Course Guide – Master Cognitive Science

Winter 2025/26

Version as of 01.10.2025

Enrollment for Courses

Students have to register for their regular courses via eCampus. All relevant information concerning eCampus (e.g. ID and password) are provided during the enrolment process. If you have any technical problems concerning eCampus please contact the Helpdesk.

Please register for your courses as soon as you receive access to eCampus. The registration deadline is usually at the beginning of October. If you fail to register during this time span, please contact the instructor of the respective course, for example, at the first session. Only the instructors can register you later on.

Please note that some courses will not be available for registration on eCampus. If a registration via eCampus is not possible, this should be indicated in the Course Guide.

Please remember always to check time, place and CP for your classes in eCampus and/or with the respective course instructor. These details in the course guide are subject to change and for your convenience only.

Please be reminded that you can choose maximally 15 CP in courses which are taught in German.

If you have taken a class already in your Bachelor's, you cannot take the same class again in your Master's.

Essay Writing Course:
One of the basic skills that need to be acquired during the program is the ability to write academic essays. This skill is not taught as one of the Basic Methods. It needs to be acquired during your course work. To do so, each student must write at least one essay in their first year of study, typically in C1 to C4. Students with little or no background in academic writing should write their essay in one of the courses that are sub-labelled "essay writing course". Those courses enable you to write academic texts as it will be needed for your master thesis, conference applications, or job applications.

FIRST YEAR PROGRAM

A1. Introduction to Cognitive Science

A1

Introduction to Cognitive Science

LECTURE & EXERCISE

INTRODUCTION TO COGNITIVE SCIENCE
(LECTURE 030005 & EXERCISE 119218)

PROF. JONAS ROSE, PROF. ALBERT NEWEN, PROF. TOBIAS SCHLICHT, PROF. ONUR GÜNTÜRKÜN, PROF. NIKOLAI AXMACHER, PROF. ROBERT SCHMIDT, PROF. MARKUS WERNING, LENA PFEIFER, PROF. GREGOR SCHÖNER, PROF. SEN CHENG

TERM:	Winter 2025/26
LECTURE:	Tuesday, 12 – 14 (First Meeting: 14.10.2025)
ROOM:	HGA 20 and IA 02/461 (see schedule Moodle course)
EXERCISE:	Thursday, 14 – 16 (First Meeting: 16.10.2025)
ROOM:	GABF 04/714, IA 1/161 and IA 0/158-79 PC-Pool 1 (see schedule Moodle course)
CP:	6

Attention:

- Further details of the Lecture and Exercise plan will be announced later.

The lecture introduces the interdisciplinary field of cognitive science in combining philosophy, psychology, computational modeling and neurosciences. The lecture has the aim to deliver important basic knowledge from empirical sciences in the framework of theory formation. For cognitive science students the credit point can only be acquired on the basis of the written examination and it presupposes in addition some active work in the obligatory additional seminar.

The lectures will take place partly in HGA 20 and partly in IA 02/461, a schedule will be provided.

Structure of the lecture is subject to changes.

The structure of the lecture:

1. Theoretical Frameworks in Cognitive Science 1
2. Theoretical Frameworks in Cognitive Science 2
3. Cognitive Models of Semantics and Pragmatics
4. Theories of Consciousness
5. Cognitive Neuroscience of Perception
6. Cognitive Neuroscience of Emotion
7. Theories of Emotion
8. Cognitive Neuroscience of Memory
9. Theory of Perception and Cognition
10. Recent Developments in Stress Research
11. Computational Approaches to Cognitive Science
12. Supervised Learning in Neural Networks
13. Reinforcement Learning in the Brain
14. Reinforcement Learning in the Brain (2)
15. Exam

BM. Basic Methods

Students are expected to choose (at least) three out of four basic methods: If you have a BA in psychology, you can skip the "Experimental Psychological Lab" but have to pass the three other basic methods. If you have a BA in philosophy, you can skip the course "Logic" but have to learn the other three methods. Some with a BA in neuroscience can skip method BM 4. All the other students need to study all basic methods. Exceptions can be made if someone can prove to have already studied the content of a course but need explicit approval by the program coordinator (cogsci-info@rub.de) or Prof. Dr. Jonas Rose.

Important note for students who have been enrolled since WS 24-25 or earlier: If you have not yet taken the course BM1 "**Experimental Psychology Lab"**, this course can be taken in the **summer semester 2026**.

BM2

BM2. Logic

LECTURE + EXERCISE

LOGIC AND PHILOSOPHICAL METHODOLOGY (110012)

PROF. DR. CHRISTIAN STRAßER

TERM:	Winter 2025/26
LECTURE:	Thursday, 10 – 11.30 (First meeting: 23.10.2025)
EXERCISE:	Thursday, 11.45 – 13.30 (First meeting: 23.10.2025)
ROOM:	IA 02/452
CP:	6

This course provides an accessible introduction to formal logic from a philosophical standpoint. Students will explore the formal languages of propositional and predicate logic, gaining a solid understanding of logical connectives such as "and," "or," "implies," and "not," as well as quantifiers like "for all" and "there exists," through the lens of model-theoretic semantics. The course covers formal proof methods and addresses the limitations of classical logic in modeling everyday reasoning. To broaden the perspective, an introduction to non-monotonic logic as a framework for defeasible reasoning will also be included.

Practical exercises form an integral part of the course, offering students the chance to apply and reinforce their theoretical knowledge. To earn a certificate, students are required to submit weekly homework assignments consistently and pass a final written exam.

Literature:

For literature besides the script (which will be available via the blackboard online portal), see e.g.,

- Graeme Forbes: Modern Logic. Oxford University Press, 1994.

- Wesley C. Salmon: Logik. Reclam, 1983.

- Theodor Sider, Logic for Philosophy, Oxford University Press, 2010.

- Dirk Van Dalen, Logic and Structure, Springer, 2004

- Raymond M. Smullyan, Logical Labyrinths, A K Peters Ltd, Wellesley, MA, 2009

BM3

Neural Networks

LECTURE & EXERCISE (+TUTORIAL)

ARTIFICIAL NEURAL NETWORKS (212006)

PROF. DR. SEN CHENG

TERM:	Winter 2025/26
LECTURE:	Monday, 16 – 18 (First meeting: 13.10.2025)
ROOM:	NC 2/99
TUTORIAL:	Wednesday, 12 – 14 (First meeting: 15.10.2025)
ROOM:	ID 03/455
EXERCISE:	Friday, 10 – 12 (First meeting: 17.10.2025)
ROOM:	NC 2/99
CP:	6

Artificial neural networks (ANN) were inspired by the architecture and function of the brain. Nevertheless, their greatest strength is not that they are good models of the brain, but rather that they are powerful function approximators. Since the 1980's many types of ANN have been developed and tricks for training ANNs on data proliferated. Recent advances in computing hardware and the availability of large datasets have made it possible to train ANNs such that they perform better than humans, e.g. on image recognition. In this class, students will, firstly, gain a theoretical understanding of the principles underlying the methods applied to neural networks and, secondly, learn practical skills in implementing neural networks and applying them for data analysis.

Topics: optimization problems, regression, logistic regression, biological neural networks, model selection, universal approximation theorem, perceptron, MLP, backpropagation, deep neural networks, recurrent neural networks, LSTM, Hopfield network, Bolzmann machine

Software: python, numpy, scipy, matplotlib, scikit-learn, tensorflow

There will be a written examination at the end of the course.

Requirements: Calculus, linear algebra, statistics, programming.

BM4

BM4. Functional Neuroanatomy

LECTURE

CLINICAL NEUROPSYCHOLOGY (112621)

PROF. DR. BORIS SUCHAN

TERM:	Winter 2025/26
MEETING TIME:	Tuesday, 10 – 12 (First meeting 21.10.2025)
ROOM:	IA 02/461
CP:	3

The aim of the lecture is to introduce basic concepts of clinical neuropsychology. First of all, all methods used in human neuropsychological brain behavior research will be discussed. This is followed by an overview of the organization of the human brain, the structure and function of frontal, temporal, parietal and occipital lobes. Furthermore, the lecture deals with all neuropsychological syndromes that can be observed after brain damage. Assessment of neuropsychological functions will also be covered in this lecture.

Literature:

B. Kolb & I.Q. Whishaw (1996). Fundamentals of Human Neuropsychology. New York: Freeman.
K.M. Hellmann & E. Valenstein (1993). Clinical Neuropsychology: Oxford University Press.

C. Topics Selection

Remarks for Essay Writing

For all students who need to learn how to write an essay or still feel insecure about it, we recommend in the winter term the following two seminars:

"Special Essay Writing Seminar: What makes us human? Comparing humans, animal and AI systems" (030092) by Prof. Dr. Albert Newen and Dr. Sanja Sreckovic: It can be evaluated as C1 or AM1 course.

"Short format scientific communication" by Wei Lin (Winston) Seah. It can be evaluated as C2 or C3 course.

C1

Social Cognition & Meta-Science

SEMINAR

SCIENCE IN A POLITICAL WORLD (030113)

PROF. DR. DUNJA SESELJA, PROF. DR. CHRISTIAN STRAßER

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 16 – 18
ROOM:	Wasserstr. 221/4
CP:	3 or 6

Scientific inquiry is embedded in society and it is influenced by cultural, political, economic and historical contexts. Which questions to inquire, which hypotheses to pursue, which methods to employ and which theories to accept as the basis for policy guidance is influenced not only by scientific evidence and epistemic values, but also by non-epistemic (or social) values. At the same time, scientific findings should have the mark of objectivity rather than the mark of politicized processes. In this course, we will explore complexities that underpin this tension. We will start with the literature on the value-free ideal of science and proceed towards discussions on politicized science. Throughout the seminar we will use articles from online media, illustrating the tension between science and politics through various examples, as the testbed for philosophical accounts on the given issues.

Literature: The reading list will be provided at the start of the course.

C1

Social Cognition & Meta-Science

BLOCK SEMINAR

FACT-CHECKING OF SCIENTIFIC CLAIMS: A PHILOSOPHY OF SCIENCE PERSPECTIVE (030112)

PROF. DR. DUNJA ŠEŠELJA

TERM:	Winter 2025/26
MEETING TIME:	Monday: 10.11.25, 15.12.25, 26.01.26, 10 - 16
	(and online tutoring in between)
ROOM:	Wasserstr. 221/4
CP:	3 or 6

Contemporary social discourse has been flooded by fake news, echo-chambers, epistemic bubbles and other epistemically pernicious processes. Scientifically relevant information has not been spared: from `anti-vaxxers' to climate-change deniers, disinformation has also had an effect on scientifically relevant news.

To combat such issues, social media have introduced the practice of `fact-checking'. However, fact-checking of scientific claims can be challenging. To start, neither does the frontier of scientific research typically produce `facts', nor can such claims easily be `checked'. Ongoing inquiry, often pervaded by scientific disagreements and controversies, is characterized by incomplete or conflicting evidence, and hence by a high degree of risk and uncertainty. At the same time, an unhinged spread of false or deceptive information can easily have numerous harmful consequences, including the loss of public trust in science. In this block seminar we will start from the philosophical discussions on the evaluation of scientific hypotheses, and the role of values in scientific inquiry. In addition, we will look into recent controversies surrounding the fact-checking of scientific claims. Throughout the course, students will work in teams, where each team will choose a case-study to research. The result of the research will be presented in the final block. The course will consist of three blocks, to be held on three Mondays. In addition, teams will have (online) coaching sessions in between the blocks.

Literature: The reading list will be provided at the start of the course.

C1

Social Cognition & Meta-Science

SEMINAR

EPISTEMIC INJUSTICE: KNOWLEDGE, POWER AND MARGINALIZATION (030114)

PROF. DR. DUNJA ŠEŠELJA, PROF. DR. CHRISTIAN STRAßER

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 14 – 16
ROOM:	Wasserstraße 221
CP:	3 or 6

This seminar introduces students to the concept of epistemic injustice—wrongs done to individuals in their capacity as knowers—and explores its implications for epistemology, ethics, and social critique. We begin by closely reading Miranda Fricker's influential account of testimonial and hermeneutical injustice, before turning to contemporary extensions, critiques, and applications of the concept. The seminar will cover topics such as epistemic oppression, epistemic violence, silencing, and the role of identity and social structures in shaping credibility and epistemic agency. We will aim to connect theoretical discussions to real-world cases and to reflect on the responsibilities of knowers in unequal epistemic environments.

Literature:

The reading list will be provided at the start of the course.

C1

Social Cognition & Meta-Science

ESSAY WRITING SEMINAR

SPECIAL ESSAY WRITING SEMINAR: WHAT MAKES US HUMAN? COMPARING HUMANS, ANIMAL AND AI SYSTEMS (030092)

PROF. DR. ALBERT NEWEN, DR. SANJA SRECKOVIC

TERM:	Winter 2025/26
MEETING TIME:	Tuesday 10- 12 (First Meeting: 14.10.2025)
ROOM:	GABF 05/703
CP:	3 or 6

This is an Essay Writing Course in Philosophy:

For all students who did not study philosophy during the BA program but need to learn how to write an essay or still feel insecure about it, we recommend in the winter semester the seminar of Prof. Dr. Albert Newen and Dr. Sanja Sreckovic.

This course can be used either in module C1 or in module AM1.

The question what makes us human is a traditional key question of philosophy. It is prominent in Kant's work but also in modern systematic philosophy, there is several proposal to highlight the specific features or abilities of human beings. In a first part, we will discuss those candidates of specific human abilities which are investigated in the context of comparing humans and animals in the last 30 years. Most important candidates are linguistic competence, rationality or inferential abilities, tool use and tool construction, social competences, morality or social cooperation. A detailed discussion questions all these candidates. In a second part, we will discuss whether there remains a clear difference between humans and AI systems concerning typical human abilities: The explosion of AI competences also questions this perspective since it seems that for each human cognitive ability, we can train an AI system that also operationalizes this ability. But this leaves us with the open question whether AI systems really have the relevant features and abilities or only simulate them: are AI systems real agents? Can they really have feelings, emotions and consciousness? Are they just intelligent tools or do they develop into life partners? What does this mean for our self-understanding as human beings?

C1

Social Cognition & Meta-Science

SEMINAR

EXPERIMENTAL DESIGN AND RESEARCH METHODS (119222)

PROF. DR. RER. NAT. NADJA FREUND,
PROF. DR. ROBERT SCHMIDT, PROF. DR. JONAS ROSE

TERM:	Winter 2025/26
MEETING TIME:	Tuesday, 08 – 10 (first meeting: 21.10.2025)
ROOM:	GA 04/187
CP:	3

In this course you will learn how a new, collaborative research project is conceived. Three professors from different faculties (Psychology, Medicine, and Computer Science) come together to showcase the process of starting a new research project. You will learn about the different stages of developing a research project, including brainstorming initial ideas, reviewing the relevant literature, designing the corresponding experiments, as well as planning the relevant data analyses and computational models. The topic of the research project that we will use as an example combines cognitive neuroscience in birds with neuropsychiatric models in rodents and computational neuroscience. The classes will be a mix of group discussions, seminar-style presentations, lab visits, as well as lectures and exercises on modern research methods from the different fields.

C1

Social Cognition & Meta-Science

SEMINAR

SOCIAL NEUROSCIENCE (11902)

LAURA STEVENS, M.SC.

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 14 – 16 (First meeting: 22.10.2025)
ROOM:	IA 02/452
CP:	3

Social neuroscience is a rapidly growing field that integrates principles from psychology, sociology, and neuroscience to understand the neural basis of social behavior and interactions. The aim of this seminar is to provide an overview of this interdisciplinary field and the methods commonly used, as well as to discuss current research and future directions. The seminar will cover topics such as empathy, emotion recognition and contagion, social connection (e.g., loneliness and love), and social touch. It will also address neural mechanisms of impaired social functions due to trauma or psychological disorders. Methods such as behavioral tasks, neuroimaging (fMRI, fNIRS), EEG, tDCS, and psychophysiological measures will be explored and illustrated by discussing recent papers critically.

Literature: Literature will be announced on the first seminar day.

C1

Social Cognition & Meta-Science

LECTURE

DIE ZUKUNFT HUMANER ARBEIT IN EINER DIGITALISIERTEN WELT (118925)

JUN.PROF. DR. LAURA KUNOLD, PROF. DR.-ING. BERND KUHLENKÖTTER

TERM:	Winter 2025/26
MEETING TIME:	Monday, 14-16 (First Meeting: 20.10.25)
ROOM:	IB 02/135
CP:	3

Language of instruction: German

Die interdisziplinäre Veranstaltung bietet ein breites Spektrum an Themen, die sich mit dem Wandel der menschlichen Arbeit in einer technologisierten Welt aus technischer und psychologischer Sicht beschäftigen. Dazu zählen

- arbeitspsychologische Grundlagen zur Gestaltung humaner Arbeit
- Wirkung von Arbeit auf den Menschen
- Technologieakzeptanz
- Technologiefolgen und Wirkung von Technologien auf den Menschen
- Technologien zur Unterstützung menschlicher Arbeit (Robotik, Assistenzsysteme, Künstliche Intelligenz, ...)
- Perspektiven von Arbeitgebenden und Arbeitnehmenden / Mitbestimmung
- Möglichkeiten und Formen der Digitalisierung
- Neue Geschäftsmodelle durch Digitalisierung und technologische Innovationen und deren Auswirkungen auf den Menschen im Arbeitsprozess
- Gastvorträge zu o.g. Themen aus Industrie und Forschung

C1

Social Cognition & Meta-Science

SEMINAR

AKTUELLE THEMEN DER ERKENNTNISTHEORIE UND META-PHILOSOPHIE (030098)

JUN.PROF. DR. JOACHIM HORVATH

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 16-18.15
ROOM:	GAFO 04/619
CP:	3 or 6

Language of Instruction: German

In diesem Seminar, das auch Elemente eines Kolloquiums enthält, werden wir aktuelle Themen aus der Erkenntnistheorie und Metaphilosophie sowie verwandten Gebieten diskutieren. Gelegentlich wird es auch Vorträge von externen Gästen (auf Deutsch oder Englisch) geben, die in der Regel führende Experten auf ihrem Gebiet sind. Studierende im fortgeschrittenen Bachelor-, im Master- oder im Promotionsstudium sind im Seminar herzlich willkommen. Darüber hinaus haben die Teilnehmer*innen die Möglichkeit, Themen oder Arbeiten vorzustellen, die für sie von Interesse sind, einschließlich ihrer eigenen Arbeiten, zum Beispiel im Zusammenhang mit einer Abschlussarbeit (auf Deutsch oder Englisch).

C1

Social Cognition & Meta-Science

COLLOQUIUM

LECTURE SERIES 'HISTORY AND PHILOSOPHY OF THE LIFE SCIENCES (030134)

JUN.PROF. DR. JAN BAEDKE

TERM:	Winter 2025/26
MEETING TIME:	Monday, 16-18
ROOM:	online
CP:	3

In this lecture series current topics in the history and philosophy of the life sciences will be discussed. The lecture series will host talks by international leading experts and local researchers, including philosophers and historians, but also scholars from the social and natural sciences. Participants will also have the opportunity to present their master and doctoral theses. Once per month (3-4 times during the whole term) the participants meet for a reading group meeting (instead of a lecture series talk) in which current research literature is discussed. For students (especially, but not only students of the HPS+Logic program) who want to participate and receive course credits, please write to jan.baedke@rub.de and register via eCampus. Talks will be given in English and online (via Zoom). They will be announced on: https://roto-rub.wordpress.com/roto-lecture-series/

C1

Social Cognition & Meta-Science

SEMINAR

PANPSYCHISM (030049)

PROF. DR. TOBIAS SCHLICHT

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 10 – 12 (First Meeting: 16.10.2025)
ROOM:	GA 03/33
CP:	3 or 6

This seminar is conducted as research-oriented teaching. We will read and discuss work by Norwegian philosopher Hedda Hassel Mørch on non-physicalist theories of consciousness as alternatives to the dominant materialist positions. One of these alternatives is panpsychism, which Dr. Mørch defends against several objections and with reference to the scientific approach to consciousness called Integrated Information Theory.

We will aim to read her short book on Non-physicalist Theories of Consciousness and a few of her papers. The seminar is offered in English but aimed at Bachelor Students who are interested in getting in touch with consciousness research. Part of the seminar is a workshop in January 2026 with Hedda Hassel Mørch and other speakers on her work. All readings will be available electronically on moodle.

Literature:

Hassel Mørch: Non-physicalist theories of consciousness. Cambridge University Press.

C1

Social Cognition & Meta-Science

SEMINAR

GENERATIVE AI AND THE PHILOSOPHY OF MIND (030118)

DR. ROBERT W. CLOWES [PROF. DR. TOBIAS SCHLICHT]

TERM:	Winter 2025/26
MEETING TIME:	Friday, 10 – 12
ROOM:	GA 03/33
CP:	tba

This course can be taken either in Module C1 or in Module AM1.

Our understanding of what minds are is in a moment of deep uncertainty and potential conceptual redrafting. Generative AI (GenAI) is the latest in a series of technical innovations that has challenged our understanding of the nature of mind and cognition (Clowes, Gärtner, and Hipólito 2021) . This course will look at how our scientific and folk-psychological understanding of mind is being reshaped through our creation and interaction with GenAI. We will discuss the mind through a number of interlocking prisms including creativity, memory, self, agency, authorship, social cognition, self-governance, folk-psychology and consciousness. We will compare competing paradigms such as functionalism, the intentional systems approach, illusionism, active inference and (4E) embodied and embedded views of mind and ask what effect the study of GenAI systems or their successors is likely to have on these frameworks.

This course seeks to study the philosophy of mind alongside and in an interlocking way with the philosophical study of GenAI systems. It will mainly be taught through reading current research papers and discussing them in seminars, but it will also employ some direct interaction with the Digital Andy System (DAS). The DAS is a Large Language Model derived from the work of philosopher Andy Clark and partly designed by the lecturer of this course (detailed in Smart, Clowes, and Clark 2025) . It will be available for direct interaction and informed philosophical study and guided reflection as part of the course. In addition, draft chapters will be discussed from Robert Clowes' forthcoming book *Brave New Minds: GenAI as Cognitive Ecology*.

Background Reading:

Buckner, C. J. (2023). *From deep learning to rational machines: What the history of philosophy can teach us about the future of artificial intelligence*: Oxford University Press. https://academic.oup.com/book/55239

Clark, A. (2025). Extending Minds with Generative AI. *Nature Communications, 16*(1), 4627. doi:10.1038/s41467-025-59906-9 https://www.nature.com/articles/s41467-025-59906-9

Frankish, K. (2024). What are Large Language Models Doing? *Anna's AI Anthology: How to live with smart machines*, 53.

Schechtman, M. (2025). Talking to Myself: Technology and Self-Knowledge. *Social Epistemology, Special Issue on the Mind-Technology Problem*. https://philpapers.org/rec/SCHTTM-8

References:

Clowes, Robert W, Klaus Gärtner, and Inês Hipólito. 2021. "The Mind Technology Problem and the Deep History of Mind Design." In *The Mind-Technology Problem*, 1-45. Springer.

Smart, Paul, Robert W Clowes, and Andy Clark. 2025. "ChatGPT, Extended: Large Language Models and the Extended Mind." *Synthese* Special Issue on the Extended Mind.

C1

Social Cognition & Meta-Science

BLOCK SEMINAR

ONTOLOGY AND ETHICS OF GENERATIVE AI COMPANIONS (030116)

DR. ROBERT W. CLOWES

TERM:	Winter 2025/26
BLOCK:	09.03.26 – 13.03.26 (Mo-Fr), 09.30 – 16.00
ROOM:	GABF 04/354
CP:	tba

We are currently living through a period of rapid advancement in the field of Generative Artificial Intelligence (GenAI). This was propelled by breakthroughs in machine learning, deep learning, and large language models and burst into public consciousness especially in 2022 the public release of ChatGPT. GenAI has since become increasingly embedded in everyday tools and routines, its growing presence across daily tasks and digital platforms forming a significant part of contemporary digital life. But perhaps as early as 2017 at least one public system Replika had been using GenAI technologies to produce interactive AI companions. AI companion apps like Replika, Character.AI, and Kuki allow users to create “artificial others” that provide not only conversation but also potentially emotional support and self-regulation, offering judgment-free interactions that apparently address users’ emotional needs. The increasing trend of humans forming deeply affective relationships with these digital companions raises many ethical issues that have remained relatively underexplored.

This course will focus on the properties and interactive profile of GenAI companions putting them in the context of previous information technologies which have shaped or reshaped the self. We will especially focus on 1) The Mechanics of GenAI Companions; 2) Nature of AI-Human Companionships; 3) The Moral Status of AI Companions as "Artificial Others"; 4) The Ethical Responsibilities of AI Companion App Developers; 5) The Implications of Human-AI Interactions for (Real-World) Relationships.

Introductory Reading

Krueger, J., & Osler, L. (2022). Communing with the dead online: chatbots, grief, and continuing bonds. *Journal of Consciousness Studies, 29*(9-10), 222-252.

Schechtman, M. (2012). The story of my (second) life: Virtual worlds and narrative identity. *Philosophy & Technology, 25* (3), 329-343.

Turkle, S. (2011). *Alone Together: Why We Expect More From Technology and Less from Each Other*. New York: Basic Books.

Vallor, S. (2016). *Technology and the virtues: A philosophical guide to a future worth wanting*: Oxford University Press.

News article on Replika & Chatacter.AI from 2023 & 2024: https://www.abc.net.au/news/science/2023-03-01/replika-users-fell-in-love-with-their-ai-chatbot-companion/102028196 & https://www.nytimes.com/2024/10/23/technology/characterai-lawsuit-teen-suicide.html

C1

Social Cognition & Meta-Science

SEMINAR

MIND, SELF AND COGNITIVE TECHNOLOGY (2025 / 2026) (030117)

DR. ROBERT CLOWES

TERM:	Winter 2025/26
MEETING TIME:	Friday, 14 - 16
ROOM:	GA 03/33
CP:	tba

The human environment is increasingly saturated with so-called 'smart' artefacts. We inhabit a world increasingly conditioned by the ubiquitous presence of computer, augmented reality and artificial intelligence technologies from social media, to fitbits, from smart glasses to Replika friends. This amounts to a radically new epistemic, affective and cognitive environment for the human mind. The course explores the history, contemporary context, possible futures of the ever-deepening engagement between mind, human nature, cognition and personal identity in the context of this artefactual background of our lives. In so doing it seeks to develop a deep understanding of how smart technologies are shaping the human environment. It provides students with access to the theories, tools, and resources to help them think about this new engagement and ideally help shape its future.Engagement with course materials will inform and complement the student´s studies in philosophy and the social sciences more generally and will give them new tools to face the future.

Introductory reading includes:

Vallor, S. (2024). *The AI Mirror: How to Reclaim Our Humanity in an Age of Machine Thinking*: Oxford University Press.

Coeckelbergh, M. (2022). *Self-improvement: Technologies of the Soul in the Age of Artificial Intelligence*: Columbia University Press.

Smart, P. R., Clowes, R. W., & Heersmink, R. (2017). Minds Online: The Interface between Web Science, Cognitive Science and the Philosophy of Mind. *Foundations and Trends in Web Science, 6*(1-2), 1-232.

Hutchins, E. (2010). Cognitive ecology. *Topics in Cognitive Science, 2* (4), 705-715.

C2

Perception & Action

SEMINAR

THEORIES OF SELF AND SELF-CONSCIOUSNESS (030093)

PROF. DR. ALBERT NEWEN

TERM:	Winter 2025/26
MEETING TIME:	Monday, 16- 18. (First Meeting: 13.10.2025)
	& Workshop Thursday 11.12.: 1:00 pm & Friday 12.12.: 4:30pm
ROOM:	GA 04/187
CP:	3 or 6

Seminar structure: This seminar is a research-oriented seminar which especially enables the participants to develop a project which leads into a BA-thesis or a master-thesis. We will read central chapters of new forthcoming book by Distinguished Professor Susanna Schellenberg (Rutgers University). She will come to a 1,5 day workshop to present and discuss her brandnew work in person at RUB. Workshop date: Thursday 11th of Dec. 1:00 pm & Friday 12th of Dec. 4:30pm.

Seminar Content: In this seminar, we will explore theories of self-consciousness. This includes a variety of phenomena which are part of or closely related to self-consciousness, namely the sense of agency, of ownership and the phenomenon of perspectivity as well as the role of an autobiographical self as well as a normative self and its development. This seminar has a clear focus in philosophy but will involve some psychological texts as well. The main topic in the introductory part is the discussion of modern theories of human self-consciousness. Self-consciousness can be defined as the ability to consciously represent one's own states, especially (but not only) mental states, as one's own (Newen, Vogeley 2003). Concerning self-consciousness, we can distinguish four central questions which allow us to illustrate the wide range of this central debate:

The epistemological question: Do we have a privileged access to our own mental phenomena such that only we can know with certainty which mental phenomena we have?

The ontological question: Is there a self as an ontologically irreducible entity?

The cognitive question: How can we investigate the natural basis of self-c. with the methods of empirical psychology and cognitive neuroscience?

The question about personal identity: What is the criterion of being a person and of remaining the same person? In the seminar we will discuss texts concerning all dimensions of human self-consciousness.

After having developed an understanding of self and self-consciousness, we will work on the question whether there can be artificial selves in AI systems and what this would look like. This question is a key question in Schellenberg's book.

Details for receiving a certificate will be presented at the beginning of the seminar. Bachelor- and Master-students can acquire the usual certificates and credit points based on the usual amount of work. The workload involves the standard tools of oral presentations and essay writing. Presentations and discussions will be (usually) in English.

[THEORIES OF SELF AND SELF-CONSCIOUSNESS (030093)

Literature: Reading Material: The reading material for the course will be distributed electronically. It includes introductory texts about the philosophy of self and then it involves some selected chapters from the book of Susanna Schellenberg.

To prepare the participation please read the following texts:

Gallagher, S., Zahavi. D.: Phenomenological Approaches to Self-Consciousness, in: Stanford Encyclopedia of Philosophy, http://plato.stanford.edu/entries/self-consciousness-phenomenological/

C2

C2. Perception & Action

LECTURE

LEFT BRAIN - RIGHT BRAIN (118111)

PROF. DR. PHIL. DR. H.C. ONUR GÜNTÜRKÜN

TERM:	Winter 2025/26
MEETING TIME:	Tuesday, 14 – 16 (First Meeting: 21.10.2025)
ROOM:	HIA
CP:	3

Most of our brain's processes are executed by different mechanisms in the left and the right hemisphere. Language, spatial orientation, motor control, emotional processing, face perception, and even the ability to comprehend the rhythm of a drum are guided by neural circuits that are differently tuned within the two hemispheres. These asymmetries of mental processing mean that damages of the human brain cannot be understood without a thorough understanding of asymmetries. The lecture aims at explaining the current knowledge about the structure and the mechanisms of cerebral asymmetries by making use of highly interactive teaching methods.

C2

C2. Perception & Action

BLOCK SEMINAR

THE NEUROSCIENCE OF CONSCIOUSNESS (114817)

PROF. DR. LUCIA MELLONI

TERM:	Winter 2025/26
BLOCK:	24. & 25.01.26 (Sa & Su), 31.01.26 (Sa), each 10 - 18
ROOM:	GABF 04/514
CP:	3

What does it mean to be conscious? How do we determine if a person has lost consciousness or not? How does your experience presumably differ from mine? This course offers an in-depth exploration of consciousness, the jewelry in the crown of mind sciences. The course will introduce both neuroscientific and philosophical perspectives, bridging empirical research with theoretical inquiry. Students will examine the mind-body problem, different types of conscious experiences, and the neural correlates of consciousness. Key discussions will include the hard problem of consciousness, state vs. content consciousness, and the inferential challenges of studying consciousness in infants, animals, and artificial intelligence.

We will explore altered states of consciousness, disorders such as blindsight and hemineglect, and the role of brain structures and neurophysiology in both typical and atypical conscious experiences. Through interactive lectures, students will engage with experimental paradigms like attentional blink, no-report paradigms, and neuroimaging techniques, while critically addressing the confounds of attention, memory, and decision-making in consciousness research.

The course also integrates prominent theories such as Global Workspace Theory, Integrated Information Theory, and Predictive Coding, culminating in discussions on how adversarial collaborations can help adjudicate between competing models of consciousness. With a blend of hands-on activities, group debates, and practical case studies, students will gain a comprehensive understanding of the neuroscience underlying conscious states and contents.

Learning Outcomes:

- Understand the philosophical and neuroscientific foundations of consciousness studies.
- Differentiate between state and content consciousness, including their neural correlates.
- Evaluate the empirical approaches and paradigms used to study consciousness, from neuroimaging to behavioral assays.
- Critically analyze disorders of consciousness and their impact on our understanding of brain function.
- Explore the inferential gap in consciousness research, particularly concerning non-human animals and artificial intelligence.
- Develop the ability to design and critique experiments aimed at studying different aspects of consciousness.
- Gain insight into the ethical problems related to the study of consciousness e.g., how do we infer that someone or something is conscious and what kind of moral status do we assign to those entities?

The seminar will be graded.

C2

Perception & Action

SEMINAR

AGENT-BASED SIMULATIONS IN PHILOSOPHY: THEORETICAL PART (030074)

PROF. DR. DUNJA ŠEŠELJA, PROF. DR. CHRISTIAN STRAßER

TERM:	Winter 2025/26
MEETING TIME:	Friday, 14 – 16 (exception January: no weekly classes but a workshop from 29.1.-31.1.25)
ROOM:	Wasserstr. 221/4
CP:	3 or 6

In recent years digital aspects have entered philosophy, both in terms of providing a plethora of new topics and by providing new perspectives on old questions. Moreover, the digital age also equips philosophy with new computational methods for tackling philosophical questions, such as computer simulations. This course is dedicated to this topic.

Computer simulations in the form of agent-based models (ABMs) have in recent years become a popular method in philosophy, particularly in social epistemology, philosophy of science and political philosophy. In this course we discuss some of the central philosophical questions studied by means of ABMs. For instance, can groups of rational agent polarize, if yes, under which conditions? Can groups composed of agents that reason individually fully rationally (e.g., according to Bayesian standards) still be inefficient as a group? If yes, how so? Other topics concern questions from social epistemology and philosophy of science, such as the division of cognitive labor, cognitive diversity and expertise, opinion dynamics, etc. In this course we will cover some of the most prominent modeling frameworks used in the philosophical literature and beyond. The readings will be announced at the start of the seminar.

We highly encourage the students to attend also the Practical part of this course: 030076, Agent-based simulations in philosophy: practical part, which takes place in the same room, right after the current course.

Literature: The reading list will be provided at the start of the course.

C2

Perception & Action

SEMINAR

AGENT-BASED SIMULATIONS IN PHILOSOPHY: PRACTICAL PART (030076)

MATTEO MICHELINI

TERM:	Winter 2025/26
MEETING TIME:	Friday, 16 – 18
ROOM:	Wasserstr. 221
CP:	3 or 6

This course can be used either for module C2 or for module AM4.

Can groups of biased scientists outperform groups of unbiased ones? Can citizens with only a slight preference for having like-minded neighbors give rise to a highly segregated city? Can rational epistemic agents polarize over the truth of a sentence?
The effect of individual actions on the collective outcome has always fascinated philosophers of many disciplines. In the last decade, to answer these and many more questions, philosophers have extensively used agent-based models. Agent-based models are computational programs that allow to explore the behaviour of a group of agents, starting from the rules guiding the actions of the individuals. As such, it is the ideal tool to explore the collective outcome of individual practices.
This course is meant to teach participants how to build an agent-based model from scratch. No pre-existing knowledge about programming is required: philosophy students with no computational background, you are welcome! At the same time, the course is also ideal for people already experienced with programming who want to learn about how to use agent-based models.

We recommend taking this course in combination with the course "**Agent-based simulations in philosophy: theoretical part",** although you can also take each of them separately (that would make sense if you followed the theoretical part last year). Each course can provide up to six credits.

The course is composed of four parts.
1. In October, I will teach you some fundamental basics required for programming. You will learn what program to use, how to install it, and which procedures are useful when building an agent-based model.
2. In November, we will go through some of the most famous examples of agent-based models in philosophy. I will teach you how to program them, and how to collect data from them.
3. Finally, December and January are dedicated to you building your own model. We will discuss together how to formulate nice ideas on which model to build, and I will help you step-by-step in building your own model.
4. The final three lectures will be dedicated to you presenting your work.

Literature: The course material will be composed of handouts.

Seselja, Dunja (2023). "Agent-Based Modeling in the Philosophy of Science". In: The Stanford Encyclopedia of Philosophy. Ed. Stanford University https://plato.stanford.edu/entries/agent-modeling-philscience
Grim, Patrick and Daniel Singer (2024). "Computational Philosophy". In: The Stanford Encyclopedia of Philosophy. Ed. Stanford University. https://plato.stanford.edu/entries/computational-philosophy/

C2

Perception & Action

SEMINAR

PERCEPTION TO ACTION: BRIDGING MIND AND MOVEMENT (110013)

NIKITA SHARMA, M.SC. [PROF. DR. JONAS ROSE]

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 10 – 12 (first meeting: 22.10.2025)
ROOM:	IA 02/460
CP:	3

This course examines the cognitive architecture that transforms perceptual inputs into motor actions.

- **Core Constructs:** intentionality, reaction time (RT), conflict processing, motor control.
- **Theoretical Frameworks:** Theory of Event Coding (TEC), Action cycle theory (ACT), Drift Diffusion Model (DDM), Optimal Feedback Control (OFC), Feedback loops.
- **Methodology:** psychophysical paradigms, applied behavioural and cognitive tasks.
- **Applied Focus:** rehabilitation, aviation, neuro-marketing, driving, ergonomics.
- **Pedagogical Approach:**
    - Interactive lectures with analogies and demonstrations
    - Low-tech experiments i.e. paper pencil tasks
    - Peer group activities i.e. brainstorming, role-play, syndicate
    - Problem classes

Learning Outcomes:

By the end of the course students will be able to:

- Analyse intention–action gaps using ideomotor and TEC principles.
- Measure and interpret cognitive processing with RT paradigms.
- Diagnose conflict scenarios via Flanker, Simon and Stroop effects.
- Optimise motor efficiency applying Fitts' Law and related models.
- Design evidence-based solutions for rehabilitation, aviation, UX and other domains.

Students can earn 3 CP graded in this class.

C2

Perception & Action

LECTURE & EXERCISE (+TUTORIAL)
ARTIFICIAL NEURAL NETWORKS (212006)
PROF. DR. SEN CHENG

TERM:	Winter 2025/26
LECTURE:	Monday, 16 – 18 (First meeting: 13.10.2025)
ROOM:	NC 2/99
TUTORIAL:	Wednesday, 12 – 14 (First meeting: 15.10.2025)
ROOM:	ID 03/455
EXERCISE:	Friday, 10 – 12 (First meeting: 17.10.2025)
ROOM:	NC 2/99
CP:	6

If this course is used for module BM3, it cannot be used for C2.

Artificial neural networks (ANN) were inspired by the architecture and function of the brain. Nevertheless, their greatest strength is not that they are good models of the brain, but rather that they are powerful function approximators. Since the 1980's many types of ANN have been developed and tricks for training ANNs on data proliferated. Recent advances in computing hardware and the availability of large datasets have made it possible to train ANNs such that they perform better than humans, e.g. on image recognition. In this class, students will, firstly, gain a theoretical understanding of the principles underlying the methods applied to neural networks and, secondly, learn practical skills in implementing neural networks and applying them for data analysis.

Topics: optimization problems, regression, logistic regression, biological neural networks, model selection, universal approximation theorem, perceptron, MLP, backpropagation, deep neural networks, recurrent neural networks, LSTM, Hopfield network, Bolzmann machine

Software: python, numpy, scipy, matplotlib, scikit-learn, tensorflow

There will be a written examination at the end of the course.

Requirements: Calculus, linear algebra, statistics, programming.

C2

Perception & Action

BLOCK SEMINAR

INTRODUCTION TO PHENOMENOLOGY AND 4E COGNITION (030051)

DR. FRANCESCO FANTI ROVETTA

TERM:	Winter 2025/26
BLOCK:	preparatory meeting: 14.10.25, 18.00 hybrid format
	17.02.26 – 20.02.26 (Tue- Fr), 9-17.30 (15.30)
ROOM:	GABF 04/352
CP:	3 or 6

This course provides an overview of key ideas developed within the phenomenological tradition and their reception in current debates in cognitive science. In the first part of the course, students will become familiar with the phenomenological method through the views of central thinkers in this tradition, such as Husserl, Heidegger, and Merleau-Ponty, as well as their recent interpretations.

In the second part, we will focus on the influence of phenomenological ideas on current debates in cognitive science. In particular, we will examine how embodied, embedded, enacted, and extended approaches to cognition, the so-called 4E cognition, have challenged the representational and computational view of the mind by drawing on phenomenology.

We will focus on three central themes:

1. Embodiment and skilled actions

2. Social cognition

3. Situated affectivity

For each of these themes, we will discuss the phenomenological approach, their reception in recent debates in cognitive science, and some examples of their application.

Literature: The reading list will be provided on Moodle before the start of the course.

C2

Perception & Action

BLOCK SEMINAR, ESSAY WRITING COURSE

SHORT FORMAT SCIENTIFIC COMMUNICATION (112916)

WEI LIN (WINSTON) SEAH

TERM:	Winter 2025/26
MEETING TIME:	Preliminary meeting: date tba
	Block Group 1: 09. + 10.02.26 & 02. + 03.03.26, 13 - 17
	Block Group 2: 09. + 10.02.26 & 04. + 05.03.26, 13 - 17
ROOM:	09. + 10.02.26: GABF 04/716;
	02.03 – 05.03.26: GABF 04/516
CP:	3

This is an Essay Writing Course in Psychology:
For all students who would like to intensify their knowledge in scientific writing, for example as preparation for further essays or theses, we recommend the class by Wei Lin Seah.

This course can be used either in module C2 or in module C3.

Effective writing is one of the most important skills in today's science, engineering, and business landscapes. Effectively communicating the value of your research can make the difference between if they are funded and accepted for publication or not.

What research means to scientific experts in the field vs. a broad public audience requires very different communication approaches. Communicating the value of research is a critical skill that will enable you to apply these skills from an early stage of your career.

During the science writing course, a combination of seminars that encourage group discussion will explore current topics at the cutting edge of research in working memory and visual neuroscience. Assessments designed to replicate the requirements of academia will help you hone the skills learned to become an effective scientific writer.

Registration is limited to 10 students.

C3

Memory & Learning

SEMINAR

DISKURS NEUROPSYCHOLOGIE: MEMORY, SPACE, AND CONCEPTS (118613)

DR. MARKUS WERKLE-BERGNER

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 10-12 & 2-3 block meetings (tba)
ROOM:	Online
CP:	3

Since Toman introduced the idea of a cognitive map, there is the idea that cognition and memory in humans have a special relationship to space. With the discovery of specialized neural coding schemes in the hippocampus (e.g., place cells, grid cells etc.), the search for common underlying principles that connect cognition, space, and memory was further fueled.

In this course, we will read into the literature underlying the key ideas of common representations for space, concepts, and memory.

C3

Memory & Learning

SEMINAR

MEMORY AND IMAGINATION (030105)

PROF. DR. MARKUS WERNING

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 12-14 (bi-weekly)
ROOM:	GA 04/187
CP:	3 or 6

Memory and imagination are central capacities of the human mind. Memory links us to our autobiographical past, whereas imagination allows us to envision hypothetical and counterfactual scenarios. It also enables us to put ourselves in the shoes of other persons. In remembering and in imagination, we mentally construct scenarios, which are very much alike with respect to their representational contents and their phenomenal character. However, when it comes to the justification of factual beliefs, memory and imagination seem to play very different roles. Whereas memory informs us about events that actually happened to us in our past, imagination does not indicate factual truths. It, at most, helps us to engage with merely possible scenarios.

In the seminar, we will shed light on the commonalities and differences between memory and imagination. The guiding questions are: What is it like when we are remembering or imagining something? Is memory a form of preservation that stores representations of what we once experienced (Martin & Deutscher, 1966)? Do memory and imagination result from a shared causal mechanism of episodic simulation (Addis, 2018; Michaelian, 2016). Are they still distinct kinds of psychological phenomena (Werning, 2020)? Does the inability to form mental images, as we observe it in aphantasia, correlate with an impairment of episodic memory? In what respects do memory and imagination provide justifications for beliefs. What about deficient phenomena such as confabulation and déjà-vu?

The seminar will provide an overview of the current research literature on memory and imagination, in philosophy, psychology and neuroscience. Students will have the opportunity to link up with our DFG research group “Constructing Scenarios of the Past: A New Framework of Episodic Memory”. Aside from active participation, participants will be expected to give a presentation in English. Assistance regarding the English language will be provided. Teaching will be assisted by Sofia Pedrini and Juan Àlvarez.

Literature:

Addis, D. R. (2018). Are episodic memories special? On the sameness of remembered and imagined event simulation. *Journal of the Royal Society of New Zealand*, *48*(2–3), 64–88. doi: 10.1080/03036758.2018.1439071

Bernecker, S., & Michaelian, K. (Eds.). (2019). *The Routledge handbook of philosophy of memory*. New York, NY: Routledge.

Kind, A. (Ed.). (2017). *The Routledge handbook of philosophy of imagination* (First issued in paperback). London New York: Routledge.

Martin, C. B., & Deutscher, M. (1966). Remembering. *Philosophical Review*, *75*, 161–196.

Michaelian, K. (2016). *Mental Time Travel: Episodic Memory and Our Knowledge of the Personal Past*. Cambridge, MA: MIT Press.

Werning, M. (2020). Predicting the Past from Minimal Traces: Episodic Memory and its Distinction from Imagination and Preservation. *Review of Philosophy and Psychology*, *11*, 301–333. doi: 10.1007/s13164-020-00471-z

C3

Memory & Learning

BLOCK SEMINAR

CLASSIC CASES IN NEUROPSYCHOLOGY GROUP 1 (112622)

JAVIER SCHNEIDER PEÑATE, M.SC.

TERM:	Winter 2025/26
BLOCK:	Preparatory Meeting: 20.10.2025, 9 - 11
	31.01.26 + 01.02.26, 09.00 – 18.00
ROOM:	GABF 04/516
CP:	3

If capacity for this seminar is full, Psychology students are prioritized.

The focus of this seminar is the discourse on classic cases in neuropsychology. In addition to modern and famous cases, lesser-known cases will also be addressed and discussed against the background of the relationship between brain, behavior and cognition. Furthermore, characteristics and theoretical implications of the cases will be worked out and contemporary neuropsychological problems will be addressed. Classic cases associated with impairments of language, memory, perception, and attention will be presented. A central learning objective of this course - and thus also the basis for successful participation and assessment - is regular active participation in scientific discourse.

Literature:

Code, C. et al. (1996). Classic Cases in Neuropsychology. Hove: Psychology Press.
Code, C. et al. (2003). Classic Cases in Neuropsychology, Volume II. Hove: Psychology Press.

C3

Memory & Learning

BLOCK SEMINAR, ESSAY WRITING COURSE

SHORT FORMAT SCIENTIFIC COMMUNICATION (112916)

WEI LIN (WINSTON) SEAH, M.SC.

TERM:	Winter 2025/26
MEETING TIME:	Preliminary meeting: date tba
	Block Group 1: 09. + 10.02.26 & 02. + 03.03.26, 13 - 17
	Block Group 2: 09. + 10.02.26 & 04. + 05.03.26, 13 - 17
ROOM:	09. + 10.02.26: GABF 04/716;
	02.03 – 05.03.26: GABF 04/516
CP:	3

This is an Essay Writing Course in Psychology:

For all students who would like to intensify their knowledge in scientific writing, for example as preparation for further essays or theses, we recommend the class by Wei Lin Seah.

This course can be used either in module C2 or in module C3.

Effective writing is one of the most important skills in today's science, engineering, and business landscapes. Effectively communicating the value of your research can make the difference between if they are funded and accepted for publication or not.

What research means to scientific experts in the field vs. a broad public audience requires very different communication approaches. Communicating the value of research is a critical skill that will enable you to apply these skills from an early stage of your career.

During the science writing course, a combination of seminars that encourage group discussion will explore current topics at the cutting edge of research in working memory and visual neuroscience. Assessments designed to replicate the requirements of academia will help you hone the skills learned to become an effective scientific writer.

Registration is limited to 10 students.

C3

Memory & Learning

BLOCK SEMINAR

WORKING MEMORY AND COGNITIVE CONTROL (118921)

SARA SANTOS SILVA, M.SC.

TERM:	Winter 2025/26
MEETING TIME:	**Preliminary Meeting**: tba (Zoom) **BLOCK:** 03.03.2026 – 07.03.2026, Mo- Di: 9 – 12; Mi – Fr 9 - 14
ROOM:	GA 04/187
CP:	3

This course will cover Working Memory and Cognitive Control from different viewpoints. The students will learn theoretical concepts of both and learn to distinguish working memory from other memory models. One emphasis of the course is the neuronal basis of these concepts. We will talk about measurement techniques and experimental design. There will be a practical exercise in experimental design as well. A second focus will be the comparison of working memory and cognitive control between birds and mammals. We will also discuss current research papers in those areas, which will be presented by the students.

C3

C3. Memory, Learning & Decision Making

SEMINAR

DISCOURSE NEURAL BASIS OF LEARNING (118665)

ANNIKA VERFERS, M.SC., PROF. DR. JONAS ROSE

TERM:	Winter 2025/26
MEETING TIME:	Monday, 9 - 10 (First Meeting: 20.10.2025)
ROOM:	GA 04/187
CP:	3

Current literature in cognitive neuroscience, with a focus on birds, will be presented and discussed in depth. We aim to follow up on novel approaches, interesting angles and to have a critical discussion of research methods and interpretations.

Maximum number of participating students: 10

C3

Memory & Learning

SEMINAR

JOURNAL CLUB: LEARNING AND MEMORY (212103)

PROF. DR. SEN CHENG

TERM:	Winter 2025/26
MEETING TIME	tba
ROOM:	tba
CP:	3

If this course is taken in module I3, it cannot be taken in C3.

We will focus on the neural basis of learning and memory at the systems level. In each (online) session a journal article will be presented by one participant and discussed by all participants. The articles will be selected particularly in the areas of spatial and episodic memory. They will focus on the functional role of the mammalian hippocampus in these processes and include a diverse set of approaches: electrophysiology, imaging, computational modeling, and robotics.

Contact: Prof. Dr. Sen Cheng, NB 3/33, sen.cheng@rub.de
Office hours: Thursdays 14:00-15:00 (Cheng)

Capacity: max. 15 students
Enrollment: ecampus

C3

Memory & Learning

SEMINAR

ALGORITHMS FOR DECISION MAKING (212130)

PROF. DR. ROBERT SCHMIDT

TERM:	Winter 2025/26
MEETING TIME:	Monday, 16 – 18 (First meeting: 13.10.2025)
ROOM:	IC 03/447
CP:	3

Automated decision-making systems are used for many important problems in engineering (e.g. automated driving), medicine (e.g. cancer screening), economics (e.g. portfolio allocation), environmental science (wildfire surveillance), and space travel (e.g. Mars exploration). In their recent book [1], Kochenderfer et al. examine different decision-making algorithms from a computational perspective, with a focus on the problem of uncertainty. Uncertainty can be represented using probability distributions and can occur on different levels, such as uncertainty about the outcome of actions or about the underlying world model.

Overall, the different parts of the book cover Probabilistic Reasoning, Sequential Problems, Model Uncertainty, State Uncertainty, and Multiagent Systems. Each part of the book contains then several chapters with a more specific topic describing mathematical problem formulations and computational approaches, often closely related to reinforcement learning and planning.
Each student will cover the topic from a book chapter in a presentation in the seminar, followed by a discussion of the topic with active participation from the whole seminar group.

Learning Outcomes:

- Knowledge on different algorithms and computational approaches for decision making
- Explain the underlying mathematical problem formulations and the implementation of the algorithms to solve them
- Insight into different types of uncertainty and the balancing of multiple objectives
- Discuss practical applications of the theoretical frameworks
- Present the algorithms and mathematical problem formulations to an audience

Examination: Oral presentation

Requirements: Knowledge of calculus, linear algebra, and probability concepts. Background in artificial intelligence, e.g. via the course “Introduction to Artificial Intelligence”.

Registration: If you would like to attend the class, please write an E-Mail to Professor Schmidt (robert.schmidt@rub.de) including your matriculation number and the Master program. The literature discussed in the seminar requires some mathematical understanding. Therefore, please take a look at the book listed below before registering to find out if the course is suitable for you.

Literature:

I recommend to browse the book beforehand: Kochenderfer, M. J., Wheeler, T. A., & Wray, K. H. (2022). Algorithms for decision making. MIT press. https://algorithmsbook.com/files/dm.pdf

C3

Memory & Learning

SEMINAR

WHAT'S ALL THE CRAZE ABOUT BAYES? AN INTRODUCTION TO BAYESIAN EPISTEMOLOGY (030115)

PROF. DR. CHRISTIAN STRAßER

TERM:	Winter 2025/26
MEETING TIME:	Friday 12- 14 (First Meeting: 17.10.2025)
ROOM:	GABF 05/703
CP:	3 or 6

This course can be used either in module C3 or in module AM2.

In recent years, Bayesianism has emerged as a powerful and widely influential framework for understanding belief and reasoning. Its principles are now applied across a diverse array of fields, from philosophy to artificial intelligence and cognitive science. But what exactly is Bayesian epistemology?

This seminar provides an introduction to the core tenets of Bayesian Epistemology, guided by Michael Titelbaum's "Fundamentals of Bayesian Epistemology." The course is designed for mid to late-stage Bachelor's and Master's students with an interest in epistemology, philosophy of science, or formal methods in philosophy.

We will begin by exploring the central concept of 'credence' – the idea that our confidence in a proposition can be represented numerically.From there, we will delve into the mathematical heart of Bayesianism: the probability axioms. We will unpack how these axioms provide a normative framework for rational belief. A key focus of the seminar will be on the dynamics of belief change. We will investigate how a rational agent should update their beliefs in light of new evidence, a process governed by the elegant and powerful rule of Conditionalization. We will also examine the role of 'priors' – our initial degrees of belief – and the ongoing philosophical debates surrounding their justification.

Throughout the course, we will engage with puzzles and paradoxes that have challenged and refined Bayesian thought, such as the infamous Monty Hall problem and the Simpson's paradox. By the end of the seminar, you will have a firm grasp of the key concepts of Bayesian epistemology, be able to apply these concepts to problems, and be ready to engage with more advanced topics in the field. Sign up to find out what all the craze about Bayes is really about!

C4

C4. Language, Logic & Categories

SEMINAR

TOPICS IN PHILOSOPHY OF LANGUAGE AND LINGUISTICS (030109)

DR. MARIA SPYCHALSKA

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 10 – 12
ROOM:	tba
CP:	3 or 6

The course introduces basic topics in philosophy of language, semantic and pragmatics. We will read classical papers by Russel (On denoting, Descriptions), Frege (Sense and Reference), Strawson (On Referring), Grice (Meaning, Logic and Conversation), Austin (Speech Acts), and a selection of modern ones in pragmatics and semantics.

Basic notions and concepts in pragmatics such as implicatures, presuppositions, speech acts, deixis will be introduced, as well as basic formal tools used in semantics (propositional and predicate logic).

Requirements for receiving 3 CP ungraded: active participation and a presentation in class
Requirements for receiving 6 CP graded: additionally passing a written test (in class)

C4

C4. Language, Logic & Categories

SEMINAR

MEANING AND INFERENCE: EXPERIMENTAL APPROACHES (030110)

DR. MARIA SPYCHALSKA

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 14 – 16
ROOM:	GABF 04/354
CP:	3 or 6

This is a journal paper-based seminar focusing on investigating semantic and pragmatic phenomena with experimental tools, such as behavioral methods (truth-value judgment tasks, reaction times, eye tracking) as well as neurocognitive methods, e.g., EEG. We will discuss empirical studies investigating topics such as conditional reasoning, implicatures, presuppositions, reasoning with quantifiers, conjunctions and disjunctions.Students will be required to actively participate and present a journal paper in class.

For a graded course credit, students will prepare and present an experimental project idea including a short paper (either individually or as teamwork).

Requirements for 3 CP ungraded: active participation and a presentation in class

Requirements for 6 CP graded: additionally preparing and presenting an individual or a team project including a short paper.

Literature: selected articles (to be provided)

C4

Language, Logic & Categories

BLOCK SEMINAR

THE PHILOSOPHY OF INNER SPEECH (030097)

DR. FRANCESCO FANTI ROVETTA

TERM:	Winter 2025/26
BLOCK:	Preparatory Meeting: 15.10.2025, 18.00 hybrid format
	Block: 03.03.26 – 06.03.26 (Tue-Fr), 9.00 – 17.30
ROOM:	GA 03/46
CP:	3 or 6

Try counting to ten 'in your head'. For most people, doing so requires mentally verbalizing each number in sequence ('one', 'two', 'three', and so on). This silent tokening of linguistic elements, known as inner speech, is involved not only in rehearsing tasks but also in complex problem-solving, decision-making, autobiographical reasoning as well as in various psychopathological conditions. Unfortunately, the intuitiveness of the pre-theoretical notion of inner speech does not extend to the scientific domain. In this block seminar, we will explore recent empirically informed debates on the nature of inner speech, its functions, developmental trajectory, and connections to mental health. For instance, we will consider whether inner speech should be conceived as a form of (internalized) speech, as thinking in words or as an imaginative process. We will also address the paradoxical nature of inner speech (what is the point of speaking to oneself if one already knows what one is going to say?), and discuss what other cognitive functions inner speech might have, if not that of conveying information. Finally, we will examine the role of specific forms of inner speech such as rumination, thought insertion, and auditory verbal hallucinations, in the symptomatology of mental health conditions.

Literature: The reading list will be provided on Moodle before the start of the course.

C4

Language, Logic & Categories

SEMINAR

LOGICS OF RELEVANCE (030111)

DR. ANDREW TEDDER

TERM:	Winter 2025/26
MEETING TIME:	Friday, 14 – 16 (First Meeting: 17.10.2025)
ROOM:	GABF 04/358
CP:	3

This course can be either used for Module C4 or for Module AM2.

In this seminar students will be introduced to relevant logics, which are logics according to which a necessary condition on argument validity is that the premises be relevant to the conclusion. The course will be concerned with philosophical foundations and foundational formal results concerning such logics including (a) proof theoretic presentations by axiomatic and sequent-style calculi, (b) model theoretic presentations by algebraic and frame semantics, and (c) applications of relevant logics to formal theories. Our primary text will be the manuscript by Standefer, to be shared in draft form (with the permission of the author).

CP can be earned by completing assignments, and possibly an end-of-term essay, to be determined by interested students in discussion with the instructor.

Literature:

Some books for reference:
Alan R. Anderson and Nuel D. Belnap. *Entailment: The Logic of Relevance and Necessity.* Volume 1. Princeton University Press (1975).
Alan R. Anderson, Nuel D. Belnap, and J. Michael Dunn. *Entailment: The Logic of Relevance and Necessity.* Volume 2. Princeton University Press (1992).
Shay Allen Logan. *Relevance Logic.* Cambridge University Press (2024).
Richard Routley, Robert K. Meyer, Val Plumwood, and Ross T. Brady. *Relevant Logics and Their Rivals.* Volume 1. Ridgeview Press (1982).
Shawn Standefer. *Relevant Logics: Implication, Modality, Quantification.* (Manuscript).

AM. Advanced Methods

Advanced methods are usually studied in the second semester. Solely the "fMRI"-course is only offered during the winter term.

Further advanced methods can be found in the program from the last summer semester on our webpage: https://philosophy-cognition.com/mcs/course-guides/

There will again be a variety of courses in the upcoming summer semester.

AM1

AM1. Theory Formation and Conceptual Analysis

BLOCK SEMINAR

ARGUMENTATION (030108)

PROF. DR. DUNJA ŠEŠELJA, PROF. DR. CHRISTIAN STRAßER

TERM:	Winter 2025/26
MEETING TIME:	Block: 09.-13.02.26, 10 - 16
ROOM:	Wasserstr. 221/4
CP:	3 or 6

Philosophy and science are based on argumentation. Instead of just voicing opinions or stating beliefs, scholars give reasons and provide evidence for their conclusions. Argumentation is key when trying to find a consensus, or at least when identifying the roots of a disagreement. As such, it is central in many areas, from everyday life to political discourse. Needless to say, good argumentative skills are a necessary requirements for successful studies (in essay and thesis writing, for instance).

In this block seminar we will survey different facets of argumentation theory. We start off with foundations (argument schemes such as the Toulmin scheme, fallacy theory, types of arguments, etc.) and proceed towards contemporary investigations (e.g.: computational argumentation; Bayesian and probabilistic argumentation; pragma-dialectics; reasoning and biases; etc.). Finally, we will look into practical applications of argumentation in the context of structured debating.

Students will receive an assignment during the semester, which will have to be completed before the block seminar. In addition, there will be group assignments during the block seminar.

Literature: The reading list will be provided via Moodle at the beginning of the semester.

AM1

AM1. Theory Formation and Conceptual Analysis

ESSAY WRITING SEMINAR

SPECIAL ESSAY WRITING SEMINAR: WHAT MAKES US HUMAN? COMPARING HUMANS, ANIMAL AND AI SYSTEMS (030092)

PROF. DR. ALBERT NEWEN, DR. SANJA SRECKOVIC

TERM:	Winter 2025/26
MEETING TIME:	Tuesday 10- 12 (First Meeting: 14.10.2025)
ROOM:	GABF 05/703
CP:	3 or 6

This is an Essay Writing Course in Philosophy:

For all students who did not study philosophy during the BA program but need to learn how to write an essay or still feel insecure about it, we recommend in the winter semester the seminar of Prof. Dr. Albert Newen and Dr. Sanja Sreckovic.

This course can be used either in module C1 or in module AM1.

The question what makes us human is a traditional key question of philosophy. It is prominent in Kant's work but also in modern systematic philosophy, there is several proposal to highlight the specific features or abilities of human beings. In a first part, we will discuss those candidates of specific human abilities which are investigated in the context of comparing humans and animals in the last 30 years. Most important candidates are linguistic competence, rationality or inferential abilities, tool use and tool construction, social competences, morality or social cooperation. A detailed discussion questions all these candidates. In a second part, we will discuss whether there remains a clear difference between humans and AI systems concerning typical human abilities: The explosion of AI competences also questions this perspective since it seems that for each human cognitive ability, we can train an AI system that also operationalizes this ability. But this leaves us with the open question whether AI systems really have the relevant features and abilities or only simulate them: are AI systems real agents? Can they really have feelings, emotions and consciousness? Are they just intelligent tools or do they develop into life partners? What does this mean for our self-understanding as human beings?

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AM1

AM1. Theory Formation and Conceptual Analysis

BLOCK SEMINAR

CAPITA SELECTA IN HISTORY, PHILOSOPHY, AND FOUNDATIONS OF MATHEMATICS (030103)

DR. SAM SANDERS

TERM:	Winter 2025/26
BLOCK:	16.02.26 – 20.02.26 (Mo – Fr), 10.00 – 18.00
ROOM:	GABF 04/354
CP:	3 or 6

The notion of infinity is central to modern mathematics but has deep historical roots, perhaps most well-known being Aristotle's concept of potential infinity.We study the historical development of infinity, working towards various modern/historical schools of philosophy of mathematics. We shall discuss the famous work of Kurt Goedel and its environs in some detail.

We apply this knowledge to topics in contemporary philosophy like vagueness and indispensability. Requirements: the course is geared towards MA students who have taken an introductory class in logic (or related topics).

AM1

AM1. Theory Formation and Conceptual Analysis

SEMINAR

GENERATIVE AI AND THE PHILOSOPHY OF MIND (030118)

DR. ROBERT W. CLOWES [PROF. DR. TOBIAS SCHLICHT]

TERM:	Winter 2025/26
MEETING TIME:	Friday, 10 – 12
ROOM:	GA 03/33
CP:	tba

This course can be taken either in Module C1 or in Module AM1.

Our understanding of what minds are is in a moment of deep uncertainty and potential conceptual redrafting. Generative AI (GenAI) is the latest in a series of technical innovations that has challenged our understanding of the nature of mind and cognition (Clowes, Gärtner, and Hipólito 2021) . This course will look at how our scientific and folk-psychological understanding of mind is being reshaped through our creation and interaction with GenAI. We will discuss the mind through a number of interlocking prisms including creativity, memory, self, agency, authorship, social cognition, self-governance, folk-psychology and consciousness. We will compare competing paradigms such as functionalism, the intentional systems approach, illusionism, active inference and (4E) embodied and embedded views of mind and ask what effect the study of GenAI systems or their successors is likely to have on these frameworks.

This course seeks to study the philosophy of mind alongside and in an interlocking way with the philosophical study of GenAI systems. It will mainly be taught through reading current research papers and discussing them in seminars, but it will also employ some direct interaction with the Digital Andy System (DAS). The DAS is a Large Language Model derived from the work of philosopher Andy Clark and partly designed by the lecturer of this course (detailed in Smart, Clowes, and Clark 2025) . It will be available for direct interaction and informed philosophical study and guided reflection as part of the course. In addition, draft chapters will be discussed from Robert Clowes' forthcoming book *Brave New Minds: GenAI as Cognitive Ecology*.

Background Reading:

Buckner, C. J. (2023). *From deep learning to rational machines: What the history of philosophy can teach us about the future of artificial intelligence*: Oxford University Press. https://academic.oup.com/book/55239

Clark, A. (2025). Extending Minds with Generative AI. *Nature Communications, 16*(1), 4627. doi:10.1038/s41467-025-59906-9 https://www.nature.com/articles/s41467-025-59906-9

Frankish, K. (2024). What are Large Language Models Doing? *Anna's AI Anthology: How to live with smart machines*, 53.

Schechtman, M. (2025). Talking to Myself: Technology and Self-Knowledge. *Social Epistemology, Special Issue on the Mind-Technology Problem*. https://philpapers.org/rec/SCHTTM-8

References:

Clowes, Robert W, Klaus Gärtner, and Inês Hipólito. 2021. "The Mind Technology Problem and the Deep History of Mind Design." In *The Mind-Technology Problem*, 1-45. Springer.

Smart, Paul, Robert W Clowes, and Andy Clark. 2025. "ChatGPT, Extended: Large Language Models and the Extended Mind." *Synthese* Special Issue on the Extended Mind.

AM2

AM2. Advanced Analysis of Language & Logic

SEMINAR

LOGICS OF RELEVANCE (030111)

DR. ANDREW TEDDER

TERM:	Winter 2025/26
MEETING TIME:	Friday, 14 – 16 (First Meeting: 17.10.2025)
ROOM:	GABF 04/358
CP:	3

This course can be either used for Module C4 or for Module AM2.

In this seminar students will be introduced to relevant logics, which are logics according to which a necessary condition on argument validity is that the premises be relevant to the conclusion. The course will be concerned with philosophical foundations and foundational formal results concerning such logics including (a) proof theoretic presentations by axiomatic and sequent-style calculi, (b) model theoretic presentations by algebraic and frame semantics, and (c) applications of relevant logics to formal theories. Our primary text will be the manuscript by Standefer, to be shared in draft form (with the permission of the author).

CP can be earned by completing assignments, and possibly an end-of-term essay, to be determined by interested students in discussion with the instructor.

Literature:

Some books for reference:
Alan R. Anderson and Nuel D. Belnap. *Entailment: The Logic of Relevance and Necessity.* Volume 1. Princeton University Press (1975).
Alan R. Anderson, Nuel D. Belnap, and J. Michael Dunn. *Entailment: The Logic of Relevance and Necessity.* Volume 2. Princeton University Press (1992).
Shay Allen Logan. *Relevance Logic.* Cambridge University Press (2024).
Richard Routley, Robert K. Meyer, Val Plumwood, and Ross T. Brady. *Relevant Logics and Their Rivals.* Volume 1. Ridgeview Press (1982).
Shawn Standefer. *Relevant Logics: Implication, Modality, Quantification.* (Manuscript).

AM2

AM2. Advanced Analysis of Language & Logic

SEMINAR

WHAT'S ALL THE CRAZE ABOUT BAYES? AN INTRODUCTION TO BAYESIAN EPISTEMOLOGY (030115)

PROF. DR. CHRISTIAN STRAßER

TERM:	Winter 2025/26
MEETING TIME:	Friday 12- 14 (First Meeting: 17.10.2025)
ROOM:	GABF 05/703
CP:	3 or 6

This course can be used either in module C3 or in module AM2.

In recent years, Bayesianism has emerged as a powerful and widely influential framework for understanding belief and reasoning. Its principles are now applied across a diverse array of fields, from philosophy to artificial intelligence and cognitive science. But what exactly is Bayesian epistemology?

This seminar provides an introduction to the core tenets of Bayesian Epistemology, guided by Michael Titelbaum's "Fundamentals of Bayesian Epistemology." The course is designed for mid to late-stage Bachelor's and Master's students with an interest in epistemology, philosophy of science, or formal methods in philosophy.

We will begin by exploring the central concept of 'credence' – the idea that our confidence in a proposition can be represented numerically.From there, we will delve into the mathematical heart of Bayesianism: the probability axioms. We will unpack how these axioms provide a normative framework for rational belief. A key focus of the seminar will be on the dynamics of belief change. We will investigate how a rational agent should update their beliefs in light of new evidence, a process governed by the elegant and powerful rule of Conditionalization. We will also examine the role of 'priors' – our initial degrees of belief – and the ongoing philosophical debates surrounding their justification.

Throughout the course, we will engage with puzzles and paradoxes that have challenged and refined Bayesian thought, such as the infamous Monty Hall problem and the Simpson's paradox. By the end of the seminar, you will have a firm grasp of the key concepts of Bayesian epistemology, be able to apply these concepts to problems, and be ready to engage with more advanced topics in the field. Sign up to find out what all the craze about Bayes is really about!

AM3

AM3. Behaviour Studies & Data Analysis

SEMINAR

MOTIVATIONAL PROCESSES AS TARGETS FOR BIOLOGICAL PSYCHIATRY (112915)

PATRICK REINHARDT, M.SC

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 10 – 12 (First meeting: 22.10.2025)
ROOM:	IA 1/157
CP:	3

The aim of the course is to give participants an overview of different methods and research questions within the area of biological psychiatry. A special focus will be put on studies investigating motivational processes. As a first step neurobiological processes underlying motivation will be discussed. Afterwards students will present studies on changes in motivation, seen in psychiatric and neurological disorders. The course will mainly consist of presentations and discussions of human- and animal studies.

Contact: Patrick.reinhardt@rub.de

Requirements: basic knowledge of clinical Psychology is mandatory for participation

Literature: Literature will be announced at the beginning of the course.

Students can receive 3 CP graded in this course.

AM3

AM3. Behaviour Studies & Data Analysis

LECTURE & EXERCISE

INTRODUCTION TO DATA SCIENCE (212039)

PROF. DR. ROBERT SCHMIDT, PROF. DR. BILAL ZAFAR

TERM:	Winter 2025/26
LECTURE:	Monday, 08 – 12(First Meeting: 13.10.2025)
ROOM:	MC 1/30 + 31
TUTORIAL:	biweekly, Wednesday, 08 – 10 (First Meeting: 29.10.2025)
ROOM:	GABF 05/703
CP:	6

Content:

Data science is a rapidly developing field with numerous application areas. In this course you will learn basic tools of data science. You will also become familiar with advanced methods involving deep learning and their practical applications. In the first part of the course you will get an introduction to fundamental statistical methods underpinning data science. You will also learn techniques for analyzing and visualizing datasets of different modalities like text, images and tabular. You will dive deep into data-driven prediction methods from machine learning and deep learning. In the final parts of the course we will introduce you to advanced topics, including recent progress in large language modelling and use of data-driven decision making in a trustworthy manner.

Learning Outcomes:

At the end of this course, you would be familiar with:

1. Key contemporary methods for data-driven prediction
2. Methods for processing, exploring and visualizing data of different modalities like image, text and tabular
3. Building proof-of-concept code bases for solving real-world data science problems
4. Issues around trust and potential remedies in applications of data science

Learning Methods:

Each session of the course consists of a lecture part, introducing the theoretical concepts, and a practical part, providing you with hands-on experience using Jupyter Notebooks.

Exam: Combinated exam: written exam 70% + assignments 30% (both parts need to be passed)

Requirements: Basic knowledge of calculus, linear algebra and programming in Python

Students are expected to acquire specific basic knowledge in Python on their own. These will not be taught in the course.

AM4

AM4. Computational Modeling

LECTURE & EXERCISE

INTRODUCTION TO NEURAL DATA SCIENCE (212014)

PROF. DR. ROBERT SCHMIDT

TERM:	Winter 2025/26
LECTURE:	Tuesday, 10.15 – 11.45 (First Meeting: 14.10.2025)
ROOM:	IC 03/447
EXERCISE:	Tuesday, 12.30 – 14.00 (First Meeting: 14.10.2025)
ROOM:	*IC 03/406
CP:	6

This course can be used either in module AM4 or in module I3.

Rapid technological advances have recently opened up new possibilities in understanding how the brain works. In particular the number of neurons that can be simultaneously recorded has increased considerably to hundreds (and soon thousands!) of neurons. However, this has led to a big challenge on how to actually process and analyze the resulting big data sets. Solutions for these challenges are part of the new exciting research field of 'Neural Data Science'.

In this module you will learn how methods and approaches from data science and machine learning can be applied to study brain signals and the related cognitive functions. In the first part of the module we will focus on so-called spike trains, how they can be analyzed, visualized, and decoded. In the second part of the module we will look at continuous signals, in particular at neural oscillations. Finally, we will learn about and apply some advanced methods from machine learning, such as dimensionality reduction approaches, reinforcement learning, clustering, and computational statistics. In the lectures I will provide the relevant neurobiological background and explain the computational approaches, which will then be applied in the computer exercises using real neural data sets.

Requirements: Basic knowledge of calculus and linear algebra, programming in Python

Literature:

Nylen, E. L., & Wallisch, P. (2017). Neural Data Science: A Primer with MATLAB® and PythonTM. Academic Press.

AM4

AM4. Computational Modeling

SEMINAR

PROGRAMMING IN MATLAB (118516)

PROF. DR. JONAS ROSE, DR. ROLAND PUSCH, SARA SANTOS SILVA, M.SC.

TERM:	Winter 2025/26
MEETING TIME:	Monday, 10 - 14 (First Meeting: 20.10.2025)
ROOM:	IC 03/452/406
	(CIP-POOL 3 of the Faculty of Mechanical Engineering)
CP:	6

The aim of this seminar is to learn programming in Matlab. The course is suitable for students without prior programming experience. It consists of several components: During a lecture you will learn and practice new concepts, in the exercises you will present and discuss demanding assignments that are to be prepared weekly at home. In an additional seminar block you will prepare the theoretical background of a small experiment that you will also program in Matlab, run, analyze and document with a protocol. For questions regarding the programming part of the seminar contact: jonas.rose@rub.de. For the theoretical part of the seminar contact: roland.pusch@rub.de

AM4

AM4. Computational Modeling

SEMINAR

AGENT-BASED SIMULATIONS IN PHILOSOPHY: PRACTICAL PART (030076)

MATTEO MICHELINI

TERM:	Winter 2025/26
MEETING TIME:	Friday, 16 – 18
ROOM:	Wasserstr. 221
CP:	3 or 6

Th is course can be used either for module C2 or for module AM4.

Can groups of biased scientists outperform groups of unbiased ones? Can citizens with only a slight preference for having like-minded neighbors give rise to a highly segregated city? Can rational epistemic agents polarize over the truth of a sentence?
The effect of individual actions on the collective outcome has always fascinated philosophers of many disciplines. In the last decade, to answer these and many more questions, philosophers have extensively used agent-based models. Agent-based models are computational programs that allow to explore the behaviour of a group of agents, starting from the rules guiding the actions of the individuals. As such, it is the ideal tool to explore the collective outcome of individual practices.
This course is meant to teach participants how to build an agent-based model from scratch. No pre-existing knowledge about programming is required: philosophy students with no computational background, you are welcome! At the same time, the course is also ideal for people already experienced with programming who want to learn about how to use agent-based models.

We recommend taking this course in combination with the course "**Agent-based simulations in philosophy: theoretical part",** although you can also take each of them separately (that would make sense if you followed the theoretical part last year). Each course can provide up to six credits.

The course is composed of four parts.
1. In October, I will teach you some fundamental basics required for programming. You will learn what program to use, how to install it, and which procedures are useful when building an agent-based model.
2. In November, we will go through some of the most famous examples of agent-based models in philosophy. I will teach you how to program them, and how to collect data from them.
3. Finally, December and January are dedicated to you building your own model. We will discuss together how to formulate nice ideas on which model to build, and I will help you step-by-step in building your own model.
4. The final three lectures will be dedicated to you presenting your work.

AM4

AM4. Computational Modeling

PRACTICAL COURSE

PYTHON-PRAKTIKUM (INFORMATIK 1) (212400)

PROF. DR. TOBIAS GLASMACHERS,
PROF. DR.-ING. KATHARINA KOHLS

TERM:	Winter 2025/26
BLOCK:	Mo- Fr, 02.03.2026 – 13.03.2026
	09.00 – 16.00
ROOM:	HID (exclusion: Wednesday 4.3.26 room HIB)
CP:	3

Language of instruction: German

Lernziele:
Nach dem Abschluss des Praktikums

- können die Studierende kleine Programme in der Programmiersprache Python entwerfen,
- implementieren und debuggen.
- Die Studierenden haben erste Erfahrung mit der Arbeit mit komplexen Programmbibliotheken für
- spezielle Aufgabenbereiche gesammelt. Sie können mit Dokumentation arbeiten und APIs
- selbstständig recherchieren.
- Die Studierenden können ihre Programme erklären und Rückfragen präzise beantworten.

Aufbau des Kurses:
In der ersten Woche sammeln die Studierenden intensive Erfahrung im Umgang mit der Programmiersprache Python. In der zweiten Woche vertiefen sie ihre Fertigkeiten durch die Bearbeitung angewandter Fragestellungen, die mit Hilfe von Programmbibliotheken adressiert werden.

Prüfung:
Der Kurs ist bestanden, wenn die Aufgaben gelöst wurden und die eigenständige Leistung in einem kurzen Prüfungsgespräch nachgewiesen wurde. Es besteht Anwesenheitspflicht.

Voraussetzungen:
Grundlegende Kenntnisse im Programmieren (Python) sind vorausgesetzt.

Anmeldung:
Bitte senden Sie eine E-Mail an tobias.glasmachers@ini.rub.de mit Ihrer Matrikelnummer und Angabe des Masterprogramms.

AM4

AM4. Computational Modeling

BLOCK SEMINAR

INTERDISCIPLINARY WORKSHOP 2026 "MATCH OF THE NEUROIMAGING GIANTS: FMRI VS. EEG FEATURES FOR NEUROIMAGING ANALYSIS AND DECODING BRAIN STATES" (200059)

PROF. DR. XENIA KOBELEVA, DR. NIKOLAI SYROV

TERM:	Winter 2025/26
BLOCK:	26.2. afternoon online, 5.3 afternoon online,
	6.3 10:30 - 14:30 onsite, 13.3 12:30-16:30 onsite
ROOM:	online/ Building MB (South entrance), Floor 6, Seminar Room
CP:	3

Why attend?

This interdisciplinary workshop on advanced neuroimaging analyses will bring the EEG or fMRI analysis skills of students to the next level, provides expertise on using EEG and fMRI for prediction, and focuses on interdisciplinary team work.

Through collaborative group work, students will develop skills to process brain signals and extract meaningful components indicative of different mental states. A distinctive feature of this course is a friendly competitive element when two teams work with prerecorded data simultaneously recorded with two neuroimaging techniques methods (EEG-fMRI) capturing the same mental processes. The competition will be to find the most suitable neuroimaging metric for simple machine learning tasks (i.e., one team will use fMRI, while the other team will use EEG features for classification). This structure provides in-depth understanding of the advantages and limitations of the most popular neuroimaging techniques within an interactive atmosphere that encourages critical discussion and debate.

Projects developed during the workshop can be further developed, potentially leading to master's theses. This workshop thus offers not only immediate learning opportunities but also pathways for continued academic development in the rapidly evolving field of neuroscience.

Course syllabus:

1) Theory: Recap of fMRI and EEG and preprocessing

2) Practical: fMRI and EEG datasets. Data Structure, Reading, Understanding, and Processing

3) Theory on network analysis and feature extraction in EEG and fMRI

4) Practical: Feature extraction and Decoding of brain states

Notably, we will employ blended learning elements, expecting some individual learning with prepared materials before 26.2 and between 27.2 and 13.3 (of about 4-6 hours/week).

[INTERDISCIPLINARY WORKSHOP 2026 “MATCH OF THE NEUROIMAGING GIANTS: FMRI VS. EEG FEATURES FOR NEUROIMAGING ANALYSIS AND DECODING BRAIN STATES” (200059)]

Prerequisites:

The course welcomes students from different academic tracks and encourages interdisciplinary teamwork. Brain data processing requires interdisciplinary skills. Since the project involves combining expertise from both the neuroscientific and computational domains, but it is not common to be expert in both. This course will help you to attain skills in the missing domain. So we expect enrolled students to have

- **Practical skills** in **EITHER** neuroimaging analyis (EEG or fMRI) **OR** in programming (preferably Python),
- Basic **understanding** of neuroimaging data such as EEG or MRI (as demonstrated by previous courses or projects),
- **Knowledge** of machine learning is a plus, but not a requirement

If you don’t possess all prerequisites, please state your expertise in an email and we will advise you. Nonetheless, to ensure smooth completion of group work, we will limit the number of participants with no programming knowledge or no neuroscientific knowledge to one per group and participants with knowledge in both will be preferred.

Registration Information:

This is a course with limited spaces with strict selection of participants. We appreciate a **registration until 01.11.2025**, later registrations will be considered but at a lower priority and only if places are left. For registration (and inquiries), please send us an email with

- Your full name,
- Current field of study + semester (and previous degrees),
- Between 3 and 5 sentences about why you want to attend and why you should be accepted to the course (what can you bring to the group work) and
- One sentence on your previous knowledge in neuroscience and programming.
- A confirmation that you will attend all sessions and participate in the group work.

Please send all the information and inquiries to: computationalneurology@ruhr-uni-bochum.de

AM5

AM5. Special Methods in Neuroscience/Genetics

BLOCK SEMINAR

IMAGING GENETICS: POLYGENIC SCORES (118515)

JAVIER SCHNEIDER PEÑATE, M.SC.

TERM:	Winter 2025/26
MEETING TIME:	Preparatory Meeting: 27.10.2025, 09.00-11.00 room tba
	24.01. – 25.01.2026, 9.00 – 18.00
ROOM:	GABF 04/252
CP:	3

Aim of the seminar is to give the participants an insight into the analysis of genome wide data in humans. The block seminar consists of two parts:

1) Presentations about a selection of studies investigating “GWAS” and “polygenic scores”.
2) Training in preprocessing and analysis of genotyped data sets using specialized bioinformatic software (“PLINK”, PRSice 2”) in order to calculate polygenic scores is. Afterwards, all newly acquired skills and knowledge will be put into practice by delving analytically into a research question that tests the link between polygenic scores and MRI-based morphometric- and/or connectivity measures of the brain.

This course is solely offered in English. All the necessary material will be provided.

Literature: Literature will be announced at the preparatory meeting.

AM5

AM5. Special Methods in Neuroscience/Genetics

SEMINAR

TRANSLATIONAL METHODS IN COGNITIVE NEUROSCIENCE (110009)

DR. HARLEEN CHHABRA [PROF. DR. JONAS ROSE]

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 12 – 14 (First Meeting: 23.10.2025)
ROOM:	IA 1/161
CP:	3

The course will focus on the advanced neuroimaging techniques like MRI, EEG, MEG and more. The course will also give the students insight into the non-invasive brain stimulation techniques like TMS, tDCS and will compare them to the widely used ECT and deep brain stimulation techniques. The discussions during the course will be a combination of theory and relevant publications. After the course the students will have the knowledge to design a well-inform multimodal research study.

Lecturer: Dr. Harleen Chhabra

AM5

AM5. Special Methods in Neuroscience/Genetics

SEMINAR

IMAGING TECHNIQUES IN NEUROPSYCHOLOGY (118513)

DR. ANTOINE BOUYEURE, DR. CARLOS A. GOMES

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 12 – 14 (First Meeting: 22.10.2025)
ROOM:	IC room E03/452/406 (CIP-POOL 3 of the Faculty of Mechanical Engineering)
CP:	3

In this seminar, the imaging methods relevant for neuropsychologist will be introduced. The theoretical basics as well as the methods of experimental design and evaluation will be presented. The knowledge of methods and application will be deepened on the basis of selected papers. The following imaging procedures, their application and evaluation are presented: Positron Emission Tomography (PET), Single Photon Emission Computer Tomography (SPECT), Magnetic Resonance Imaging/Functional Magnetic Resonance Imaging (fMRI), Magnetic Encephalography (MEG), Transcranial Magnetic Stimulation (TMS), Statistical Parametric Maps (SPM). It is planned to carry out an exemplary evaluation of an experiment during the seminar.

Literature: Literature will be announced at the beginning of the seminar

AM5

AM5. Special Methods in Neuroscience/Genetics

SEMINAR

PREDICTIVE PROCESSING (114816)

PROF. DR. HELEN BLANK

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 10 – 12 (First Meeting: 22.10.2025)
ROOM:	IA 02/452
CP:	3

Seminar Overview

This seminar explores the framework of predictive processing in neuroscience—an influential framework for understanding perception, cognition, and action. Students will critically engage with its claims, examine current neuroimaging and computational methods, and evaluate the falsifiability of predictive coding models, including how advanced tools like layer-specific fMRI can help adjudicate between competing interpretations.

Format and Process

In the initial sessions, we will collaboratively establish key concepts in the framework of predictive processing and define the seminar topics for the semester. Students will then work in small groups to explore one of these topics in depth. This includes researching, evaluating, and preparing the material for a well-structured presentation.

Literature: Will be provided in the first session, and can be extended throughout the seminar

Students can earn 3 CP ungraded in this seminar.

Remarks for AM7

Students who already have basic knowledge in cognitive neuroscience can choose to learn the "fMRI"-technique in the first semester. Necessary background: basic knowledge in cognitive neuroscience. The fMRI-seminar must be integrated into the course program during the first or the third semester; in case you want to learn the fMRI –technique in the first semester, an individual application for the course is necessary at Dr. Khazar Ahmadi (khazar.ahmadi@rub.de).

AM7

fMRI Training

SEMINAR & PRACTICAL COURSE

APPLIED NEUROPSYCHOLOGICAL METHODS: MRI (118511& 118512)

DR. KHAZAR AHMADI, ALICJA WICHER, M.SC.

TERM:	Winter 2025/26
MEETING TIME:	Monday, 14 – 18 (First Meeting: 20.10.2025)
ROOM:	IA 0/69 PC-Pool 2
CP:	6

Practical course and seminar have to be attended both together. They cannot be taken individually.

Please also see remarks for AM7 above.

This practical course has to be combined together with the seminar. You have to participate in both courses to get credit points. The aim of the seminar is to learn how fMRI experiments are designed, how to measure using fMRI and how to analyze and present the resulting data. Based on literature, a new fMRI experiment will be designed together during the course of the seminar and data will be acquired by the participants during MRI scanning sessions. Afterwards data will be analyzed, and participants have to give a short presentation of the results. Grading requires participation on a regular basis in at least two thirds of all dates as well as participating in scanning sessions (as an experimenter). After the subscription in eCampus where everyone is placed on the waiting list, participants will be selected during the first meeting.

Requirements: Basic knowledge in programming with Matlab.

Literature: will be announced at the beginning of the seminar.

D1. Free Selection

There is one free selection module in the program which can take any course of the program you passed and do not need to complete the modules. If there is a problem to complete a module, in principle, the courses in the free selection module can be used for obligatory modules. But this has to be explicitly confirmed in advance by the program coordinator or Prof. Dr. Jonas Rose. Students are only allowed to take up to 15 credit points in courses with German as language of instruction in the whole program.

D1 Free Selection

LECTURE
STRESS (117031)
PROF. DR. OLIVER T. WOLF

TERM:	Winter 2025/26
MEETING TIME:	Monday, 12 – 14 (First Meeting: 20.10.2025)
ROOM:	HZO 80
CP:	3

Language of instruction: German

Ursachen und Folgen von Stress werden aus einer psychologischen Perspektive beleuchtet. Es werden sowohl Aspekte der biopsychologischen Grundlagenforschung als auch Aspekte der anwendungsbezogenen Forschung (Gesundheitspsychologie, Klinische Psychologie, Wirtschaftspsychologie) berücksichtigt. Die Vorlesung gibt einen Überblick über aktuelle Forschungsthemen der Stressforschung. Folgende Fragen werden adressiert: Was ist Stress? Was ist ein Stressor? Welche psychischen und biologischen Veränderungen treten in Reaktion auf Stress auf? Wie kann man sich die große interindividuelle Varianz im Stresserleben erklären? Wann ist Stress adaptiv und unter welchen Umständen kann er negative Konsequenzen haben (maladaptiv sein)? Welche Auswirkungen hat Stress auf affektive und kognitive Prozesse? Wie wird unser Körper und unser Gehirn durch Stress beeinflusst? Neben psychologischen Ansätzen werden Theorien und Befunde aus den Forschungsfeldern der Psychoneuroendokrinologie und den affektiven und kognitiven Neurowissenschaften besprochen.

D1

Free Selection

LECTURE

LERNEN (112231)

PROF. DR. PHIL. DR. H.C. ONUR GÜNTÜRKÜN

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 16 – 18 (First Meeting: 23.10.2025)
ROOM:	HIA
CP:	3

Language of instruction: German

Die Vorlesung soll einen Überblick über die Lerngesetze, ihre Anwendungsmöglichkeiten in therapeutischen Verfahren und die hirnphysiologischen Grundlagen von Lern- und Gedächtnisprozessen bieten. Soweit möglich, sollen alle drei Aspekte immer zusammen besprochen werden; z.B. werden bei der klassischen Konditionierung zuerst die historischen Entwicklungslinien, dann die Details des eigentlichen Lernphänomens, dann die therapeutischen Anwendungen (z.B. systematische Desensibilisierung) und anschließend die synaptischen Mechanismen referiert.

Literatur: Als Vorbereitung ist folgendes Buch zu empfehlen:
The Principles of Learning and Behaviour, Michael Domjan,7. Auflage, 2015

D1

Free Selection

LECTURE

GRUNDLAGEN DER NEURO- UND SINNESPHYSIOLOGIE (112241)

PROF. DR. NIKOLAI AXMACHER

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 8 – 10 (First meeting: 22.10.2025)
ROOM:	HIA
CP:	3

Language of instruction: German

Ziel der Vorlesung ist es, ein Grundverständnis der Informationsverarbeitung im ZNS und der Sinnesorgane zu übermitteln. Neben den anatomischen Grundlagen im Aufbau von Nervenzellen werden auch das Verhalten, d.h. die Erregungsleitung und -übertragung, sowie die Verrechnungsprozesse an Synapsen näher betrachtet. Hierbei soll auch ein Schwerpunkt auf die synaptische Plastizität gelegt werden. Auch die in der Psychologie und Medizin eingesetzten diagnostischen Verfahren, wie z. B. das EEG, sollen erläutert werden.

D1

Free Selection

LECTURE

MOTIVATION UND VOLITION (112271)

PROF. DR. MARIE HENNECKE

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 12 – 14 (First meeting: 15.10.2025)
ROOM:	HIB
CP:	3

Language of instruction: German

Warum tun wir, was wir tun – und warum tun wir manches nicht, obwohl wir es eigentlich wollen? Die Vorlesung Motivations- und Volitionspsychologie widmet sich genau diesen zentralen Fragen menschlichen Handelns. Wir beleuchten grundlegende Konzepte der Motivation und werfen einen Blick auf ihre historischen Wurzeln – von Freuds Triebtheorie über Hulls behavioristische Herangehensweise bis hin zu modernen kognitiven Ansätzen. Darüber hinaus erkunden wir die Vielfalt menschlicher Motive – von Leistung und Macht bis zur Anschluss- und Intimitätsmotivation – und tauchen ein in aktuelle Theorien und Forschung zu Volition, Selbstregulation, Zielsetzung und Selbstkontrolle. Ziel der Vorlesung ist es, ein vertieftes Verständnis für die Mechanismen zu vermitteln, die unser Verhalten steuern, erhalten und verändern.

Literatur:

Schmidt-Atzert, L., Hennecke, M., Peper, M., & Stemmler, G. (in Druck). Emotions- und Motivationspsychologie. Kohlhammer.

D1

Free Selection

SEMINAR

STRESS UND KOGNITION (118032)

PROF. DR. CHRISTIAN MERZ

TERM:	Winter 2025/26
MEETING TIME:	Wednesday 12 – 14 (First Meeting: 22.10.2025)
ROOM:	IA 02/460
CP:	3

Language of instruction: German

Stress beeinflusst nicht nur unser Befinden, sondern auch die unterschiedlichsten kognitiven Prozesse. In dieser Veranstaltung werden eine Auswahl an kognitiven Prozessen besprochen, die sich unter dem Einfluss von Stress und Stresshormonen verändern, beispielsweise das deklarative Gedächtnis oder die Furchtkonditionierung. Hierbei werden humanexperimentelle Befunde in Form von Referaten dargestellt und diskutiert.

Literatur: Die Literatur für die Referate wird in der ersten Sitzung bekannt gegeben.

D1

Free Selection

LECTURE

PSYCHOPHARMAKOLOGIE (112931)

PROF. DR. DIRK SCHEELE

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 16 – 18 (First meeting: 16.10.2025)
ROOM:	HZO 30
CP:	3

Language of instruction: German

In der Vorlesung „Psychopharmakologie“ werden die Grundlagen der Pharmakologie für Psycholog*innen und Psychotherapeut*innen vermittelt. Dabei werden die Themen Pharmakodynamik, Pharmakokinetik, Psychopharmaka und Pharmakotherapie behandelt. In der Vorlesung wird es beispielsweise um folgende Fragen gehen: Welche Klassen von Psychopharmaka gibt es und wann werden welche Psychopharmaka eingesetzt? Wie werden neue Psychopharmaka entwickelt und welche Innovationen gibt es in der psychopharmakologischen Behandlung psychischer Erkrankungen? Die Vermittlung der Psychopharmakologie erfolgt dabei immer in Bezug zu den biologischen Grundlagen psychischer Störungen und Symptome.

D1

Free Selection

SEMINAR

NEUROTOXIKOLOGIE: VOM NEURON ZUM VERHALTEN (118411)

PD DR. CHRISTOPH VAN THRIEL

TERM:	Winter 2025/26
MEETING TIME:	Tuesday, 16 – 18 (First meeting: 21.10.2025)
ROOM:	IA 1/161
CP:	3

Language of instruction: German

Chemikalien in der Umwelt, Drogen, Arzneimittel aber auch Naturstoffe können das Nervensystem des Menschen nachhaltig beeinflussen oder schädigen. Mit diesen Effekten beschäftigt sich die Neurotoxikologie. Diese Themenfeld bietet sich an bio- und neuropsychologische Methoden anhand verschiedener Beispiele zu vertiefen. So lassen sich Mechanismen der Schädigung untersuchen und relevante Effekte im Menschen frühzeitig erkennen. Das Seminar gliedert sich in zwei Phasen:

1) Einführungsphase (insgesamt 6 SWS, 3 Termine zu Beginn der Veranstaltung)

Ich werde in das Thema/ die Toxikologie einführen, wesentliche Begriffe erläutern, die besondere Empfindlichkeit des Nervensystems darstellen und anschließend die wesentlichen Substanzklassen (organische Lösemittel und Alkohol, Pestizide, Drogen, Metalle und Arzneimittel) und einige Wirkmechanismen (z.B. die Hemmung der Acetylcholineesterase durch Pestizide) exemplarisch darstellen.

2) Vertiefungsphase (verbleidende Sitzungstermine)

Für sechs bis sieben Neurotoxine werden ausgewählte Studien durch die Studierenden präsentiert, wobei jeweils eine Studie biologischen Mechanismen untersucht hat, während die andere Studie toxische Effekte mittels neuropsychologischer Methoden untersucht hat.

Literatur:

van Thriel, C.: Verhaltenstoxikologie / C. van Thriel In: : Das Toxikologiebuch 311-327 – 2017

Studierende können 3 CP benotet erwerben.

SECOND YEAR PROGRAM

I. Interdisciplinary Research Module

If a student wants to use a course from C1 to C4 as a substitute for I1 to I4, this is possible if the substitute course is closely connected with the master thesis project.

I1 Cognitive Philosophy

COLLOQUIUM
PHILOSOPHY MEETS COGNITIVE SCIENCE: MEMORY AND LANGUAGE (030131)
PROF. DR. MARKUS WERNING

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 12 – 14 (First Meeting: 16.10.2025)
ROOM:	GA 04/187
CP:	3 or 6

In the research colloquium current topics at the interface between Philosophy and Cognitive Science will be discussed. The colloquium hosts talks by leading international experts and local researchers as well as presentations by doctoral and master students. Students will be given the (assisted) opportunity to present their projects, which will count for their credits.

This semester the sessions of the research colloquium will alternate in a bi-weekly rhythm between the topics “Memory” and “Language”. A detailed schedule will be published in due course at https://www.ruhr-uni-bochum.de/phil-lang/colloquium.html.

Talks will be held either online via Zoom or in person.

I1

Cognitive Philosophy

COLLOQUIUM

INTERDISCIPLINARY READING CLUB: RECENT DEBATES ON SITUATED COGNITION (030127)

PROF. DR. ALBERT NEWEN

TERM:	Winter 2025/26
MEETING TIME:	Tuesday, 14 – 16 (First Meeting: 14.10.2025)
ROOM:	GA 04/187
CP:	3 or 6

The colloquium is organized for PhD students and for advanced Master Students only (of several programs) who are already working on their Master thesis or at least have decided to work out the master thesis in the area of theoretical philosophy. Bachelor-students are welcome if they already have a decided on a project for the BA-thesis in the area of theoretical philosophy. We will offer regular presentations half from master- (or Bachelor) and PhD-students from Bochum and half from external guests. The presentations will all be in the general domain of theoretical philosophy and cognitive sciences, many of them discussing problems in philosophy of mind or in the area of 'Situated Cognition'. The presentations should ideally but not necessarily have some interdisciplinary dimension such that perspectives from philosophy, psychology, linguistics, and neurosciences can be systematically interconnected. The aim of the colloquium is to offer a platform for discussion of ongoing research in the RTG-group 'Situated Cognition' and further research projects on social understanding, the self, episodic memory, emotions, animal cognition, the perception-cognition divide and many more.

PhD-students who are interested in presentations should write an email to albert.newen@rub.de and come to the first meeting. The program of the semester will be fixed then. PhD students can receive credit points for an active participation if they are part of the new PhD-program. Master students can receive standard CPs (ungraded certificate) for a presentation in the colloquium (in the case of an additional essay, Master students can receive standard CV and a graded certificate). BA students are welcome if they are about to work out their Bachelor thesis or are searching a topic now.

I1

Cognitive Philosophy

COLLOQUIUM

TOPICS IN THE PHILOSOPHY OF LANGUAGE, LOGIC AND INFORMATION: IMAGINATION (030123)

JUN.PROF. DR. KRISTINA LIEFKE, PROF. DR. DOLF RAMI

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 16 – 18 (First Meeting: 15.10.2025)
ROOM:	GA 04/187
CP:	3 or 6

Representations play an important role in semantics and the philosophy of language. This research seminar gives an introduction to current work on representations, focusing on linguistic, pictorial, and mental representations as well as on the history of (philosophical work on) representations. Discussion will investigate what properties are shared by all representations (expectedly: reference and truth/ accuracy, among other), whether all representations are conceptual, and whether representations must have constituent parts.
The seminar will combine introductions to various aspects of representations (by Kristina Liefke and Dolf Rami) with talks by international experts. Students will have the opportunity to earn a 'kleine Studienleistung' [3 CPs] (by writing a summary of one of the expert talks, or by giving an in-class presentation) and a 'große Studienleistung' [6 CPs] (by additionally writing a research paper).

Requirements: basic familiarity with logic and the philosophy of language
Literature: Selected readings: All readings will be made available on Moodle.
Greenberg, G. (2011). The Semiotic Spectrum. Rutgers University.
Liefke, K. (2025). Mnemic scenarios as pictures. Asian Journal of Philosophy. https://doi.org/10.1007/s44204-025-00288-6

I1

Cognitive Philosophy

COLLOQUIUM

PHILOSOPHY OF INFORMATION AND COMMUNICATION (030133)

JUN.PROF. DR. KRISTINA LIEFKE

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 12 – 14 (First Meeting: tba)
ROOM:	tba
CP:	3 or 6

This colloquium (co-organized with Prof. Daniel Gutzmann, Germanistik) serves the discussion of current topics in semantics, pragmatics, and the philosophy of language. The colloquium combines talks by international experts with presentations of local researchers and (PhD/MA) students. Students will be given the opportunity to present their (ongoing) work in English.
Students can receive 3 CP for giving a presentation or 6 CP for giving a presentation and writing an essay or passing an oral exam).

A detailed schedule will be available by mid-September at https://www.ruhr-uni-bochum.de/phil-inf/colloquium/index.html.en.

I2

I2. Psychology

COLLOQUIUM

SCIENTIFIC COLLOQUIUM: COGNITIVE PSYCHOLOGY AND PSYCHONEUROENDOCRINOLOGY (118113) [FORSCHUNGSKOLLOQUIUM: KOGNITIONSPSYCHOLOGIE UND PSYCHONEUROENDOKRINOLOGIE]

PROF. DR. OLIVER T. WOLF

TERM:	Winter 2025/26
MEETING TIME:	Tuesday, 16 – 18 (First Meeting 14.10.2025)
ROOM:	IB 6 /127
CP:	3

In this forum, scientific projects (i.e. Master and PhD projects) of the Cognitive Psychology work group will be presented. The main focus is on experimental stress studies. Here we will try to answer the questions, “what makes us stressed” and “how does stress affects our cognitive skills”. In addition, invited guests from our faculty, from other faculties of the RUB and from other universities world wild will present their current research findings on topics that relate to cognitive psychology or psychoneuroendocrinology.

An overview of the schedule will be available on the AE homepage at the beginning of the semester.

Students in the 3rd semester who think about conducting their master thesis with our AE can participate.

I2

Psychology

COLLOQUIUM

RESEARCH COLLOQUIUM SOCIAL COGNITION (118918)

DR. MORITZ INGENDAHL

TERM:	Winter 2025/26
MEETING TIME:	Wednesday, 16 - 18 (First Meeting: 22.10.2025)
ROOM:	IA 1/157
CP:	3

The colloquium features presentations by external and sometimes internal researchers on topics of social cognition. Example topics are attitudes formation, social perception, stereotypes and prejudices, judgment and decision making, etc. In addition, master students can present their research projects, e.g., in the context of their final thesis.

Students can earn 3 CP ungraded in this class.

I3

I3. Computational Modeling

LECTURE & EXERCISE

INTRODUCTION TO NEURAL DATA SCIENCE (212014)

PROF. DR. ROBERT SCHMIDT

TERM:	Winter 2025/26
LECTURE:	Tuesday, 10.15 – 11.45 (First Meeting: 14.10.2025)
ROOM:	IC 03/447
EXERCISE:	Tuesday, 12.30 – 14.00 (First Meeting: 14.10.2025)
ROOM:	*IC 03/406
CP:	6

This course can be used either in module AM4 or in module I3.

Rapid technological advances have recently opened up new possibilities in understanding how the brain works. In particular the number of neurons that can be simultaneously recorded has increased considerably to hundreds (and soon thousands!) of neurons. However, this has led to a big challenge on how to actually process and analyze the resulting big data sets. Solutions for these challenges are part of the new exciting research field of 'Neural Data Science'.

In this module you will learn how methods and approaches from data science and machine learning can be applied to study brain signals and the related cognitive functions. In the first part of the module we will focus on so-called spike trains, how they can be analyzed, visualized, and decoded. In the second part of the module we will look at continuous signals, in particular at neural oscillations. Finally, we will learn about and apply some advanced methods from machine learning, such as dimensionality reduction approaches, reinforcement learning, clustering, and computational statistics. In the lectures I will provide the relevant neurobiological background and explain the computational approaches, which will then be applied in the computer exercises using real neural data sets.

Requirements: Basic knowledge of calculus and linear algebra, programming in Python

Literature:

Nylen, E. L., & Wallisch, P. (2017). Neural Data Science: A Primer with MATLAB® and PythonTM. Academic Press.

I3

Computational Modeling

SEMINAR

JOURNAL CLUB: LEARNING AND MEMORY (212103)

PROF. DR. SEN CHENG

TERM:	Winter 2025/26
MEETING TIME	tba
ROOM:	tba
CP:	3

This course can be used either in module C3 or in module I3.

We will discuss the latest research results in learning and memory at the systems level. Each session will be based on a journal article or unpublished results. These will be presented by one participants and discussed by all. The topics will include a diverse set of approaches: electrophysiology, imaging, computational modeling, and robotics. They will be selected particularly in the areas of spatial and episodic memory with a focus on the functional role of the mamalian hippocampus.

Contact: Prof. Dr. Sen Cheng, NB 3/33, sen.cheng@rub.de
Office hours: Thursdays 14:00-15:00 (Cheng)

Capacity: max. 15 students
Enrollment: ecampus

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Computational Modeling

LECTURE & EXERCISE

NUMERICAL OPTIMIZATION (212043)

PROF. DR. TOBIAS GLASMACHERS

TERM:	Winter 2025/26
MEETING TIME:	Thursday, 10.15 – 13.15 (First Meeting: 16.10.2025)
ROOM:	IC 04/414
CP:	6

This course offers a contemporary introduction to numerical optimization. Optimization algorithm find applications in many areas of engineering, economics, machine learning, and many more. This course covers the most prominent design principles and algorithm classes:

· gradient and Newton search directions

· line search and trust region methods

· conjugate gradients

· quasi Newton algorithms

· constraint handling, duality

· linear programming, including the mixed integer case

· direct search (gradient-free) methods

Methods are presented and analyzed in the lecture, and implemented and tested in the exercise sessions.

During the practical sessions, participants work on a mix of conceptual and practical exercises. Many practical exercises involve programming in Python.

Learning Outcomes:

The participants can explain important classes of optimization algorithms, like conjugate gradients (CG), BFGS, CMA-ES, and the simplex algorithm for linear programming. They understand properties of different types of search directions (sampling methods, gradient, conjugate gradient, Newton step and quasi Newton methods), as well step size control mechanisms (line search and trust region methods). They can relate these methods to convergence speed classes like linear and super-linear convergence. They understand Lagrangians and they can derive dual optimization problems. They can model real-world problems as mathematical optimization problems. They can pick suitable algorithms, apply them to actual optimization problems, and solve them efficiently.

[NUMERICAL OPTIMIZATION (212043)]

Recommended Prior Knowledge:
This course requires a solid grasp on various mathematical concepts for defining and analyzing optimization algorithms with mathematical tools, including a few proofs. Participants need a solid understanding of linear algebra (matrices, eigen decomposition, positive definiteness), analysis (sequences, convergence, convexity, gradient and Hessian matrix), and probability theory (multi-variate normal distribution). Prior knowledge of numerics is a plus, but not required. The exercise sessions as well as the exam require basic Python programming.

Exam:
Written electronic exam (90 minutes)
Exam registration for Cognitive Science students will be managed via ecampus.

Requirements: This course does not have formal requirements. The target audience includes Master students of all technical subjects, like computer science, mathematics, physics, and engineering.

Literature:

1. “Numerical Optimization”, Nocedal and Wright

2. “Introduction to derivative-free optimization”, Conn, Scheinberg and Vicente

3. “The CMA evolution strategy: A tutorial”, Hansen

14

Cognitive Neuroscience

COLLOQUIUM

RESEARCH COLLOQUIUM NEUROPSYCHOLOGY (118916)
[FORSCHUNGSKOLLOQUIUM NEUROPSYCHOLOGIE]

PROF. DR. NIKOLAI AXMACHER

TERM:	Winter 2025/26
MEETING TIME:	Thursday 14 – 16 (First meeting: 16.10.2025)
ROOM:	IB 6/127
CP:	3

The content of this course is to present current research work in the spheres of neuropsychology and talks by guest professors on clinical neuropsychological topics. The schedule with information on the topics and speakers will be posted on the information board and at http://www.ruhr-uni-bochum.de/neuropsy/ before the start of the WS. The central educational goal of this course – and as such the basis for a successful participation and awarding of credits – is regular active contribution to the scientific discourse. Therefore, regular attendance in the scope of at least 2/3 of the sessions is required.

I4

I4. Cognitive Neuroscience

COLLOQUIUM

BIOPSYCHOLOGY RESEARCH COLLOQUIUM (118914)

PROF. DR. PHIL. DR. H.C. ONUR GÜNTÜRKÜN

TERM:	Winter 2025/26
MEETING TIME:	Monday, 13 – 15 (First meeting: 13.10.2025)
ROOM:	IB 6/127
CP:	3

The research colloquium is open to all employees and graduate students of the Biopsychology department. The aim is to present and discuss their research. In addition, external guests are invited to give talks on different aspects of biopsychology.

You can have a look at the schedule at the department's information board and our homepage: http://www.bio.psy.ruhr-uni-bochum.de/.

I4

I4. Cognitive Neuroscience

COLLOQUIUM

COLLOQUIUM: NEURAL BASIS OF LEARNING (118919)

PROF. DR. JONAS ROSE,
DR. JESÚS JAVIER BALLESTEROS CARRASCO

TERM:	Winter 2025/26
MEETING TIME:	Friday, 12 – 14
ROOM:	GA 04/187
CP:	3

A broad range of current research topics in cognitive neuroscience will be covered by internal and external speakers. Our focus lies in a mechanistic understanding of crucial processes that in turn form the basis of higher cognition.

A schedule will be available on the homepage https://www.ngl.psy.ruhr-uni-bochum.de/ngl/

I4

I4. Cognitive Neuroscience

COLLOQUIUM

THEMEN DER KOGNITIVEN NEUROWISSENSCHAFT (118711)

PROF. DR. NIKOLAI AXMACHER ,PROF. DR. PHIL. DR. H.C. ONUR GÜNTÜRKÜN, PROF. DR. OLIVER T. WOLF

TERM:	Winter 2025/26
LECTURE:	Friday, 10 – 12 (First meeting: 24.10.2025)
ROOM:	IA 02/461
CP:	3

This course is specifically interesting for students who consider conducting their Master thesis in Biopsychology/Neuropsychology and Cognitive Psychology. Please enrol in the following Moodle course to find more information about requirements and possible Master thesis topics in Biopsychology/ Neuropsychology and Cognitive Psychology:

https://moodle.ruhr-uni-bochum.de/enrol/index.php?id=66343

In dieser Veranstaltung werden laufende Forschungsprojekte, die sich für eine M.Sc. Arbeit eignen, vorgestellt. Ein zentrales Lernziel dieser Veranstaltung - und damit auch Grundlage für die erfolgreiche Teilnahme und Leistungsbewertung - ist die regelmäßige aktive Beteiligung am wissenschaftlichen Diskurs. Daher ist eine regelmäßige Anwesenheit im Umfang von mindestens zwei Dritteln der Termine notwendig.

Voraussetzungen: Interesse an neurowissenschaftlicher Master-Arbeit
Literatur: wird in der Veranstaltung bekannt gegeben.

I4

I4. Cognitive Neuroscience

COLLOQUIUM

RESEARCH COLLOQUIUM PREDICTIVE COGNITION (118930)

PROF. DR. HELEN BLANK

TERM:	Winter 2025/26
LECTURE:	Friday, 10 – 12 (First meeting: 24.10.2025)
ROOM:	IB 6/127.
CP:	tba

The colloquium features presentations by external and sometimes internal researchers on topics of social cognition. Example topics are attitudes formation, social perception, stereotypes and prejudices, judgment and decision making, etc. In addition, master students can present their research projects, e.g., in the context of their final thesis.

I4

I4. Cognitive Neuroscience

COLLOQUIUM

RESEARCH COLLOQUIUM PREDICTIVE BRAIN (118922)

PROF. DR. LUCIA MELLONI

TERM:	Winter 2025/26
LECTURE:	Friday, 10 – 12 (First meeting: 24.10.2025)
ROOM:	hybrid format
CP:	tba

Synchronous digital teaching, and for those onsite the option to attend in person is also possible at the seminar room of the predictive brain department (MB Building)

This colloquium provides a structured academic forum for students, postdoctoral researchers, and early career investigators affiliated with the Predictive Brain Lab to present, discuss, and critically engage with ongoing scientific work in the field of cognitive neuroscience and psychology. The course is designed to support Bachelor, Master, PhD students, and researchers as they develop and refine their research projects, including thesis work and scientific publications. Participants will present their empirical or theoretical research for peer and faculty feedback, discuss foundational and cutting-edge scientific literature related to predictive processing, brain function, and cognition, develop scientific communication skills through structured presentations and critical dialogue, and engage in interdisciplinary discussions to integrate psychological theory with neuroscience, philosophy of mind, and computational modeling. The colloquium also features presentations by national and internationally renowned guest speakers, offering participants exposure to a broad range of perspectives and expertise. This course fosters a collaborative and intellectually rigorous environment that supports the development of high-quality scientific research. Attendance and active participation are required, and all participants are expected to contribute to the academic discourse, whether by presenting their own work or by constructively engaging with the work of others.