

PHD STUDENT  
MAX PLANCK INSTITUTE FOR INTELLIGENT SYSTEMS  
MAX PLANCK INSTITUTE FOR BIOLOGICAL CYBERNETICS

## Research

**Bounded rationality:** optimal decision-making under limited information processing resources. I am working on an information theoretic optimality principle for bounded rational inference and decision-making that leads to the formation of natural **hierarchies of abstraction**. Closely related topics are structure learning and model selection of which I have tested theoretical aspects in sensorimotor paradigms in virtual reality experiments. Find more about my research on [inversetemperature.net/research](http://inversetemperature.net/research).

## Key topics

**Hierarchies of abstraction**[1,4]

Information-theoretic optimality principle that leads to the formation of hierarchies of abstraction.

**Structure learning** [2]

Humans extract statistical invariants to enhance their performance. Behavior can be modelled with a hierarchical Bayesian model.

**Model selection** [3,5]

Humans select among learned structures in a way that is quantitatively consistent with Bayesian model selection.

## Education

**PhD: Computational Neuroscience**Max Planck Institute for Intelligent Systems  
Max Planck Institute for Biological Cybernetics

since 2012

Topic: Structure learning through hierarchies of abstraction (supervised by: Daniel A. Braun)

**MSc, BSc: Telematics**

Graz University of Technology, completed with distinction

2006-2012

Focus on: Computational Intelligence and Autonomous Robots.

MSc Thesis: Structure learning for robotic motor control (supervised by: Wolfgang Maass, Gerhard Neuman)

## Skills

**knowledge**

Information theory

Machine learning

Sensorimotor learning

Decision theory

Robotics

**practical**

Probabilistic inference

Hierarchical Bayesian modeling

Neural networks

Computer vision

Embedded systems

**languages**

Julia

Python

Matlab

C#

C/C++

## Experience

**NTE Systems**

Software developer (part-time)

11/2009-03/2011

Encapsulation of ZigBee-to-web communication for a smart home automation controller  
Web-service implementation on micro-controller platform (SOAP, .NET Micro Framework)**IVM Engineering**

Junior consultant, software developer (part-time)

08/2008-10/2009

Encapsulation of CAN-bus communication module (high-level backend in .NET)  
Applicability of aspect-oriented programming in a commercial software project

## SELECTED PUBLICATIONS

- [1] Genewein, Leibfried, Grau-Moya, Braun (2015) *Bounded rationality, abstraction and hierarchical decision-making: an information-theoretic optimality principle*. *Frontiers in Robotics and AI*
- [2] Genewein, Hez, Razzaghpour, Braun (2015) *Structure Learning in Bayesian Sensorimotor Integration*. *PLoS Computational Biology*
- [3] Genewein, Braun (2014) *Occam's Razor in sensorimotor learning*. *Proceedings of the Royal Society B*
- [4] Genewein, Braun (2013) *Abstraction in Decision-Makers with Limited Information Processing Capabilities*, NIPS 2013 workshop on Planning with Information Constraints. *arXiv*
- [5] Genewein, Braun (2012) *A sensorimotor paradigm for Bayesian model selection*. *Frontiers in Human Neuroscience*

For a complete list (including posters and talks) see [inversetemperature.net/publications](http://inversetemperature.net/publications)