

EGPROC 2024

		Wed, 31.07.	Thu, 01.08.	Fri, 02.08.
from	to			
09:00	09:30	Coffee + Registration	Coffee + Registration	
09:30	10:00	Workshop <i>LLMs and Process Tracing</i>	Talk session 1 <i>Attention & Information Search</i>	Coffee
10:00	10:30			Talk session 3 <i>Verbal Reports</i>
10:30	11:00			
11:00	11:30	Coffee break		
11:30	12:00	Workshop	Keynote Jella Pfeiffer	Keynote Lukasz Walasek
12:00	12:30			
12:30	13:00	Lunch break		
13:00	13:30			
13:30	14:00			
14:00	14:30	Workshop	Talk session 2 <i>Social Decision Making & Education</i>	Talk session 4 <i>Memory & Perception</i>
14:30	15:00			
15:00	15:30	Coffee break		Coffee break
15:30	16:00	Workshop	Coffee break	Talk session 5 <i>Methodological Developments</i>
16:00	16:30		Poster session	
16:30	17:00			
17:00	17:30			
17:30	18:00	Wrap Up		
18:00	18:30	Welcome drinks	Conference dinner	
18:30	19:00			

EGPROC: Thursday, 01.08.

TALK SESSION 1: ATTENTION & INFORMATION SEARCH (9:30 – 11:00)

Jacob Orquin	Attention strategies and consumer search
Dirk Wulff	Strategic information search in decisions from experience
Christoph Ungemach	Attention Processes Underlying Choice Architecture Interventions
Eoin Cremen	Introducing AI advice to Decision Making Teams in a Hypothesis-Guided Search Task

KEYNOTE (11:30 – 12:30)

Jella Pfeiffer	Decoding Consumer Choices: The Predictive Power of Eye-Tracking in Virtual Reality Retail Environments
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TALK SESSION 2: SOCIAL DECISION MAKING & EDUCATION (14:00 – 16:00)

Jonas Frenkel	Instructional Video Design: Nonverbal Social Behavior and Its Effects on Cognitive, Affective, and Motivational Learning Outcomes
Miruna Cotet	
Rima-Maria Rahal	Cognitive Processes of Discrimination against National Outgroups: Webcam-based Eye-tracking Analysis of Ingroup-Biased Prosociality
Dominik Deffner	Disentangling the search and use of social information in collective decision-making
Natalie Badstuber	Click by click: An investigation of applicants' Test-Taking Approaches in a timed Verbal Reasoning Task

POSTER SESSION (16:30 – 17:30)

Jakub Cacek	Pupil size predicts strategy use in complex decision-making
Ezequiel Lopez Lopez	Leveraging LLMs and Networks to Analyze Collective Knowledge
Tianwei Liu	The Process of Adjustment in Anchoring
Long Nguyen	Do more numerate solve BNTS with heuristics or formal logic? A Verbal Protocol Analysis of the BNTS
Nicolas Roth	Saccadic decision-making in dynamic scenes under competing task demands
Hooman Habibnia	Merit or Luck? The Role of Inequality in Learning Opportunity on Hiring Decisions - MouseLab Study
Moritz Reis	Sticky tradition impedes selection of creative ideas

EGPROC: Friday, 02.08.

TALK SESSION 3: VERBAL REPORTS (10:00 – 11:00)

Luke Henstock	Why and how do workplaces invest in mental health and wellbeing: theory-testing in typical cases
Michael Bedek	Analyzing interactions and processes in an adaptive and evidence-based consumer health information system
Tehilla Ostrovsky	Using verbal reports to test the assumptions of cognitive models

KEYNOTE (11:30 – 12:30)

Lukasz Walasek	Incommensurability and Structure of Everyday Choices: LLM Analysis of Real World Dilemmas
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TALK SESSION 4: MEMORY & PERCEPTION (14:00 – 15:30)

Eva-Marie Heißler	Attentional guidance during decisions from memory: A matter of strategy or a matter of weight?
Chris Donkin	Eye-gaze, attention and strategy in visual working memory
Carolin Häffner	Predecisional Information Distortion: In/congruency of information predicts preference-induced memory errors
Oliver Grenke	Down to a single trial: Linking movement trajectories to sequential sampling theory

TALK SESSION 5: METHODOLOGICAL DEVELOPMENTS (16:00 – 17:30)

Michael Schulte-Mecklenbeck	Movement tracking of psychological processes
Judith Herbers	Investigating Task Choice Strategies in a Real-World Experimental Scenario
Lilian Weber	Continuous decision paradigms for quantifying the flexibility of decision formation and its neural signatures
Alexander Schakowski	Cognition in the wild: A computational workflow for integrating high resolution tracking data with formal models of decision-making

ABSTRACTS

Natalie Badstuber — Click by click: An investigation of applicants' Test-Taking Approaches in a timed Verbal Reasoning Task

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Response processes data are not only a valuable for understanding how test takers approach a test but also for test evaluation. In this preliminary data analyses, we focused on a computerized verbal reasoning (VR) task with time constraints administered to applicants in a university admission test. Each of the 10 VR items comprised a short text and five accompanying statements. Applicants were required to evaluate each statement as true, false, or unanswerable based on the text. Click tracking data of 1966 applicants from three years was examined. To identify test-taking approaches, we applied exploratory k-means cluster analysis and identified six distinct clusters, labeled after their characteristic clicking speeds. The clusters were as follows: constant-very slow (18.9%), constant-slow (26.2%), constant-medium (27.8%), constant-fast (4%), speeded (15.5%), and inactive (7.6%). Further analysis is planned to identify the specific differences in response patterns between each cluster. This will include time to first click on an item, frequency of response changes, click count per item, sequence of statement responses, mean item score, and total test score. The results will be discussed in the context of limiting test time. Nevertheless, our findings already emphasize the necessity of considering response processes beyond mere accuracy in test evaluation and development.

Michael Bedek — Analyzing interactions and processes in an adaptive and evidence-based consumer health information system

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The A+CHIS project (<https://apchis.cg.v.tugraz.at/>) develops an interactive and adaptive Consumer Health Information System (CHIS) that incorporates information on Type II Diabetes Mellitus (T2DM). More and more people are relying on the internet, social media or hallucinating LLMs as their source of health information, with varying degree of credibility. Many existing CHIS are of poor quality and not suitable as a basis for informed decisions by patients. Since patients have different pre-knowledge and information needs, a static one-fits-all approach seems inadequate. To counter these critical issues, A+CHIS aims to provide strictly evidence-based information (curated by medical experts) in an interactive and adaptive way. To individually tailor user recommendations, tracking and interpreting the behavior is necessary. As part of an evaluation study, twelve participants with different levels of pre-knowledge on T2DM and computer literacy, individually applied a cognitive walkthrough consisting of eleven tasks that required different A+CHIS components. During the walkthroughs, the participants were asked to think aloud. The audio and on-screen recordings enabled to identify processes, ranging from 'basal' (e.g., mouse clicks) to more cognitive ones (e.g., reading), the order in which they were applied as well as their duration. While 'basal' processes can be tracked automatically and quite easy, some of the more cognitive processes can only be assessed indirectly. Different approaches like the lag-sequential analysis or metrics inspired by behavioral mapping and graph theory, are suitable to analyze patterns in the behavior. These analyses can be used to assess efficiency and make recommendations for system improvement or user recommendations.

Jakub Cacek — Pupil size predicts strategy use in complex decision-making

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When faced with complex choices, people can rely both on complex and simple strategies to make the decisions. The difference in the effort required to perform such strategies should be reflected in pupil size, because pupil size is a well-established measure of cognitive effort, linked to information processing in many domains. In the present study ($N = 24$), we tested if 1) pupil size measured before a choice task is associated with the preference for a particular (complex vs. simple) strategy across the task, 2) task-evoked pupil size can predict a consistent preference for the use of a particular strategy across the task, and 3) task-evoked pupil size changes can predict strategy use trial-by-trial. To test these hypotheses, we used a multi-attribute decision task, in which participants acquire cues about the value of two diamonds, and based on them, they decide which of the two diamonds to choose. With continuous measurement of pupil size, using generalized linear mixed effects models, we showed that 1) participants with larger baseline pupil size have a greater tendency to use a simple strategy during the task, 2) participants preferring the complex strategy have larger pupils across the task, and 3) larger task-evoked pupil size predicts the use of the complex strategy on a given trial. These results extend previous findings demonstrating that pupil size dynamics is a valid measure in complex decision-making, and they are novel in showing that pupil size can predict decision strategy use.

Miruna Cotet — Altruism and Attention to Social Information

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Our decisions are often influenced by what those around us do, but not everybody conforms. It is unclear whether people don't conform because they are not aware of social norms, or because they disregard them. Using eye-tracking, we study the effects of social influence on altruism. We recorded subjects' eye movements while they inspected others' previous choices before making their own giving decisions. Surprisingly, subjects that did not conform still paid attention to how others behaved.

We also attempted to predict subjects' giving using models of what information they took into account. Most subjects were best explained by models that only included fixated others, but a third of the subjects were covertly influenced by immediate neighbors. This suggests that social information that is hard to ignore can affect behavior.

We also characterized subjects' gaze transition patterns using a multinomial regression model with both spatial and social information effects. Selfish subjects tended to seek out more altruistic others when giving was inexpensive, while they gravitated towards less altruistic others when giving was costly. Additionally, selfish subjects were more likely to continue looking around when encountering large donations suggesting that they keep searching for those who do not give a lot. These findings offer insights into how social information affects giving and how attention and modeling of can be used to design online platforms that aim to increase giving.

Eoin Cremen — Introducing AI advice to Decision Making Teams in a Hypothesis-Guided Search Task

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Considering the advice of multiple contributors can be advantageous to a decision-making (DM) team. To boost the efficacy of information pooling, team members may be assigned different moderating roles during information search and aggregation. However, humans rarely execute these moderating roles consistently or effectively. Progress in AI presents the opportunity to equip AI with different moderating roles and test its effectiveness. Hence, we investigated to what extent AI advice affected decision-makers' search strategies and ultimately changed decision accuracy in a hypothesis testing task.

Students from University of Bath ($n = 85$) played a medical diagnosis game, first learning to diagnose patients based upon the provided symptoms and medical test results. Participants received feedback on the correct diagnosis. In two test phases, participants selected which medical tests to reveal before providing a diagnosis. For the second test phase, AI provided advice before test selection, as one of three moderating roles: DA encouraged a change in first test selection, FAC: no change in first test selection, MOD: encouraged the test least often selected first. Accuracy and test selection strategy were analysed, with and without advice.

Participants complied with advice in 71% of trials. Results found no significant difference in accuracy between the advice (and no advice) conditions. A mixed linear model predicting the first test selection distribution found significant interaction effects for DA and trends for both FAC and MOD on the tests selected. The direction of the changes suggested that test selection behaviour responded differently depending on the advice provided.

Dominik Deffner — Disentangling the search and use of social information in collective decision-making

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Social learning promotes the rapid dissemination of adaptive information among individuals. By strategically integrating personal and social information, groups of individuals can track environmental gradients and adapt to changing conditions more efficiently than single decision makers. However, an individual's ability to use social information not only depends on their learning strategies and decision rules but also on the processes that govern information acquisition in the first place. Decision makers not just passively absorb and respond to information present in their environment, they actively seek new information to minimize uncertainty. Here, we use Mouselab process data in combination with choice data from a collective learning experiment to investigate how processes of social information search and social information use interact. With a cluster analysis of box opening events, we identify distinct strategies of social information search and find stable interindividual search patterns. Relating search patterns to estimated parameter values of social reinforcement learning models we find that, overall, individuals who search more for social information are also more likely to use it to guide decisions. We further show that experiencing negative prediction errors in reinforcement learning (being "disappointed") is associated with more social information search in the next round. As the next step, we will incorporate a Markov attention model describing the full search trajectories within the social reinforcement learning framework to develop a process-based model of social decision-making.

Chris Donkin — Eye-gaze, attention and strategy in visual working memory

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Most models of visual working memory are relatively mute on their explanation for how items are encoded, making it challenging to distinguish between models that make similar predictions for performance but make fundamentally different assumptions about the nature of storage in memory (e.g., flexible-resource vs. slot-based theories). We tried to use eye tracking to measure how attention was distributed during visual working memory tasks, but to our surprise we found relatively little connection between when and if the target was fixated and task performance. Using a gaze-contingent paradigm, where items were shown depending on eye fixations, we were able to see a connection between fixation of the target and task performance. We also saw notable individual-differences in the way that attention was deployed, which helped revealed a strong recency effect. Overall, our results are consistent with flexible-resource theories of visual working memory, and are most in line with interference-based accounts of VWM (e.g., Oberauer & Lin, 2017).

Jonas Frenkel — Instructional Video Design: Nonverbal Social Behavior and Its Effects on Cognitive, Affective, and Motivational Learning Outcomes

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Online education has significantly increased in popularity, with video lectures becoming a common instructional format. While the importance of instructors' nonverbal social cues—such as gaze, facial expressions, and gestures—in face-to-face teaching is well-established, their impact in instructional videos remains less explored.

The majority of existing research on nonverbal social cues in instructional videos has focused on isolated cues, rather than on multimodal non-verbal behavior patterns and their comprehensive effects on learning. This study examines the role of instructors' nonverbal immediacy—a construct capturing multimodal non-verbal behaviors that reduce psychological distance—in affecting learners' cognitive, affective, and motivational outcomes in video lectures. An eye-tracking experiment was conducted with 87 participants ($M_{age} = 24.11$, $SD = 4.80$).

Multilevel path analysis results indicate that high nonverbal immediacy significantly enhances learners' state motivation and enjoyment, yet has no discernible effect on cognitive learning outcomes. Analysis of learners' eye movements revealed that with increasing levels of nonverbal immediacy displayed by the instructor, learners allocate more attention to the instructor than to the learning material. While initial analyses employed relatively broad Areas of Interest (AOIs), limiting spatial and temporal resolution, , moving forward more granular gaze analysis techniques will be adopted to analyze the combined effects of multimodal nonverbal signals on a finer temporal and spatial scale.

The study underscores the importance of considering multimodal nonverbal behavior patterns in online education and offers insights for the design of effective video lectures.

Oliver Grenke — Down to a single trial: Linking movement trajectories to sequential sampling theory

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Our main goal is to explore the question of how well parameters extracted from mouse cursor trajectories predict basic parameters of a well-established sequential sampling model, the drift diffusion model (DDM – Ratcliff, 1978). We aim at deepening our understanding about the information inherent in mouse cursor trajectories while simultaneously exploring possibilities to extract, rather than fit, DDM parameters. This approach intends to circumvent model fitting requirements such as a minimal amount of comparable trials. 103 participants completed 90 trials in a random dot motion task in which evidence accumulation is well accounted for by sequential sampling theory. Mouse cursor parameters are taken from mouse tracking literature. Due to multicollinearity, a partial least square regression is used to predict the variability of fitted DDM parameters drift rate, threshold separation, and non-decision time with the help of the mouse cursor measures. In our study, mouse cursor measures can predict DDM parameters. We further implement a trial reduction simulation: Cursor measures remain predictive even when reducing the number of trials, on which the cursor measure is based, below the minimal trial amount required for fitting the DDM. For threshold separation and non-decision time, cursor measures remained predictive down to a single trial per participant. Throughout the simulation, cursor measures showed higher stability in comparison to self-correlation of DDM parameter.

Hooman Habibnia — Merit or Luck? The Role of Inequality in Learning Opportunity on Hiring Decisions - MouseLab Study

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People perceive and make sense of inequality in their environment, which shapes how they think and behave (e.g., Gimpelson & Monusova, 2014). Recognizing potential disparities in opportunity, this study investigates the impact of learning opportunity inequality on information search behavior and hiring decisions. In a pre-registered, fully incentivized experiment with 400 participants, we utilize n-arm bandit tasks to simulate diverse learning opportunities. Advantaged participants are expected to achieve better test results by leveraging acquired knowledge during the learning phase, while disadvantaged participants are anticipated to exhibit lower proficiency than their advantaged counterparts.

In the hiring stage, participants review two simplified CVs, including data on test scores and learning opportunities, using the MouseLab paradigm (Johnsons et al., 1989), to make their preferred hiring choice. In the end, recruiters will receive an additional bonus based on the chosen candidate's performance, and the selected candidate will receive a fixed bonus.

Drawing on motivated reasoning research, we hypothesize that privileged groups may overlook information about disadvantaged individuals' learning opportunities. Additionally, individuals with prosocial preferences may allocate more time to information search tasks. This online experiment aims to deepen our understanding of these behaviors and preferences by exploring the causal relationship between information-seeking behavior, social preferences, and group disadvantage.

Gimpelson, V., & Monusova, G. (2014). Perception of Inequality and Social Mobility (SSRN Scholarly Paper ID 2538527).

Johnson, E. J., Payne, J. W., Schkade, D. A., & Bettman, J. R. (1989). Monitoring information processing and decisions: The mouselab system. *Zugriff am*, 17, 2014.

Carolín Häffner — Predecisional Information Distortion: In/congruency of information predicts preference-induced memory errors

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Information distortion (ID) occurs when individuals alter their evaluations of sequentially presented information to match their emerging preferences (Russo, 2015). The robust finding shows that information about the preferred option (i.e., leader information) is evaluated more positively, while information about the non-preferred option (i.e., trailer information) is evaluated more negatively. Previous studies focused exclusively on the distortion of currently presented information. We tested whether participants also distort previously presented information about options in hindsight before they decide between options. Specifically, we investigated how preferences might distort the reproduction of information. We propose that the mis-remembering of previous information depends on preferences as well as specific properties of the information (i.e., strength, valence, and congruency of information). Our results support the assumption of preference-induced memory errors, revealing that (1) leader information is recalled more positively than trailer information (recall distortion), (2) recall distortion is stronger for incongruent (i.e., negative leader and positive trailer information) than for congruent (i.e., positive leader and negative trailer information) information (recall congruency effect), and (3) congruent information is recalled more accurately than incongruent information (accuracy-congruency effect). These results highlight the role of preferences in memory distortion and have implications for understanding how individuals process information as preferences emerge.

Eva-Marie Heißler — Attentional guidance during decisions from memory: A matter of strategy or a matter of weight?

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Internal attention has been shown to guide preferential and inferential choice behavior. However, research suggests different processes to explain the observed behavior: For one, a change in the integration strategy (compensatory or non-compensatory) and alternatively, an increase in decision weights for attended information. This study will use a retro-cue to guide attention to one of several attributes. Attribute information has to be retrieved from memory for the decision task. To tease apart the contributions of attention on attribute weighting and attribute integration processes, the current study increases the number of items for which the assumed underlying processes make different predictions on the outcome level, and will use eye-tracking to trace the integration processes.

Data collection is ongoing and expected to conclude in time for the conference. We assume that if attentional guidance changes the integration strategy, there is an effect on choice outcomes only for those items, where compensatory and non-compensatory strategies make different predictions. This would be accompanied by a change in the strategy-index (the relation of transitions within and between alternatives) in the eye-tracking data for all retro-cue items. If attentional guidance changes decision weights, an effect on choice outcomes should only occur, when the alternatives differ on the cued attribute. Fixations on the cued attribute should increase for all retro-cue items.

Result of this study will advance our theoretical understanding of the processes by which attention guides decision making. This can be used to develop process-targeted interventions against adverse effects of unwanted attentional manipulation.

Luke Henstock — Why and how do workplaces invest in mental health and wellbeing: theory-testing in typical cases

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Background: In recent years, investment in workplace mental health and wellbeing has grown significantly. However, the decision-making processes behind resource allocation—financial, time, and space—remain underexplored. This research aims to develop a causal theory explaining how investments in employee wellbeing are made, drawing from a systematic review and a case study in a multinational conglomerate. An adapted version of the Stages Heuristic from policy literature was used to map the decision-making process across four stages: problem identification, policy formulation, implementation, and evaluation.

To test this process theory, we conducted case studies in two highly investing workplaces: a local authority council and a university. These case studies represent typical cases with sufficient heterogeneity across different sectors to rigorously test our theory. We conducted twelve interviews with key decision-makers in both organisations, focusing on the empirical manifestations identified during theory-building.

Preliminary findings indicate that the decision-making processes in both the council and the university are longer but not necessarily more considered. The local council faces heightened scrutiny over spending due to the use of taxpayers' money, leading employees to expect and support rigorous resource allocation practices for staff wellbeing. Conversely, the university contends with the influence of a trade union and the need to provide varied services across different colleges and departments, adding layers of complexity to their decision-making process.

Our study highlights sector-specific challenges and considerations in resource allocation for workplace wellbeing, contributing to a nuanced understanding of how organisations navigate these decisions, but indicates that our theory will apply cross-sector.

Judith Herbers — Investigating Task Choice Strategies in a Real-World Experimental Scenario

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In our everyday life, we must constantly decide which task to perform out of a multitude of possible tasks and when to switch to a different task. Experimentally, this is typically investigated by paradigms that require participants to perform one of two simple tasks on each trial. Which task to perform can either be instructed (instruction-based task switching) or decided by the participants themselves (voluntary task switching). Two limitations of these paradigms are their highly structured nature and their lack of complexity. Therefore, behavioral strategies that humans might use in real-life decisions cannot be fully captured. Here, we developed a novel applied paradigm to address these issues. In this paradigm, participants proof-read texts in which some words have spelling errors at the beginning, in the middle or at the end of the word (i.e., targets). We have planned two experiments, for the first one, data collection is already complete. In the second experiment, additional short-term exercises pop up. Importantly, participants can freely choose when they want to complete these exercises (e.g., switch to each exercise when it appears or complete all exercises at the end). Our objectives are (i) to test whether standard findings of typical task switching paradigms are also observable, and (ii) explore novel directions like meta-level strategies that could play a role in everyday behavior. We will present preliminary results of this line of research with regard to task decisions and response times as well as insights derived from tracking the mouse trajectory during the experiment execution.

Tianwei Liu — The Process of Adjustment in Anchoring

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The anchoring effect is a robust cognitive heuristic where an initial value influences subsequent judgments. Yet, theoretical accounts disagree as to whether adjustments are involved in the anchoring effect, and the literature only provided circumstantial evidence for this question. Since adjustment is a process where estimates change over time, in this paper I used a processing tracing method to investigate whether people adjust from provided anchors. In a lab experiment, participants made numerical judgements on general knowledge questions. For each question, they could type in and revise their answers within 90 seconds as often as they wanted. A protocol adopted from Agranov, Caplin, and Tergiman (2015) incentivized the entire thinking process instead of only the final judgements. One question in each experimental session was randomly chosen. The participant(s) whose answer to this question was closest to the correct answer won a 13 Euro bonus. Importantly, the payment was determined based on participants' answers at a random time point within the 90-second period. Therefore, participants were incentivized to make what they believe as the best judgement at each point in time. In this way, we could observe how participants' judgments evolved over time as they thought about the questions. Results showed clear evidence that participants adjusted away from provided anchors and towards the correct answers. For the questions in this experiment, adjustments went on for 40-50 seconds before estimates stabilized. The adjustments were still insufficient, as the anchoring effect remained significant at the final time point.

Ezequiel Lopez Lopez — Leveraging LLMs and Networks to Analyze Collective Knowledge

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Addressing complex policy challenges like the COVID-19 pandemic, climate change, and AI regulation necessitates understanding citizen opinions and ideas. Traditional methods to gather public views either lack depth, relying on closed questions (surveys and polls), or offer a broad thematic analysis (e.g., social media listening) without nuanced details. Qualitative methods like interviews and focus groups provide rich insights but are impractical for large populations due to high costs and slow processes. We introduce an AI-supported technique to quickly gather both quantitative and qualitative insights from vast, diverse respondent groups for policy design and implementation. Participants brainstorm responses to prompts online, yielding short, text-based ideas. Leveraging Large Language Models (LLMs), we extract and organize these ideas into conceptual (semantic and co-nomination) networks or "collective knowledge representations", facilitating detailed analysis across demographic or political subgroups, identifying commonalities, differences, and central themes. A study with 300 UK participants responding to UN Sustainable Development Goals prompts demonstrated the method's effectiveness in engaging citizens and extracting valuable policy insights. This approach promises to efficiently incorporate public opinion into policymaking across various domains, offering timely, in-depth understanding while ensuring inclusivity and addressing biases. It complements existing data collection methods and contributes to more democratic, citizen-centered policymaking processes.

Long Nguyen — Do more numerate solve BNTS with heuristics or formal logic? A Verbal Protocol Analysis of the BNTS

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Protocol analysis research indicates that numerate people typically don't make superior decisions by "doing the math" (e.g., making expected value calculations), but instead primarily rely on elaborative heuristics (Cokely & Kelley, 2009). Do numerate people also rely on heuristics for problem solving on numeracy tests? Researchers typically assume that numerate people utilize formal methods (Stanovich et al., 2012); however, they could rely on elaborative heuristics during numeracy problem solving just as they do during decision making, which may confer reasoning benefits (e.g., promoting intuitive, representative understanding in long-term memory; Skilled Decision Theory; Cokely et al., 2018). To test this hypothesis, the current study aims to refine concurrent verbal protocol methods for assessing cognitive processes on the Berlin Numeracy Test (Cokely et al., 2012; Schwartz, 1997) and risk literacy tests (Allan et al., 2021). Regardless of the observed processes, by conducting protocol analyses it may be possible to identify how skilled people effectively solve numeracy problems, which may inform the design of training programs.

Jacob Orquin — Attention strategies and consumer search

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We present a model of multi-option multi-attribute choice providing a unified account of three important patterns of consumer inattention: a) inattention to goal-irrelevant attributes, b) inattention to goal-relevant attributes that are difficult to locate, and c) inattention for the sake of avoiding goal-relevant attributes. We represent attribute goal relevance as weights in a utility function and assume that attention creates goal competition. The goal competition modulates the weights so that attended attributes become more equal while unattended attributes get zero weight. Consumers select a priori the level of attention or inattention to each attribute but choose a posteriori according to the modulated weights. We assume that consumers select the levels of attention that best achieve their current goals that is, they maximize a priori utility. The model explains the emergence of the three patterns of inattention and makes novel predictions about how changes to consumer environments may help reduce information avoidance of relevant attributes, such as health and sustainability information.

Tehilla Ostrovsky — Using verbal reports to test the assumptions of cognitive models

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In my talk I will introduce a novel theoretical framework that merges verbal reports with computational cognitive models. This approach leverages the context-sensitive capabilities of advanced large language models (LLMs) to analyze participants' verbal descriptions of their approaches to performing a task. As such, this framework proposes to integrate cognitive modeling and verbal reports, as a type of process tracing. To facilitate such an analysis, we have developed a JavaScript-based plugin for use with JsPsych that enables real-time speech recognition, where spoken reports are automatically converted into text and subsequently analyzed using LLMs. This tool significantly reduces the typical burden of analysing self-report data. I will start my talk by outlining the theoretical framework, emphasizing its potential to enrich our understanding of cognitive processes through verbal data. I will then continue with discussing the functionalities of the plugin, ranging from its voice-to-text transcription capabilities, vectorization, and the application of analytical techniques such as keyword extraction, clustering, and labeling. These features are pivotal for quantitatively assessing verbal data. Additionally, I will share insights from a pilot study conducted to evaluate the efficacy of our software, providing a comprehensive overview of its potential to enhance cognitive modeling research. Drawing inspiration from the challenges identified by Ericsson and Simon (1980) and incorporating insights from our recent theoretical framework Ostrovsky and Newell (2023), this talk provides a generalizable roadmap for researchers interested in collecting verbal reports as tracing data.

Rima-Maria Rahal — Cognitive Processes of Discrimination against National Outgroups: Webcam-based Eye-tracking Analysis of Ingroup-Biased Prosociality

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In times of globalization, fostering inclusive communities often extends beyond borders. However, international collaboration can be hindered by national stereotypes and subsequent discrimination. We study cognitive processes of ingroup-biased prosocial behavior of members of four national groups (Mexico, South Africa, USA, India, N = 451). In incentivized study, participants indicated their national ingroup and played a reaction time game to reinforce group membership salience. Thereafter, they repeatedly decided about allocating resources between themselves and matched players in decomposed dictator games. In each game, they faced either a member of their national ingroup, or of one of the three national outgroups. Using participants' webcams, we recorded data about visual attention during this task. We demonstrate pervasive ingroup favoritism in prosocial decisions. In addition, results suggest marked heterogeneity in the degree of discrimination depending on participants' national ingroup. Assessing cognitive processes underlying these decision patterns, we expect this behavioral ingroup favoritism effect to be mirrored in gaze data: in more collectivist societies, decision makers facing a national in- rather than an outgroup member show higher fixation counts and longer dwell times, attend to a higher number of available information and fixate less on their own outcomes, while these differences diminish in more individualistic societies. We discuss implications for mitigating discrimination of national outgroups through individual- and system-level intervention strategies.

Moritz Reis — Sticky tradition impedes selection of creative ideas

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Creativity is a driving force for human development and has fascinated scholars for centuries. Surprisingly little is known about the cognitive underpinnings of putting creative ideas into action, however. To shed light on this part of the creative process, we tracked how hand movements unfolded when choosing between either a traditional or a creative use of a given object. Participants could freely decide between both options (Experiment 1, N = 51 adults) or were prompted to select a specific use (Experiment 2, N = 51 adults). Temporal as well as spatial measures of action unfolding revealed behavior to be strongly biased toward traditional options when choosing an available, more creative option eventually. Creative behavior thus comprises two obstacles: not only coming up with new ideas, but also overcoming a lasting bias toward using old ones.

Nicolas Roth — Saccadic decision-making in dynamic scenes under competing task demands

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Humans can intelligently adapt their visual exploration behavior to their varying goals and interests. Computational models have been shown to be useful tools for investigating visual attention, but existing models are either only applicable to static images or restricted to predicting where humans look on average. We present a computational framework that simulates realistic human gaze behavior for dynamic real-world scenes, including saccade timing and smooth pursuit behavior. We model saccades as sequential decision processes between potential targets. In contrast to typical saliency models, it operates on attentional units given by the objects in the scene, which we show to lead to more human-like free-viewing gaze behavior. The individual components of the model are implemented in a modular fashion with a small set of well-interpretable parameters. To extend the framework to other task demands, we recorded a rich yet highly controlled video database. In 168 sets of 10-second videos, we systematically varied the scene clutter, brightness, object, and camera motion. We recorded eye-tracking data of 50 participants in a blocked design, either during free-viewing, visual search, scene memorization, or a hybrid task in which participants are asked to search for targets while simultaneously memorizing the scene content. We are currently analyzing the systematic viewing differences and using the insights we obtained to inform the computational modeling. We will present our existing modeling framework, the newly recorded dataset, and our current efforts of replicating the influence of bottom-up scene features and top-down task demands on gaze behavior in mechanistic computational models.

Alexander Schakowski — Cognition in the wild: A computational workflow for integrating high resolution tracking data with formal models of decision—making

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Human cognition operates in a complex world: The time and place of decision-making, the available information and alternative options (i.e., option spaces) emerge from interactions with the environment, internal states, and perceptual constraints. Human cognition, however, is rarely studied in such naturalistic decision-making environments. Rather, laboratory experiments (intentionally) abstract away from the complexities of the real world, externally prompt decisions, constrain available information, and impose option spaces. Exclusively relying on laboratory experiments might thus lead to a detailed understanding of cognition within experimental paradigms at the expense of limited insight into the functional contexts these paradigms are supposed to emulate. Novel technological tools now allow researchers to quantify spatial positioning, internal states, information acquisition and choice environments with ever increasing precision outside the laboratory. When integrated with cognitive theories of decision-making, such tools, we argue, allow us to bridge the “opposition between formal modeling and real-world decisions” (Todd and Gigerenzer, 2001). Here, we outline how this integration can be achieved by leveraging statistical tools routinely applied in animal ecology to process large amounts of high-dimensional data, extract psychologically meaningful and analyzable units and construct option spaces. In the talk, I will illustrate this computational workflow using examples from our own research, and outline the opportunities and conceptual limitations of such an approach.

Michael Schulte-Mecklenbeck — Movement tracking of psychological processes

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Movement tracking is a novel process-tracing method that promises unique access to the temporal dynamics of psychological processes. The method involves high-resolution tracking of a hand or handheld device (e.g., a computer mouse) while it is used to make a choice. In contrast to other process-tracing methods, which mostly focus on information acquisition, movement tracking focuses on the processes of information integration and preference formation. In this article, we present a tutorial to movement tracking of psychological processes with the mousetrap R package. We address all steps of the research process, from design to interpretation, with a particular focus on data processing and analysis and featuring both established and novel approaches. Using a representative working example, we demonstrate how the various steps of movement-tracking analysis can be implemented with mousetrap and provide thorough explanations of their theoretical background and interpretation. Finally, we present a list of recommendations to assist researchers in addressing their own research questions using movement tracking of psychological processes.

Christoph Ungemach — Attention Processes Underlying Choice Architecture Interventions

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Marketers can choose different attributes to describe products. Decision signposts as attributes can help consumers make choices that are aligned with their personal goals. In this paper, we investigate the attentional processes and cognitive mechanisms underlying the alignment of individual preferences as part of the signpost effect and related choice architecture interventions in the domain of environmental decisions. Across several process-tracking studies using eye-tracking and MouselabWEB methodologies, we provide novel empirical evidence on how the presence of decision signposts induces significant changes in the observed allocation of attention. These changes, in turn, are shown to partially mediate the effect of the signposts on environmental choice. In particular, we show how, in the presence of decision signposts, participants allocate more attention to attributes relevant to their personal goals and make fewer transitions between costs. We identify transitions between cost attributes as a significant factor impeding environmental choice, and show how decision signposts facilitate environmental choice by reducing reliance on cost attributes. We also demonstrate that the observed effects on choice behavior as a result of intrinsic attention shifts due to decision signposts cannot be achieved by externally imposed attention shifts. Finally, we examine how relevant individual differences, such as environmental attitudes and temporal discounting, moderate the effects of observed attention shifts on choice behavior. The studies provide novel insights into the role of attention processes in driving choice architecture effects and show how observed heterogeneity in effectiveness can be related to individual differences in consumers.

Lilian Weber — Continuous decision paradigms for quantifying the flexibility of decision formation and its neural signatures

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To study the sub-components of decision-making and their neurochemical basis, previous research has mostly employed trial-based choice paradigms, where participants choose between two options, the value of which remains fixed within trials. However, in everyday life we do not make decisions in confined trials and between two options. Instead, we continuously accumulate information about multiple decision options whose value might be changing over time.

I will present data from novel continuous decision paradigms (CDP), paired with a deconvolutional GLM analysis of EEG data, to study decision-making in dynamic and temporally extended choice settings and across different domains. Instead of emitting one choice per trial, in our tasks, participants are presented with a continuous stream of evidence for several minutes and need to continuously integrate evidence over time to decide when to commit to a choice.

I will show evidence across different studies that (1) participants flexibly adjust their weighting of recent evidence to changes in both environmental volatility and stimulus noise, (2) our novel task & analysis framework allow us to study sub-components of decision-making across perceptual, value and emotion domains and assess the effects of pharmacological challenges on decision formation, and (3) that we are able to make more efficient use of experimental time & data, yielding reliable EEG signatures within 10-20min of recording.

Dirk Wulff — Strategic information search in decisions from experience

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