérieure Sélection Internationale, ranked 7th (of 98)
2009-2019	Swiss Study Foundation

Research Papers

Inattention and Inequity in School Matching (with Andrew Caplin), NBER Working Paper 29586

The attractive properties of the Deferred Acceptance (DA) algorithm rest on the assumption of perfect information. Yet field studies of school matching show that information is imperfect, particularly for disadvantaged students. We model costly strategic learning when schools are ex ante symmetric, agree on their ranking of students, and learning is rationally inattentive. Our analytic solution quantifies how

each student's rank, learning costs and prior beliefs interact to determine their gross and net welfare as well as the extent and form of mistakes they make. In line with the evidence, we find that lower-ranked students are affected disproportionately more by information costs, generally suffering a larger welfare loss than higher-ranked students. Interactions between mechanism design, inattention and inequity are thus of first order importance.

Divisive Normalization is an Efficient Code for Multivariate Pareto-Distributed Environments (with Adam Brandenburger), revision requested

Divisive normalization is a canonical computation in the brain, observed across sensory domains, that is often considered to be an implementation of the ***efficient coding principle***. We provide a theoretical result that makes the conditions under which divisive normalization is an efficient code analytically precise: We show that, in a low-noise environment, encoding an n-dimensional stimulus via divisive normalization is efficient ***if and only if*** its prevalence in the environment is described by a multivariate Pareto distribution. We generalize this multivariate analog of histogram equalization to allow for arbitrary metabolic costs of the representation, and show how different assumptions on costs are associated with different shapes of the distributions that divisive normalization efficiently encodes. Our result suggests that divisive normalization may have evolved to efficiently represent stimuli with Pareto distributions, consistent with empirical observations on naturalistic stimulus distributions such as the conditional variance dependence of filter responses to natural images. Our theoretical result also yields empirically testable predictions across sensory domains on how the divisive normalization parameters should be tuned to features of the input distribution.

Priors enter choice optimally only when evidence accumulation is inconclusive (with Paul Glimcher)

Prior information is invaluable to decision makers facing noisy evidence, allowing them to increase their chances of choosing the best option. Yet human choice behavior often exhibits base-rate neglect. In order to better understand the mechanisms underlying such sub-optimal behaviors, we psychophysically measured when and how a prior enters the choice process, by experimentally controlling stimulus duration in a perceptual choice task. We found that subjects' choices neglected the prior entirely when they were unconstrained, even when it could have improved their choice accuracy. Instead, subjects only took prior information into account when the amount of evidence they could accumulate was constrained and confidence was too low to be conclusive. Yet in this case their reliance on the prior was consistent with Bayes-optimal decision-making, decreasing systematically with increasingly reliable information. This suggests, further corroborated by subjects' decision confidence, that the prior is maintained by a cognitive mechanism that is distinct from evidence accumulation, which subjects resort to only when accumulated evidence is inconclusive, but not in deciding how much evidence to accumulate. Our psychometric method is more broadly applicable and yields behavioral data that identify directly how the otherwise unobservable decision variable evolves with time. Our data reveal that accumulated evidence is perfectly linear in log-time, confirming the qualitative prediction of drift-diffusion models while providing additional empirical restrictions for their refinement.

Teaching Experience

Spring 2021	Firms & Markets (Microeconomics), NYU Stern EMBA, TA for Simon Bowmaker
Summer 2020	NYU Shanghai Neuroeconomics Summer School (PhD), TA
Spring 2019	Applied Statistics & Econometrics II, NYU Master's, TA for Banani Nandi
Fall 2018	Applied Statistics & Econometrics I, NYU Master's, TA for George Lentzas
Spring 2017	Macroeconomic Analysis, NYU Undergraduate, TA for Giorgio Topa

Research Experience and Other Employment

2014	Swiss National Bank, Money Market and Foreign Exchange Unit
2013-2014	ETH Zurich Center for Law & Economics, RA to Prof. Daniel Chen (assisted in the development of the oTree.org platform for behavioral experiments)

References

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Professor Paul Glimcher
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