

Thursday, December 11, 2025 at 13:00

Speaker:

**Charley Wu**

W3 Professor of Computational Cognitive Science at TU Darmstadt



## Generalization Guides Exploration Across Development, Social Contexts, and Memory

**Location:** Institute of Computer Science (Informatik) | Friedrich-Hirzebruch-Allee 8 | 53115 Bonn | Seminar Room 0.016. (Online link: <https://shorturl.at/mlw50>)

**Abstract:**

Human learning and decision-making often relies on generalizing from limited experience to novel situations. In this talk, I will present a unified framework that models this process as a form of function approximation using Gaussian Process regression. Beginning with a spatial reward-learning task, I will show how this approach captures how people exploit structure in their environments to explore effectively across conceptual and graph-structured domains. This framework also allows us to capture how these capacities develop over the lifespan, with new implications how development shapes cognition. I will then focus on recent extensions that introduce heteroskedastic noise to model more flexible and adaptive forms of generalization. These models explain how people integrate social information despite differing individual preferences, and how memory limitations shape exploratory behavior by prioritizing surprising or recent experiences. Together, these studies illustrate how structured yet adaptive generalization mechanisms can give rise to the remarkable flexibility of human learning across spatial, social, and mnemonic domains.

**Charley** is a W3 (tenured) Professor of Computational Cognitive Science at TU Darmstadt and PI of the [Human and Machine Cognition Lab](#). Previously, he was a Postdoctoral researcher at Harvard University working jointly with Fiery Cushman and Sam Gershman, and before that he completed his PhD at the Center for Adaptive Rationality at the Max Planck Institute for Human Development in Berlin.

His research is primarily concerned with understanding how people learn under uncertainty. Whereas optimal solutions are generally unobtainable in real-world environments, humans are able to learn with unrivaled robustness and efficiency. How do people take overwhelmingly rich and complex problems and transform them into compressed representations that facilitate rapid inference and generalization?

His work uses a combination of statistical and machine learning models to uncover the computational principles behind human learning and inference. I also often use biologically inspired multi-agent systems for studying social learning and collective intelligence. My work has so far focused on two main branches of learning: efficient exploration guided by generalization, and learning from others in a social environment.

For more information on the event, please contact: Konstantinos Armaos at [karmaos@uni-bonn.de](mailto:karmaos@uni-bonn.de) or Olivier de Vries at [odevries@uni-bonn.de](mailto:odevries@uni-bonn.de)

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