Course Guide – Master Cognitive Science

Winter 2024/25

Version as of 06.10.2024

Enrollment for Courses

Students are automatically registered for the preparatory 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. This mainly concerns lectures and seminars offered by the Institute of Neuroinformatics. Again, please attend the first session and talk to the instructor. 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

Every student is strongly recommended to participate in the preparatory courses. The course "Academic English" need not be passed by native speakers of English. The course "Biostatistics" need not be passed by students who have a standard BA in psychology. The course "Mathematics and Computerscience for Modeling" need not be passed by students with a BA in mathematics or computer science.

Preparatory Courses

Academic English

SEMINAR

ENGLISH FOR MASTER COGNITIVE SCIENCE (251209)

DR. SETH BERK

TERM:	Winter 2024/25
MEETING TIME:	Block: September 23 – October 4, 12.30 - 14.30
	(Exception 4.10.: 14-16)
ROOM:	IA 1/91 (In Person)

This course is directed towards students who have been admitted to the Master of Cognitive Science programme at the Ruhr-University Bochum and who can benefit most from an improvement of their language skills based on their results in the language assessment test. It offers a fast-paced introduction to Academic English in the field of Cognitive Science.

Biostatistics

SEMINAR
BIOSTATISTICS (119212)
MARTIN BORDEWIECK, M.SC.

TERM:	Winter 2024/25
MEETING TIME:	Block: September 23 – October 4, 08:30 – 11:30
ROOM:	IA 0/158-79 (PC-Pool 1) (In Person)

“Biostatistics” will cover the basic statistical methods used by researchers in the life sciences to collect, summarize, analyse, and draw conclusions from data. The topics include descriptive statistics, univariate statistical tests, and experimental design.

Informatics and Mathematics

SEMINAR
MATHEMATICS AND COMPUTER SCIENCE FOR MODELING (119219)
STEPHAN SEHRING, M.SC.

TERM:	Winter 2024/25
MEETING TIME:	Block: September 23 – October 4, 15.00 - 17.30
	Exception: October 4th: 12:00-13:00
ROOM:	IA 0/158-79 (PC-Pool 1) (In Person)

The "Informatics and Mathematics" preparatory course will combine a hands-on introduction to programming in python with a revision of elementary mathematical concepts. The topics include data types, data structures, control structures and data visualisation on the programming side and they will be applied to vector/matrix calculation, integration/differentiation of functions and differential equations.

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. LAURENZ WISKOTT, PROF. SEN CHENG

TERM:	Winter 2024/25
LECTURE:	Tuesday, 12 – 14 (First Meeting: 15.10.2024)
ROOM:	IA 1/157 and HGA 20 (see schedule Moodle course)
EXERCISE:	Wednesday, 14 – 16 (First Meeting: 16.10.2024)
ROOM:	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 IA 1/157 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. Unsupervised Learning
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.

BM1

BM1. Experimental Psychology Lab

SEMINAR

EXPERIMENTAL PSYCHOLOGICAL LAB (119213)

LAURA STEVENS

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 14.30 – 16.00 (First meeting: 15.10.2024)
ROOM:	GB 1/144
CP:	6

The goal of the "experimental psychology lab" is the supervised implementation of an independent experimental study, including the research question, operationalization, data collection and statistical evaluation. The content of the study is to investigate possible mechanisms for an increased susceptibility to stress in socially isolated or lonely people. For example, a possible negative bias in emotion recognition can be tested experimentally. The results of this study will be presented in a written report.

BM2

BM2. Logic

LECTURE + EXERCISE

LOGIC AND PHILOSOPHICAL METHODOLOGY (110012)

PROF. DR. CHRISTIAN STRASSER

TERM:	Winter 2024/25
LECTURE:	Monday, 10 – 12 (First meeting: 14.10.2024)
EXERCISE:	Monday, 12 – 14 (First meeting: 14.10.2024)
ROOM:	GAFO 02/364
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

General Remark Concerning BM3 – Neural Networks

A basic course in neural networks is obligatory. Students have to pass only one course in BM3.
If you notice that are not equipped with the necessary mathematical groundwork for the courses offered in the winter semester, make sure to attend the Matlab seminar, only offered in summer semesters.

BM3

BM3. Neural Networks

LECTURE & EXERCISE

COMPUTATIONAL NEUROSCIENCE – NEURAL DYNAMICS (212005)

PROF. DR. RER. NAT. GREGOR SCHÖNER

TERM:	Winter 2024/25
LECTURE:	Thursday, 14.15 – 16.00 (First meeting: 10.10.2024)
ROOM:	NB 3/57
EXERCISE:	Thursday, 16.15 – 17.00 (First meeting: 10.10.2024)
ROOM:	NB 3/57
CP:	6

This is the standard course for the BM3 Module. But it requires quite some math preparation, typically as covered in two semesters of higher mathematics (functions, differentiation, integration, differential equations, linear algebra). The course does not make extensive use of the underlying mathematical techniques but uses the mathematical concepts to express scientific ideas. Students without prior training in the relevant mathematics may be able to follow the course but will have to work harder to familiarize themselves with the concepts.

This course lays the foundations for a neurally grounded understanding of the fundamental processes in perception, in cognition, and in motor control, that enable intelligent action in the world. The theoretical perspective is aligned with ideas from embodied and situated cognition but embraces concepts of neural representation and aims to reach higher cognition. Neural grounding is provided at the level of populations of neurons in the brain that form strongly recurrent neural networks and are ultimately linked to the sensory and motor surfaces.

The theoretical concepts on which the course is based come from dynamical systems theory. These concepts are used to characterize neural processes in strongly recurrent neural networks as neural dynamic systems, in which stable activation states emerge from the connectivity patterns within neural populations. These connectivity patterns imply that neural populations represent low-dimensional features spaces. This leads to neural dynamic fields of activation as the building blocks of neural cognitive architectures. Dynamic instabilities induce change of attractor states from which cognitive functions such as detection, change, or selection decisions, working memory, and sequences of processing stages emerge. The course partially follows a textbook (Dynamic Thinking—A primer on Dynamic Field Theory, Schöner, Spencer, and the DFT research group. Oxford University Press, 2016), of which chapters will serve as reading material. Exercises will focus on hands-on simulation experiments, but also involve readings and the writing of short essays on interdisciplinary research topics. See www.dynamicfieldtheory.org for some of that material. Tutorials on mathematical concepts are provided, so that training in calculus and differential equations is useful, but not a prerequisite for the course.

The final exam is an oral module exam, bonus points for the final exam can be obtained homework and an essay (10 pages). by submitting

Please find more information at https://www.ini.rub.de/teaching/courses/

BM4

BM4. Functional Neuroanatomy

LECTURE

CLINICAL NEUROPSYCHOLOGY (112621)

PROF. DR. BORIS SUCHAN

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 10 – 12 (First meeting 15.10.2024)
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:

"Aesthetic Cognitivism: How the Arts Enhance our Understanding of the World" (030111) by Dr. Alfredo Vernazzani: It can be evaluated as C2 or AM1 course.

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

C1

Social Cognition & Meta-Science

SEMINAR

THE EVOLUTION OF MORALITY (030097)

DR. TOBIAS STARZAK

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 10 – 12 (First Meeting: 10.10.2024)
ROOM:	GA 3/143
CP:	tba

Moral thinking pervades our practical lives, but where does it come from? Is there an innate basis to human morality or is it a cultural phenomenon? Can we give a plausible evolutionary account of our sense of morality? What purpose does this sense of morality serve? What does that mean for the normative status of our moral judgments? Can an evolutionary perspective help to answer to moral skepticism? Or does an adaptive explanation of morality in terms of genetic success ("if it is just something that helped our ancestors make more babies", as Joyce writes) rather undermine morality´s central role in our life? In this seminar we´ll discuss these question on the basis of Richard Joyce´s 2005 book *The evolution of morality*. The language of the seminar is English.

C1

Social Cognition & Meta-Science

BLOCK SEMINAR

FACT-CHECKING OF SCIENTIFIC CLAIMS: A PHILOSOPHY OF SCIENCE PERSPECTIVE (030059)

PROF. DR. DUNJA ŠEŠELJA

TERM:	Winter 2024/25
MEETING TIME:	Block: 09.11.24, 07.12.24, 25.01.25, 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 Saturdays. 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

SCIENCE IN A POLITICAL WORLD (030077)

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

TERM:	Winter 2024/25
MEETING TIME:	Friday, 12 – 14
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

SEMINAR

MIND, COGNITION, AND NEUROSCIENCE – A PHILOSOPHICAL INTRODUCTION (030090)

BARTOSZ RADOMSKI

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 12 – 14 (/14-16?) (first meeting: 09.10.2024)
ROOM:	GABF 04/709
CP:	3 or 6

The aim of this course is to provide a high-level interdisciplinary overview of theoretical issues in cognitive science, psychology, and neuroscience. The first part of the course consists of an introduction to a broad range of fields concerned with the study of cognition. We will become familiar with the neuroscientific underpinnings of cognitive science and explore a set of philosophical puzzles concerning the metaphysics and epistemology of studying our own and others' minds. The second part of the course focuses on introducing a selection of the most topical debates surrounding the brain and mind sciences. We will study the history of Western scientific thought, the current state of cognitive science, and its future outlook. To pass the course, students are expected to submit two critical questions each week concerning the assigned reading. To pass the course with a grade, students are additionally required to submit a 6,000-10,000 word (12-20 page) essay on a topic relevant to the course. The primary and optional secondary readings will be made available on Moodle.

Literature:

Young, B. D., & Dicey Jennings, C. (Eds.). (2022). Mind, Cognition, and Neuroscience: A Philosophical Introduction.Routledge.

C1

Social Cognition & Meta-Science

SEMINAR

EXPLAINABLE ARTIFICIAL INTELLIGENCE (030093)

DR. WANJA WIESE

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 14 – 16 (first meeting: 09.10.2024)
ROOM:	GABF 04/354
CP:	tba

This course deals with philosophical issues surrounding the transparency and accountability of artificial intelligence (AI) systems. Traditional AI is typically transparent; its algorithms are programmed to follow specific strategies, making their performance understandable to the programmers. In contrast, contemporary AI, often based on machine learning and large datasets, operates in a more opaque manner. The complexity of these systems means that while programmers understand how the algorithms work, they often cannot fully explain how an AI achieves successful outcomes or cannot predict the conditions under which it might fail. Put differently, there is – at least in many contexts – a trade-off between accuracy and interpretability.

Explainable AI (XAI) aims to alleviate this problem by providing insights into the functioning of current AI systems. This includes understanding successes and failures of AIs, which is crucial to assessing their reliability and trustworthiness. However, the concepts of explainable, interpretable, and trustworthy AI are themselves philosophically complex and ambiguous.

This seminar offers an overview of philosophical challenges related to XAI. It provides some insights into contemporary approaches to enhancing AI transparency, interpretability, and trustworthiness, fostering a critical understanding of these efforts. As a result, students will be able to critically discuss current approaches in AI development, as well as in AI ethics and governance.

Literature:

Beisbart, C., & Räz, T. (2022). Philosophy of science at sea: Clarifying the interpretability of machine learning. *Philosophy Compass*, *n/a*(n/a), e12830. https://doi.org/10.1111/phc3.12830

Erasmus, A., Brunet, T. D. P., & Fisher, E. (2021). What is Interpretability? *Philosophy & Technology*, *34*(4), 833–862. https://doi.org/10.1007/s13347-020-00435-2

Hatherley, J., Sparrow, R., & Howard, M. (2022). The Virtues of Interpretable Medical Artificial Intelligence. *Cambridge Quarterly of Healthcare Ethics*, 1–10. https://doi.org/10.1017/S0963180122000305

Rudin, C. (2019). Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead. *Nature Machine Intelligence*, *1*(5), 206–215. https://doi.org/10.1038/s42256-019-0048-x

Samek, W., Montavon, G., Lapuschkin, S., Anders, C. J., & Muller, K.-R. (2021). Explaining Deep Neural Networks and Beyond: A Review of Methods and Applications. *Proceedings of the IEEE*, *109*(3), 247–278. https://doi.org/10.1109/JPROC.2021.3060483

Zerilli, J., Knott, A., Maclaurin, J., & Gavaghan, C. (2019). Transparency in Algorithmic and Human Decision-Making: Is There a Double Standard? *Philosophy & Technology*, *32*(4), 661–683. https://doi.org/10.1007/s13347-018-0330-6

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 2024/25
MEETING TIME:	Monday, 10 – 12 (first meeting: 14.10.2024)
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

LECTURE

DIE ZUKUNFT HUMANER ARBEIT IN EINER DIGITALISIERTEN WELT (118925)

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

TERM:	Winter 2024/25
MEETING TIME:	Monday, 14-16 (First Meeting: 14.10.24)
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

-Prüfungsleistung: Ausarbeitung + Video zu Chancen und Risiken in Kleingruppen

-3 Creditpoints

-benotet

C2

C2. Perception & Action

LECTURE

LEFT BRAIN - RIGHT BRAIN (118111)

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

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 14 – 16 (First Meeting: 15.10.2024)
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

Perception & Action

SEMINAR

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

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

TERM:	Winter 2024/25
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.

This course will consist of three parts:
1. From October until December we will cover some of the most prominent modeling frameworks used in the philosophical literature and beyond. The readings will be aimed at preparing students for talks by experts on the topic, which constitute part 3.
2. At the end of January (part 3) we will have a workshop in which experts working in this field will come to RUB and present their work. During December students will choose a topic related to one of the talks in the workshop and start reading the relevant literature on it.
3. There will be no classes in January except for the workshop, which will take place from January 29-31, 2025 (we will start on January 29 in the afternoon). Students will have a task to follow the talks, and to subsequently submit a 2-pages protocol of one of the talks.

To get the ungraded 3 credit points for the course, students will have to:

- submit the protocol of one of the workshop talks
- prepare a question for the talk and ask the question either during the workshop, or submit it afterwards, together with the protocol.

To get 6 credit points and a grade for the course, students will have to submit the above mentioned assignments, and in addition, to submit a term paper.

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 during the course.

C2

Perception & Action

SEMINAR

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

MATTEO MICHELINI

TERM:	Winter 2024/25
MEETING TIME:	Friday, 16 – 18
ROOM:	Wasserstr. 221/4
CP:	3 or 6

This course can be used either in module C2 or in 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

THEORETICAL ISSUES IN THE STUDY OF CONSCIOUSNESS AND MIND (030063)

BARTOSZ RADOMSKI

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 14 – 16 (first meeting: 10.10.2024)
ROOM:	GABF 04/352
CP:	3 or 6

This course offers a philosophical introduction to conceptual problems related to the study of consciousness. It addresses questions such as: What is consciousness? Can it be systematically studied, and can facts about it be uncovered? How are other mental faculties such as attention, memory, perception, and emotion related to consciousness? We will explore these issues from a Western philosophical (analytical) perspective, while incorporating empirical (neuroscientific) evidence.

To pass the course, students are expected to submit two critical questions each week based on the assigned readings. To pass the course with a grade, students are additionally required to submit a 6,000–10,000 word (12–20 page) essay on a topic relevant to the course. The primary and optional secondary readings will be made available on Moodle.

Literature:

Young, B. D., & Dicey Jennings, C. (Eds.). (2022). Mind, cognition, and neuroscience: A philosophical introduction. Routledge.

C2

Perception & Action

SEMINAR, ESSAY WRITING COURSE

AESTHETIC COGNITIVISM: HOW THE ARTS ENHANCE OUR UNDERSTANDING OF THE WORLD (030111)

DR. ALFREDO VERNAZZANI

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 10 – 12
ROOM:	GAFO 04/619
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 Dr. Alfredo Vernazzani.

This course can be used either in module C2 or in module AM1.

Artworks like paintings, novels, poetry, dramas, comics, movies, etc. do not merely entertain us, they also enrich our understanding of the world: think of how the tale of the Great Inquisitor in Dostoevskij's Brothers Karamazov or the brothers Strugackij's novel Hard to be a God outline complex moral dilemmas; whereas other artworks, like Chantal Akerman's Jeanne Dielman or Sarah Kane's 4:48 Psychosis, offer a window into others' condition. Under the label "aesthetic cognitivism" we group all philosophical views that seek to clarify in what ways artworks deepen our understanding of the human condition.

In this seminar, we will discuss philosophical texts as well as different kinds of artworks (movies, literary texts, poems, comics, etc.) and explore questions such as: Can artworks be arguments? Does literature enhance our empathic imagination? Is there a distinctively aesthetic form of rationality? What is the relation between games and agency? Does music lead to a deeper self-understanding? How should we think of imaginative resistance?

Literature:

The reading material will be made available via Moodle, including a list of works to be read/watched, etc. as part of the seminar requirements. As introduction to the seminar, I would recommend to read one or more of the following short stories (in any language): Ursula Le Guin's "The Ones Who Walked Away from Omelas;" Franz Kafka's "The Burrow" (Der Bau) and "Before the Law" (Vor dem Gesetz); Arno Schmidt "Gadir or Know Thyself" (Gadir oder Erkenne dich Selbst); Jorge Luis Borges' "The Immortal" (El inmortal); Ray Bradbury's "The Cistern" and "The Fog Horn;" Alice Munro's "The Moons of Jupiter.".

C2

Perception & Action

"I, ME, AND MINE": THE SELF FROM KANT TO FREUD, WITTGENSTEIN, AND SARTRE (030114)

DR. ALFREDO VERNAZZANI

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 10 – 12 (First meeting: 09.10.2024)
ROOM:	GABF 04/714
CP:	3 or 6

What is self-consciousness, and in what ways does it relate to our use, in language and in thought, of the first person pronoun 'I'? This question, first raised by Kant in his first *Critique*, is at the core of Béatrice Longuenesse's last book *I, Me and Mine: Back to Kant and Back Again* (OUP, 2017). In this ambitious work, Longuenesse explores recent developments in the philosophy of self-consciousness, starting from Wittgenstein's famous distinction between 'I' as an object and 'I' as a subject, which has largely dominated analytical philosophy in the last decades, to Gareth Evans's and Jean-Paul Sartre's accounts of bodily self-consciousness. Longuenesse argues for a reassessment of Kant's distinction between consciousness of one's own body and consciousness of mental unity, i.e. a specific organization of mental events. Focusing on the latter, Longuenesse argues that the most promising account of mental unity preserving the Kantian insights can be found in Freud's theory of the "ego," an internal organization of mental events according to the "reality principle" and governed by elementary logical rules that allow us to acquire a reliable representation of the world.

Literature:

In this seminar, we will read and discuss Longuenesse's book along with passages from Kant, Wittgenstein, Evans, Sartre, and Freud. As introductory reading, I would recommend Andrew Brook & Julian Wuerth (2023) "Kant's View of the Mind and Consciousness of Self" in The Stanford Encyclopedia of Philosophy, ed. by E. N. Zalta & U. Nodelman https://plato.stanford.edu/archives/spr2023/entries/kant-mind/ (especially §4).

C2

Perception & Action

SEMINAR

PREDICTIVE PROCESSING: APPLICATIONS AND IMPLICATIONS (030103)

DR. ELMARIE VENTER

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 14 – 16 (First meeting: 08.10.2024)
ROOM:	GABF 05/707
CP:	3 or 6

This seminar offers a deep dive into predictive processing, a theory positing the brain as a hypothesis-testing mechanism aimed at minimizing discrepancies between predictions and sensory inputs, and its extensive implications across philosophy, cognitive science, and interdisciplinary studies. We will explore how this model reshapes our understanding of perception, cognition, belief, and knowledge, delving into its theoretical foundations and the philosophical questions it raises, particularly in epistemology, metaphysics, philosophy of mind, and philosophy of AI. Key themes include the historical development of predictive processing, its redefinition of sensory experiences and decision-making processes through Bayesian inference and error minimization, and its impact on understanding mental disorders and altered states of consciousness. The seminar also examines the application of predictive processing in philosophy of mind—such as social cognition and emotional disorders—and in technological fields like AI. Through weekly discussions and critical analysis of both primary and secondary texts, participants will gain a comprehensive understanding of predictive processing, enabling them to critically evaluate its philosophical dimensions and apply these insights in various philosophical and practical contexts.

Students can earn either 3 CP ungraded or 6 CP graded based on an essay/oral exam.

Literature: Literature will be provided on Moodle.

C2

Perception & Action

SEMINAR

EMBODIED COGNITION: PAST, PRESENT, AND FUTURE (030107)

DR. ELMARIE VENTER

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 14 – 16 (First meeting: 09.10.2024)
ROOM:	GA 03/149
CP:	3 or 6

This seminar provides an in-depth exploration of embodied cognition, a cornerstone concept in cognitive science that posits the body as integral to shaping the mind. We will trace its historical roots and evolution, critically examine empirical evidence, and assess the concept's implications across traditional philosophical domains and emerging cognitive sciences. The course includes a review of seminal works by Varela, Thompson and Rosch (1991), and other pioneers, along with a thorough analysis of how sensory and motor systems influence cognitive functions. We'll delve into embodied cognition's application in language processing, problem-solving, and memory, and discuss its potential challenges to conventional cognitive science paradigms. Additionally, we'll explore its impact on psychology, neuroscience, artificial intelligence, and robotics, considering future research trends and the implications of its technological applications.

Students can earn either 3 CP ungraded or 6 CP graded based on an essay/oral exam.

Literature: Literature will be provided on Moodle.

C2

Perception & Action

SEMINAR

THE PHILOSOPHY OF ANIMAL MINDS (030092)

DR. TOBIAS STARZAK

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 12 – 14 (first meeting: 08.10.2024)
ROOM:	GABF 05/703
CP:	tba

Can animals think? And if so, what do they think about and what are the limits of animal thought? Are they rational in the same sense humans are? Or is there a distinct animal rationality? Do they have concepts or beliefs? Do they understand causality or other minds? How can we get access to the animal mind? And how can we choose between alternative explanations for animal behavior? Philosophers have been discussing questions like these since antiquity and they do so for various reasons. Answers to these questions can have important implications for animal ethics but they are also important from an anthropological perspective, since one possible way to determine human nature is by comparison to non-human animals. But is there really an essential difference between humans and non-human animals, a so-called anthropological difference? Or are there only gradual differences that add up to something that seems more fundamental than it really is? Finally, what can we learn about the psychological abilities in question and our mental vocabulary by studying the animal mind?

In this seminar we´ll discuss these philosophical questions in due consideration of the relevant empirical literature from comparative psychology.

C2

Perception & Action

ONE-WEEK PRACTICAL COURSE
AUTONOMOUS ROBOTICS (212401)
PROF. DR. RER. NAT. GREGOR SCHÖNER

TERM:	Winter 2024/25
MEETING TIME:	Preliminary Meeting: 06.02.2025 10.00 – 11.00; room NB 02/77
	Block: 10.02.25 – 14.02.25, 10 - 18
ROOM:	NB 02/77
CP:	3

This course can be used either in module C2 or in module I3.

E-learning course: https://www.ini.rub.de/elearning/?eid=457

The practical course gives an introduction to mobile robotics with a focus on dynamical systems approaches. The open-source simulation environment Webots is used to control e-puck miniature mobile robots, equipped with a differential drive, combined infrared/proximity sensors and a video camera. The course covers elementary problems in robot odometry, use of sensors and motor control. It then teaches basic dynamic methods for robot navigation, in which the robot's sensors are used for obstacle avoidance and approach to a target location.

The practical part of the lab course consists of a week of full-time work in which students solve programming tasks with simulated mobile robots. The students then write reports in which they describe and analyze the work they have done. The grade for the lab course is based on both the practical work and the report. Students will get support during programming.

Registration: Via E-Learning (registration period: 07.10.24 – 31.12.24)
A decision on participation will be published shortly afterwards via the e-learning portal.

Additionally, a registration for the exam is required. Registration deadlines can be found here:
https://informatik.rub.de/studium/pruefungsamt/pruefungstermine/

C2

Perception & Action

BLOCK SEMINAR, ESSAY WRITING COURSE

SHORT FORMAT SCIENTIFIC COMMUNICATION (112916)

WEI LIN SEAH [PROF. DR. JONAS ROSE]

TERM:	Winter 2024/25
MEETING TIME:	Preliminary meeting: date tba
	Block Group 1: 06. + 07.02.24 & 24. + 25.02.24, 13 - 17
	Block Group 2: 06. + 07.02.24 & 26. + 27.02.24, 13 - 17
ROOM:	GA 04/187
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.

C2

Perception & Action

SEMINAR

WAHRNEHMEN UND VERSTEHEN: SICH SELBST, DIE WELT UND ANDERE. (030087)

PROF. DR. ALBERT NEWEN, PROF. DR. KATJA CRONE

TERM:	Winter 2024/25
MEETING TIME:	Monday, 16 – 18 (First Meeting: 07.10.24)
ROOM:	GA 04/187
CP:	3 or 6

Language of Instruction: German

Vorbemerkung: Dieses Seminar richtet sich insbesondere an Studierende im Master ‚Philosophy of Education', die bereit sind, sich über das Seminar hinaus, an der Vorbereitung einer Ausstellung zu beteiligen. Es ist natürlich offen für Studierende andere Studiengänge, aber alle Studienleistungen des ersten Studienjahres müssen abgeschlossen sein. Es ist eine inhaltliche Vorbereitung einer Ausstellung, mit der sich die Philosophie an die Öffentlichkeit richtet, und zwar zum Seminarthema. Es bietet besondere Möglichkeiten, die Ausstellung mit vorzubereiten und sich in Führungen von Schulklassen im Kontext der Ausstellung einzubringen. Die Ausstellung ist für März 2025 geplant.

Thema: Wahrnehmungen sind unser Fenster zur Welt. Doch wie entstehen sie? Ist etwas wahrzunehmen im Kern dasselbe wie ein Foto von der Umgebung zu machen? Oder konstruieren unsere Gehirne uns eine eigene Welt, die von der Welt anderer Personen verschieden ist? Wie verschieden sind Wahrnehmungen von Menschen in unterschiedlichen Kulturen? Wenn wir die Welt wahrnehmen, bedarf es eines zusätzlichen Schrittes ein Verstehen zu entwickeln. Dabei entwickeln wir ein Alltagsverstehen einerseits und ein wissenschaftliches Verstehen andererseits. Das Verstehen der Welt steht uns schließlich nicht einfach als ein objektives Faktum gegenüber, sondern ist systematisch eingebettet in ein Selbstverstehen und ein Verstehen anderer Personen. Theorien der Wahrnehmung involvieren Fragen (a) nach den Grundelementen der Wahrnehmung (Sinnesdaten, physische Reize, Situationen), (b) nach den ontologischen Rahmenbedingungen und (c) nach den Grundbedingungen des Verstehens. Diese breite Themenfeld von „Wahrnehmen und Verstehen" wird in drei Schritten thematisch im Seminar bearbeitet. Im ersten Teil geht es um die Philosophie der Wahrnehmung mit dem Fokus auf Wahrnehmung der Welt. Dazu gehört es auch als Ziel, die enge Verbindung von Wahrnehmen und Verstehen herauszuarbeiten. Im zweiten Schritt geht es dann darum, wie wir andere Personen wahrnehmen und verstehen: in welchem Maße sind wir von Vorurteilen geprägt, welchen Spielraum haben wir uns davon zumindest teilweise zu befreien? Im dritten Teil geht es dann um die Rolle der Kultur für Wahrnehmen und Verstehen, wobei dabei nicht nur das Verstehen anderer, sondern auch das Selbstverstehen einbezogen wird.

Literatur: Literatur wird auf Moodle zur Verfügung gestellt.

C3

Memory & Learning

SEMINAR

DISKURS NEUROPSYCHOLOGIE: WHAT IS A MEMORY REPRESENTATION? (118613)

DR. MARKUS WERKLE-BERGNER

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 10-12
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

PHILOSOPHY AND NORM PSYCHOLOGY (030110)

DR. LEDA BERIO

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 12 – 14 (first meeting: 08.10.2024)
ROOM:	GABF 04/514
CP:	tba

Every aspect of our life is permeated by norms - but how do we learn them? What psychological mechanisms underlie our ability to internalize and follow norms, and how did these mechanisms evolve? The class offers an overview of interdisciplinary research into the psychological capacity for norm-guided cognition, motivation, and behavior.

Literature:

Possible background reading:
Richerson, P. and Boyd, R. (2005). Not By Genes Alone: How Culture Transformed Human Evolution Sterelny, K. (2012). The Evolved Apprentice: How Evolution Made Humans Unique Moral Tribes: Emotion, Reason, and the Gap Between Us and Them, by Joshua Greene (2013) Henrich,J.(2015).The Secretof Our Success: How Culture Is Driving Human Evolution, Domesticating Our Species, and Making Us Smarter
Bicchieri, C. (2016). Norms in the Wild: How to Diagnose, Measure, and Change Social Norms

C3

Memory & Learning

SEMINAR

ANIMALS MINDS: REASONINGS AND SOCIAL UNDERSTANDING (030078)

PROF. DR. ALBERT NEWEN, DR. SANJA SRECKOVIC

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 10 – 12 (First meeting: 10.10.2024)
ROOM:	IC 04/414
CP:	3 or 6

Modern philosophy of mind aims at understanding the mental abilities not only of human beings but also of nonhuman animals. A comparative perspective contrasting the cognitive abilities of both is very helpful to enrich our understanding of intelligent minds. Central question of our seminar will be: How do animals solve particular tasks? Do they have mental maps, metacognition, or number concepts? How do animals solve problems: do they engage in logical reasoning, causal reasoning, future planning? How social are animals and what is the role of their feelings for their cognition: are they able to develop a certain understanding of the others as mental agents and to interact e.g. as empathic agents? We want to take up these questions and discuss central articles developing recent observations and arguments to characterize animals behavior. This will allow us to develop a new perspective on animal minds and also our to human minds. The evolutionary perspective also relativizes some of our human cognitive abilities: Here a background claim is that all mental abilities of humans have essential roots in the animal kingdom. Methodologically, we will make use of the paradigm of 'Situated Cognition' according to which we need to account for the ecological environment and challenges of a species (the ecological niche) to adequately evaluate the cognitive abilities underlying a behavior.

Literature:

The literature of the seminar will be arranged for the first seminar session. Furthermore, it will be arranged to be downloaded from moodle.

Recommended background literature from the Stanford Encyclopedia of Philosophy: https://plato.stanford.edu/entries/cognition-animal/ (Please read the first two sections for the first session).

C3

Memory & Learning

BLOCK SEMINAR, ESSAY WRITING COURSE

SHORT FORMAT SCIENTIFIC COMMUNICATION (112916)

WEI LIN SEAH [PROF. DR. JONAS ROSE]

TERM:	Winter 2024/25
MEETING TIME:	Preliminary meeting: date tba
	Block Group 1: 06. + 07.02.24 & 24. + 25.02.24, 13 - 17
	Block Group 2: 06. + 07.02.24 & 26. + 27.02.24, 13 - 17
ROOM:	GA 04/187
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 2024/25
MEETING TIME:	**Preliminary Meeting**: tba (Zoom) **BLOCK:** 03.03.2025 – 07.03.2025, 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)

JUAN MEDINA PESCHKEN, MSC

TERM:	Winter 2024/25
MEETING TIME:	Monday, 9 - 10 (First Meeting: 14.10.2024)
ROOM:	GA 04/187
CP:	3

Current literature in cognitive neuroscience 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 2024/25
MEETING TIME	Tuesday, 14 – 16 (First Meeting: 08.10.2024)
ROOM:	NB 3/72
CP:	3

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 2024/25
MEETING TIME:	Tuesday, 16 – 18 (First meeting: 08.10.2024)
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:

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

C4

SEMINAR

COMPOSITIONALITY IN LANGUAGE, MIND, AND BRAIN (030106)

PROF. DR. MARKUS WERNING

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 14 – 16 (First Meeting: 09.10.2024)
ROOM:	GA 04/187
CP:	3 or 6

Compositionality is a key concept in linguistics, the philosophy of mind and language, and throughout the cognitive sciences. Understanding how it works is a central element of syntactic and semantic analysis, and a challenge for models of cognition. In this seminar, we will read papers on the state of the art in all aspects of the subject from every relevant field. They reveal the connections in different lines of research and highlight its most challenging problems and opportunities. The force and justification of compositionality have long been contentious. First proposed by Frege as the notion that the meaning of an expression is syntax-dependently determined by the meaning of its parts, it has since been deployed as a constraint on the relation between theories of syntax and semantics, as a means of analysis, and, more recently, as underlying the structures of representational systems such as mental concepts, computer programs and neural architectures. This seminar explores these and many other dimensions of one of the most exciting fields in the study of language and cognition.

Aside from active participation, participants will be expected to give a presentation in English. Assistance regarding the English language will be provided.

Literature:

Werning, M., Hinzen, W., & Machery, M. (Eds., 2012). The Oxford Handbook of Compositionality. Oxford: Oxford University Press.

C4

Language, Logic & Categories

BLOCK SEMINAR

FREGE'S PHILOSOPHY OF LANGUAGE AND LOGIC (030101)

PROF. DR. DOLF RAMI

TERM:	Winter 2024/25
MEETING TIME:	Block: 03.03.25 – 06.03.25, 9 – 18
ROOM:	GABF 04/358
CP:	tba

Gottlob Frege (1848-1925) is one of founding fathers of analytic philosophy. His philosophical views still have a big influence on current debates in analytic philosophy. There is an ongoing debate about the correct interpretation of his views and on the influence of German 19th century philosophy on Frege's thoughts. On the occasion of Frege's 100th death anniversary, this seminar aims to focus on different aspects of philosophy of logic and language. For this purpose, we will invite six different international Frege scholars that will give talks, and we will have the opportunity to discuss their views with them in detail.

C4

Language, Logic & Categories

SEMINAR

RESEARCH SEMINAR ON CONTRADICTORY LOGICS (030091)

PROF. DR. HEINRICH WANSING

TERM:	Winter 2024/25
MEETING TIME:	Tuesday 14-16 (First Meeting: 08.10.2024)
ROOM:	GABF 04/354
CP:	6

This seminar is related to the ERC-Advanced Grant project ConLog, Contradictory Logics: A Radical Challenge to Logical Orthodoxy, and contributes to the idea of research-based learning. The seminar is open to M.A. students with an interest in philosophical logic, the philosophy of logic, and the philosophies of language and of science.

In the 20th century, many systems of non-classical logic have been developed, including inconsistency-tolerant logics, which are typically all subsystems of classical logic. There are, however, logical systems that are radically different from classical logic insofar as they are non-trivial but contradictory. These logics are in glaring conflict with logical orthodoxy since Aristotle, who called the Principle of Non-Contradiction the firmest of all principles. Non-trivial contradictory logics not only permit inconsistencies in theories, but contain provable contradictions.

A prerequisite for a successful attendance in the seminar is some knowledge of non-classical logic and modal logic, including familiarity with Gentzen-style proof systems and Kripke models. We will discuss ongoing research into non-trivial contradictory logics and their applications in the philosophy of logic, and will read research papers, old and new, dealing with the notions of contradictoriness, consistency, negation, triviality, and related concepts. These papers may range from rather informal to formal studies. Students can earn credits by presenting a paper and will get detailed feedback. The seminar will continue to run over several semesters.

Students interested in experimental work on the endorsement or rejection of certain logical principles that play a crucial role in obtaining non-trivial negation-inconsistent logics are also very welcome.

C4

Language, Logic & Categories

SEMINAR

NEURODIVERSITY IN LANGUAGE AND COMMUNICATION (030084)

JUN.PROF. DR. KRISTINA LIEFKE

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 14 – 16 (First Meeting: 17.10.2024)
ROOM:	GA 04/187
CP:	3 or 6

Much classical work in philosophy of language uses an idealized model of communication (due to Grice, 1957) in which agents are fully cooperative, attentive, well-informed, verbally skilled, socially adept, cognitively flexible, and pragmatically competent. It is easy to see that this model grossly overestimates agents' resources and abilities. This holds especially for communicative agents on the autism spectrum, who are often attributed "difficulties in understanding . . . irony and jokes, in adjusting their contribution . . . to conversational expectations, . . . to construct a coherent narrative discourse, and to detect and avoid faux-pas" (Kissine, 2012, p.1). This seminar investigates the possible sources of the communicative particularities of different neurodiverse populations (esp. individuals with ASD and AD(H)D) by studying state-of-the-art research at the interface of philosophy, psychology, and linguistics. Thus, the seminar aims to remove some Gricean idealizations and arrive at a more adequate model of communication that accommodates diverse verbal, behavioral, and cognitive profiles. Note: This seminar is associated with the RUB student initiative project *Campus Neurodivers 1).*

Prerequisites: None.

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.

1) https://initiativprojekte.blogs.ruhr-uni-bochum.de/Startseite/aktuelle-projekte/

Selected readings: All readings will be made available on Moodle.

Cushing, S. (2013). Autism: The very idea. In J.L. Anderson & S.Cushing (eds.), *The Philosophy of Autism* (pp. 17-45). Rowman & Littlefield.
Grice, H. P. (1975). Logic and conversation. In *Speech A cts* (pp. 41-58). Brill.
Geurts, B., Kissine, M., & van Tiel, B. (2019). Pragmatic reasoning in autism. In *Thinking, R easoning, and D ecision M aking in A utism* (pp. 113-134). Routledge.
Kissine, M. (2012). Pragmatics, cognitive flexibility and autism spectrum disorders. *Mind & L anguage 27*(1): 1-28.
Vermeulen, P. (2012). *Autism as C ontext -B lindness*. AAPC Publishing.

C4

Language, Logic & Categories

SEMINAR

GÖDEL: THE UNPROVABILITY OF THE CONSISTENCY OF ARITHMETIC (030094)

PD DR. NILS KÜRBIS

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 14 – 16 (First Meeting: 09.10.2024)
ROOM:	GABF 04/356
CP:	3 or 6

Gödel's first incompleteness theorem proved that if arithmetic is (omega) consistent, then it is not negation complete, that is, there is a sentence such that neither it nor its negation is provable in arithmetic. Gödel established this result by exhibiting a sentence of arithmetic, the so-called Gödel sentence, that is equivalent to the statement of its own unprovability in arithmetic. The second incompleteness theorem showed that if arithmetic is consistent, then it cannot prove the statement that expresses the consistency of arithmetic.

This course is an introduction to all formal aspects of Gödel's incompleteness theorems. We will begin with a recapitulation of fundamental results about first order logic, such as its completeness and the Löwenheim Skolem Theorem, and proceed to first order theories, in particular a fragment of number theory. Gödel's method of the arithmetisation of syntax and its application to the formalisation of proofs in arithmetic will be presented in detail. We will then be ready to prove Gödel's first incompleteness theorem. Afterwards we will consider the resources needed to prove the second incompleteness theorem. There will also be time to discuss the philosophical importance of Gödel's results.

3 CP can be earned by active participation and giving an oral presentation. 6 CP can be earned when students additionally write an essay.

Literature:

George Boolos: The Logic of Provability (Cambridge University Press 1993)

Herbert B. Enderton: A Mathematical Introduction to Logic, 2nd edition (San Diego: Harcourt 2001)

Eliot Mendelson: An Introduction to Mathematical Logic, 6th edition (Boca Raton: CRC Press 2015)

C4

Language, Logic & Categories

SEMINAR

SPEAKING WITH AND WITHOUT TONGUES – COMMUNICATION IN ANIMALS (118165)

LUTZ WEHRLAND, M.SC.

TERM:	Winter 2024/25
MEETING TIME:	Monday, 14 – 16 (First Meeting: 14.10.2024)
ROOM:	IA 1/87
CP:	3 or 6

In this seminar you will get an introduction about the biology of communication. We will learn what communication is, how it has evolved, and which different ways of communication exist in the animal kingdom. Furthermore, we will look deeply into specific animal communication based on the phylogenetic order.

We will try to answer questions such as:

- Why is - and was- communication a good strategy to find someone for a date?

- Why is it sometimes not enough to dance in circles and shake your bottom so everyone around you knows where to go next, just as bees do?

- Why have whales and songbirds invented singing contests, millions of years before mankind?

- And finally: What does the fox say?

To do so, I will give brief introductory lectures about bioacoustics and communication in animals, some definitions which are relevant in this field of research and also a broad overview of the cognitive processes of communication. After that you will work every week on some literature, guided by a worksheet, which helps and teaches you how to navigate through academic papers, understand and prepare literature for a general discussion during our seminar days. In the last third of the semester, you will prepare a talk in small groups about a chosen topic. In the end we will come back to human language and use our new knowledge to try to understand human language and its “special status” in communication research. Moreover, we will have a look on what ChatGTP would say about that.

C4

Language, Logic & Categories

SEMINAR

KRIPKES NAMING AND NECESSITY (030043)

JUN.PROF. DR. KRISTINA LIEFKE

TERM:	Winter 2024/25
MEETING TIME:	Monday, 14 – 16 (First Meeting: 14.10.2024)
ROOM:	GA 04/187
CP:	3 or 6

Language of Instruction: German

Saul Kripkes Vorlesung *Naming and Necessity* (Princeton, 1970) ist eine der wichtigsten philosophischen Arbeiten des zwanzigsten Jahrhunderts. Die in ihr enthaltenen Diskussionen zur Bedeutung von Eigennamen, der Natur von Modalität und des Zusammenhangs zwischen sprachlicher Bezugnahme, Identität und Notwendigkeit haben noch heute einen Einfluss weit über die Sprachphilosophie hinaus, z.B. in der philosophischen Semantik, Metaphysik, Erkenntnistheorie und Logik. Dieses Seminar führt durch sorgfältige Textarbeit an der deutschen Übersetzung der Vorlesung in diese wichtigen Diskussionen ein. Dabei liefert das Seminar eine detaillierte Erklärung aller für diese Diskussionen wichtigen Begriffe (z.B. 'mögliche Welt', 'notwendige Eigenschaft', 'starre Bezeichnung', 'Essentialismus'). Um eine argumentative und philosophiehistorische Einbettung zu ermöglichen, konsultieren wir im Rahmen des Seminars gelegentlich andere sprachphilosophische Primärwerke (z.B. von Mill, Russell, Frege, Donnellan und Putnam).

Voraussetzungen: Das Seminar setzt keine sprachphilosophischen Vorkenntnisse voraus. Logik-Grundkenntnisse sind wünschenswert, aber keine Teilnahmevoraussetzung.

Studierende können 3 CP für das Halten einer Präsentation erhalten oder 6 CP für das Halten einer Präsentation und dem zusätzlichen Schreiben eines Essays oder dem Bestehen einer mündlichen Prüfung.

Literatur:

Kripke, S. (1982). *Naming and Necessity*. Oxford: Basil Blackwell.
Kripke, S. (1993). *Name und Notwendigkeit*. Übersetzung von (Kripke, 1983). Übersetzt von Ursula Wolf. Suhrkamp Taschenbuch Wissenschaft 1056. Frankfurt a.M.: Suhrkamp.
Textor, M. (2004). *Neue Theorien der Referenz*. Mentis Anthologien Philosophie. Paderborn: Mentis.

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

SEMINAR, ESSAY WRITING COURSE

AESTHETIC COGNITIVISM: HOW THE ARTS ENHANCE OUR UNDERSTANDING OF THE WORLD (030111)

DR. ALFREDO VERNAZZANI

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 10 – 12
ROOM:	GAFO 04/619
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 Dr. Alfredo Vernazzani.

This course can be used either in module C2 or in module AM1.

Artworks like paintings, novels, poetry, dramas, comics, movies, etc. do not merely entertain us, they also enrich our understanding of the world: think of how the tale of the Great Inquisitor in Dostoevskij's Brothers Karamazov or the brothers Strugackij's novel Hard to be a God outline complex moral dilemmas; whereas other artworks, like Chantal Akerman's Jeanne Dielman or Sarah Kane's 4:48 Psychosis, offer a window into others' condition. Under the label "aesthetic cognitivism" we group all philosophical views that seek to clarify in what ways artworks deepen our understanding of the human condition.

In this seminar, we will discuss philosophical texts as well as different kinds of artworks (movies, literary texts, poems, comics, etc.) and explore questions such as: Can artworks be arguments? Does literature enhance our empathic imagination? Is there a distinctively aesthetic form of rationality? What is the relation between games and agency? Does music lead to a deeper self-understanding? How should we think of imaginative resistance?

Literature:

The reading material will be made available via Moodle, including a list of works to be read/watched, etc. as part of the seminar requirements. As introduction to the seminar, I would recommend to read one or more of the following short stories (in any language): Ursula Le Guin's "The Ones Who Walked Away from Omelas;" Franz Kafka's "The Burrow" (Der Bau) and "Before the Law" (Vor dem Gesetz); Arno Schmidt "Gadir or Know Thyself" (Gadir oder Erkenne dich Selbst); Jorge Luis Borges' "The Immortal" (El inmortal); Ray Bradbury's "The Cistern" and "The Fog Horn;" Alice Munro's "The Moons of Jupiter.".

AM1

AM1. Theory Formation and Conceptual Analysis

BLOCK SEMINAR

ARGUMENTATION (030073)

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

TERM:	Winter 2024/25
MEETING TIME:	03. – 07.02.2025, 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.

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

AM1

AM1. Theory Formation and Conceptual Analysis

SEMINAR

PHILOSOPHICAL METHODS: AN INTRODUCTION (030113)

JUN. PROF. DR. JOACHIM HORVATH

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 10.30 – 12.00
ROOM:	GAFO 04/619
CP:	3 or 6

In this introductory seminar, we will discuss both general questions about methods, such as "What are methods in the first place?" or "How should methods be evaluated?", and specific questions about philosophical methods, like "Are there any philosophical methods at all?", "Are there uniquely or distinctively philosophical methods?", or "What are the main philosophical methods?". In light of this general background, we will also consider some philosophical methods in more detail, such as argumentation, conceptual analysis, experimental philosophy, formal methods, or thought experiments. The course will be based on a manuscript version of the introductory volume *Methods in Analytic Philosophy: A Primer and Guide* (edited by Joachim Horvath, Steffen Koch, and Michael G. Titelbaum), which is forthcoming as an open access book with the PhilPapers Foundation. There will be a lot of flexibility for the participants of the seminar to decide which philosophical methods they want to focus on, including decisions about selected further readings on these methods. Apart from the ability to read philosophical texts in English, some prior experience with doing philosophy would be helpful for a seminar that has the aim of reflecting on methods as a key aspect of philosophical practice.

AM3

AM3. Behaviour Studies & Data Analysis

SEMINAR

MOTIVATIONAL PROCESSES AS TARGETS FOR BIOLOGICAL PSYCHIATRY (112915)

PATRICK REINHARDT, MSC

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 10 – 12 (First meeting: 16.10.2024)
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

AM3

AM3. Behaviour Studies & Data Analysis

LECTURE & EXERCISE

INTRODUCTION TO DATA SCIENCE (212039)

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

TERM:	Winter 2024/25
LECTURE:	Tuesday, 08.30 – 10.00 (First Meeting: 08.10.2024)
ROOM:	ND 3/99
EXERCISE:	Tuesday, 10.15 - 11.45 (First Meeting: 08.10.2024)
ROOM:	ND 3/99
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: Written final module examination of 120 minutes.

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 2024/25
LECTURE:	Friday, 08.30 – 10.00 (First Meeting: 11.10.2024)
ROOM:	GABF 04/516
EXERCISE:	Friday, 10.15 - 11.45 (First Meeting: 11.10.2024)
ROOM:	MB 2/90
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

PROJECT SEMINAR

MACHINE LEARNING: UNSUPERVISED METHODS (212501)

PROF. DR. LAURENZ WISKOTT

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 10.30 -13.45 (First Meeting: 08.10.2024)
ROOM:	IC 03/134
CP:	9

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

This course is given in a hybrid of *inverted classroom* and *problem based learning*. The course starts with a two-week introduction into unsupervised methods of machine learning, providing an overview. The students then work in groups of about 4 on realistic problems that can be solved with these methods. In the first week of a problem, they develop hypotheses and strategies for a solution and identify which methods they want to learn. Then the course agrees on a method to focus on theoretically, which will then be done in an inverted classroom format. The students then try to solve the problem and present their results in a short video talk with slides. Thus, the students will not only learn about machine learning but also soft skills.

This course covers a variety of unsupervised methods from machine learning such as principal component analysis, independent component analysis, vector quantization, clustering, Bayesian theory and graphical models.

After the successful completion of this course the students

- know a number of important unsupervised learning methods,
- can discuss and decide which of the methods are appropriate for a given data set,
- understand the mathematics of these methods,
- know how to implement and apply these methods in python,
- have gained experience in organizing and working in a team,
- know problem solving strategies like brain storming,
- can communicate about all this in English.

Exam (Prüfungsformen):

The exam is a combination of graded presentations for the problems and graded quizzes for the theory. 50% of the grade come from the average group performance on solving the problems. 10% come from the presentations, taking into account slides and presentation style, this is an individual grade of the presenter. 40% come from a digital quiz about the theory of the methods covered. Thus 50% of the grade are individual, 50% come from the group. In addition you can gain up to 4 bonus points for being voted for as a 'most valuable player (MVP)' on a project. Since the exam is distributed over the semester, students (at least of Applied Computer Science) must register for it at the beginning of the semester.

Condition for granting the credit points (Voraussetzungen für die Vergabe von Kreditpunkten):
Continuous participation and passed exam.

Remarks on online sessions:

- It is really annoying to talk to an array of black tiles. So please turn on your video.
- If you do not want to turn on your video, please at least upload a portrait image of yourself, so that we can see your face. That is better than a black tile.
- Do not use other images, like a black cat, terminator, or a galaxy. Feel free to do that with your buddies, but I consider that inappropriate in this university teaching context.
- I will record some of the online sessions, for the benefit of those who cannot attend. I will tell you beforehand and you will see an indication of it in zoom. Please turn off camera and mic, if you don't want to be recorded (but remember the portrait image).

Max. number of participants: 30

Moodle: https://moodle.ruhr-uni-bochum.de/user/index.php?id=61070

Requirements: The mathematical level of the course is mixed but generally high, including calculus (functions, derivatives, integrals, differential equations, ...), linear algebra (vectors, matrices, inner product, orthogonal vectors, basis systems, ...), and a bit of probability theory (probabilities, probability densities, Bayes' theorem, ...). Programming is done in Python, thus the students should have a basic knowledge of that as well, or at least be fluent in another programming language.

Literature: For most topics a script will be available.

AM4

AM4. Computational Modeling

SEMINAR

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

MATTEO MICHELINI

TERM:	Winter 2024/25
MEETING TIME:	Friday, 16 – 18
ROOM:	Wasserstr. 221/4
CP:	3 or 6

This course can be used either in module C2 or in 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/

AM5

AM5. Special Methods in Neuroscience/Genetics

BLOCK SEMINAR

IMAGING GENETICS: POLYGENIC SCORES (118515)

JAVIER SCHNEIDER PENATE

TERM:	Winter 2024/25
MEETING TIME:	Preparatory Meeting: 21.10.2024, 16- 18, Room IA 1/157
	25.01. – 26.01.2025, 9 - 18
ROOM:	GABF 04/253
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

INTRODUCTION TO SINGLE-CELL RECORDINGS (112617)

DR. ROLAND PUSCH, DR. GIANMARCO MALDARELLI

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 10 - 12
ROOM:	IA 02/460
CP:	3

In this seminar we will give an overview of the neurophysiological processes underlying spike trains. We will start with the biological basics of spike generation and the electrical activity accompanying neural communication. After setting up the theoretical framework, we will have hands-on sessions both for data acquisition and spike sorting. To get credit points, students need to present a scientific article.

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

AM5

AM5. Special Methods in Neuroscience/Genetics

SEMINAR

TRANSLATIONAL METHODS IN COGNITIVE NEUROSCIENCE (110009)

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

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 12 – 14 (First Meeting: 17.10.2024)
ROOM:	IA 1/157
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 2024/25
MEETING TIME:	Wednesday, 12 – 14 (First Meeting: 16.10.2024)
ROOM:	IB 02/109 PC-Pool
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

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. Erhan Genç (erhan.genc@rub.de).

AM7 fMRI Training

SEMINAR & PRACTICAL COURSE

NEUROPSYCHOLOGICAL METHODS: fMRI (118518 & 118519)

DR. PHIL. NAT. ERHAN GENÇ

TERM:	Winter 2024/25
MEETING TIME:	Preparatory Meeting: 07.10.2024, 18.00: Zoom
	Monday 11.11., 18.11., 25.11., 02.12., 09.12.2024, 10 - 18
ROOM:	IB 02/109 (PC-Pool)
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 seminar can only be taken in combination with the practical course. Participants must participate in both courses to get credit points: The aim of this course is to learn how magnetic resonance imaging can be used to acquire new scientific knowledge. Its main aim is to give the participants an insight into the evaluation and analysis of structural and functional MRI data and present their results in a scientific manner. The structural data are composed of high-resolution anatomical and diffusion-weighted measurements (DTI) which can be used to visualize the white matter fiber bundles. The functional data include common fMRI and resting state measurements to determine spontaneous brain activity. To pass this course, participants must be present on at least 2/3 of the seminar. The course is held regularly “in person” and includes visits to an MRI scanner where the brain scans of the course participants will be acquired. The date of these visits will be scheduled together with the course participants. This course is designed specifically for students of the cognitive science master program and due to the practical exercises, the number of participants is limited to 12.

After the subscription in eCampus where everyone is placed on the waiting list participants will be selected during the first meeting.

Please register online if interested.

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, PROF. DR. CHRISTIAN MERZ

TERM:	Winter 2024/25
MEETING TIME:	Monday, 12 – 14 (First Meeting: 14.10.2024)
ROOM:	HGB 30
CP:	3

Language of instruction: German

Ursachen und Folgen von Stress werden aus einer psychologischen Perspektive beleuchtet. Es werden sowohl Apsekte 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 2024/25
MEETING TIME:	Thursday, 16 – 18 (First Meeting: 17.10.2024)
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 2024/25
MEETING TIME:	Wednesday, 8 – 10 (First meeting: 16.10.2024)
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)

DR. RER. NAT. MARLIES PINNOW

TERM:	Winter 2023/24
MEETING TIME:	Monday, 16 – 18 (First meeting: 14.10.2024)
ROOM:	HIA
CP:	3

Language of instruction: German

Die Vorlesung führt in das Gebiet der Motivations- und Volitionspsychologie ein. In einem ersten Abschnitt wird in einem kurzen Überblick über die Forschungs- und Problemgeschichte, eine Gegenstandsbestimmung der Motivationspsychologie und ihrer zentralen Fragestellungen erarbeitet. Darüber hinaus werden zentrale Methoden der Motivationsforschung erörtert. Auf dieser Basis werden dann einzelne Verhaltenssysteme wie Hunger, Neugier, Angst, Leistung, Aggression diskutiert. Spezifische Ansätze wie Attributionstheorien, Erwartungs- X Wert-Modelle, Instrumentalitätstheorie etc. werden innerhalb der Motivsysteme oder als Exkurse behandelt. Den Abschluss bildet eine Erörterung handlungstheoretischer und volitionaler Probleme zielgerichteten Verhaltens.

The course will be held in German. Students may choose to take the exam in English. The recommended literature for those following this option is:
Heckhausen J. & Heckhausen, H. (2010). Motivation and Action. Cambridge: Cambridge University Press.

Literatur:
Schmalt, H.-D. & Langens, T. A. (2009): Motivation (4. vollständig überarbeitete Auflage). Stuttgart: Kohlhammer Heckhausen, J. & Heckhausen,H. (2010): Motivation und Handeln (4. Auflage). Berlin: Springer.

D1

Free Selection

SEMINAR

STRESS UND KOGNITION (118032)

LENA SOPHIE PFEIFER, M.SC.

TERM:	Winter 2024/25
MEETING TIME:	Wednesday 12 – 14 (First Meeting: 16.10.2024)
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 2024/25
MEETING TIME:	Thursday, 16 – 18 (First meeting: 17.10.2024)
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.

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

I1. Cognitive Philosophy

COLLOQUIUM

EXTRA RESEARCH COLLOQUIUM "METAPHILOSOPHY, EXPERIMENTAL PHILOSOPHY, AND ARGUMENTATION THEORY" (030128)

JUN-PROF. DR. JOACHIM HORVATH

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 16.30 – 18.00 (First Meeting: 09.10.2024)
ROOM:	GAFO 04/619
CP:	3 or 6

In this colloquium in seminar-style, we will discuss current topics from argumentation theory, epistemology, experimental philosophy, and metaphilosophy, broadly construed. The colloquium will also host a number of talks by external guests, many of which are leading experts in their field. Advanced bachelor students, master students, and doctoral students are especially welcome in the colloquium, in which they can also acquire the normal range of credit points. Moreover, student participants can make suggestions for suitable readings to be discussed in the colloquium, and they will have the option of presenting their work, for example, related to their thesis, in English.

I1

I1. Cognitive Philosophy

COLLOQUIUM

RESEARCH COLLOQUIUM "LOGIC AND EPISTEMOLOGY" (030124)

PD DR. NILS KÜRBIS, DR. DANIEL SKURT

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 14 – 16 (First Meeting: 10.10.2024)
ROOM:	GABF 04/354
CP:	3 or 6

In this colloquium students will have an opportunity to present a paper on a topic of their choice from philosophical logic or epistemology. This paper may or may not be related to an MA thesis. Background knowledge in analytic epistemology and philosophical logic is required. In addition to presentations by students, there will be talks by guest and invited speakers.

3 CP can be earned by active participation and giving an oral presentation. 6 CP can be earned when students additionally write an essay.

I1

Cognitive Philosophy

COLLOQUIUM

PHILOSOPHY MEETS COGNITIVE SCIENCE: MEMORY AND LANGUAGE (030131)

PROF. DR. MARKUS WERNING

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 12 – 14 (First Meeting: 08.10.2024)
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 in English.

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, DR. JULIA WOLF

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 14 – 16 (First Meeting: 08.10.2024)
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. We will offer regular presentations half from master- 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, the perception-cognition divide and many more. PhD-students who are interested in presentations should write an email to both organizers (albert.newen@rub.de and Julia Wolf (julia.wolf-n8i@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).

I1

Cognitive Philosophy

COLLOQUIUM

COLLOQUIUM: TOPICS IN PHILOSOPHY OF LANGUAGE, LOGIC AND INFORMATION: FICTIONAL ENTITIES (030102)

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

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 16 – 18 (First Meeting: 16.10.2024)
ROOM:	GA 04/187
CP:	3 or 6

This colloquium serves the discussion of current topics at the semantic interface of logic, the philosophy of language, and the philosophy of information. The colloquium will combine 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 at:
https://www.ruhr-uni-bochum.de/phil-inf/colloquium/index.html.en.

I1

Cognitive Philosophy

COLLOQUIUM

COLLOQUIUM PHILOSOPHY OF INFORMATION AND COMMUNICATION (030122)

JUN.PROF. DR. KRISTINA LIEFKE

TERM:	Winter 2024/25
MEETING TIME:	Thursday, 12 – 14 (First Meeting: 17.10.2024)
ROOM:	GB 5/37
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.

I1

Cognitive Philosophy

SEMINAR

ÜBUNG FÜR ABSCHLUSSARBEITEN (BA, MA, PHD): PHILOSOPHIE DER SPRACHE UND KOGNITION (030112)

PROF. DR. MARKUS WERNING

TERM:	Winter 2024/25
MEETING TIME:	Wednesday, 12 – 14 (First Meeting: 16.10.2024) (every two weeks)
ROOM:	GA 04/187
CP:	3 or 6

The exercise offers the opportunity to discuss your own final theses (BA, MA, doctoral theses) in a protected environment and to exchange ideas for your own final theses. Help is offered with the content, structure and preparation of the theses. The language of the event is English.

Die Übung bietet Gelegenheit in geschütztem Rahmen eigene Abschlussarbeiten (BA, MA, Doktorarbeiten) zu diskutieren und Ideen für eigene Abschlussarbeiten auszutauschen. Es werden Hilfestellungen bei Inhalt, Gliederung und Ausfertigung der Arbeiten angeboten. Die Sprachen der Veranstaltung sind deutsch und englisch.

I2

I2. Psychology

COLLOQUIUM

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

PROF. DR. OLIVER T. WOLF

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 16 – 18
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: INTERDISCIPLINARY PERSPECTIVES ON EPISODIC MEMORY (212102)

PROF. DR. SEN CHENG

TERM:	Winter 2024/25
MEETING TIME:	Friday, 14.00 – 16.00 (First Meeting: 11.10.2024)
ROOM:	GA 04/187
CP:	3

Link: https://for2812.rub.de/events/

This research colloquium covers the range of topics in the interdisciplinary research unit FOR 2812 "Constructing scenarios of the past: A new framework in episodic memory". Presentations will focus on the cognitive and neuronal mechanisms underlying scenario construction in episodic memory. The discussed studies employ and integrate approaches from philosophy, psychology, as well as experimental and computational neuroscience. The colloquium hosts talks by leading international experts and local researchers as well as presentations by doctoral and master students. In addition, students will read journal articles and book chapters related to the topics of the talks.

Assessment: term paper
Course material: available on Moodle (registration required)

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

Capacity: max. 15 students
Enrollment: eCampus

Requirements: advanced knowledge of learning and memory

I3

I3. Computational Modeling

LECTURE & EXERCISE

INTRODUCTION TO NEURAL DATA SCIENCE (212014)

PROF. DR. ROBERT SCHMIDT

TERM:	Winter 2024/25
LECTURE:	Friday, 08.30 – 10.00 (First Meeting: 11.10.2024)
ROOM:	GABF 04/516
EXERCISE:	Friday, 10.15 - 11.45 (First Meeting: 11.10.2024)
ROOM:	MB 2/90
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 2024/25
MEETING TIME	Tuesday, 14 – 16 (First Meeting: 08.10.2024)
ROOM:	NB 3/72
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

I3

Computational Modeling

PROJECT SEMINAR

MACHINE LEARNING: UNSUPERVISED METHODS (212501)

PROF. DR. LAURENZ WISKOTT

TERM:	Winter 2024/25
MEETING TIME:	Tuesday, 10.30 -13.45 (First Meeting: 08.10.2024)
ROOM:	IC 03/134
CP:	9

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

This course is given in a hybrid of *inverted classroom* and *problem based learning*. The course starts with a two-week introduction into unsupervised methods of machine learning, providing an overview. The students then work in groups of about 4 on realistic problems that can be solved with these methods. In the first week of a problem, they develop hypotheses and strategies for a solution and identify which methods they want to learn. Then the course agrees on a method to focus on theoretically, which will then be done in an inverted classroom format. The students then try to solve the problem and present their results in a short video talk with slides. Thus, the students will not only learn about machine learning but also soft skills.

This course covers a variety of unsupervised methods from machine learning such as principal component analysis, independent component analysis, vector quantization, clustering, Bayesian theory and graphical models.

After the successful completion of this course the students

- know a number of important unsupervised learning methods,
- can discuss and decide which of the methods are appropriate for a given data set,
- understand the mathematics of these methods,
- know how to implement and apply these methods in python,
- have gained experience in organizing and working in a team,
- know problem solving strategies like brain storming,
- can communicate about all this in English.

Exam (Prüfungsformen):

The exam is a combination of graded presentations for the problems and graded quizzes for the theory. 50% of the grade come from the average group performance on solving the problems. 10% come from the presentations, taking into account slides and presentation style, this is an individual grade of the presenter. 40% come from a digital quiz about the theory of the methods covered. Thus 50% of the grade are individual, 50% come from the group. In addition you can gain up to 4 bonus points for being voted for as a 'most valuable player (MVP)' on a project. Since the exam is distributed over the semester, students (at least of Applied Computer Science) must register for it at the beginning of the semester.

Condition for granting the credit points (Voraussetzungen für die Vergabe von Kreditpunkten): Continuous participation and passed exam.

Remarks on online sessions:

- It is really annoying to talk to an array of black tiles. So please turn on your video.
- If you do not want to turn on your video, please at least upload a portrait image of yourself, so that we can see your face. That is better than a black tile.
- Do not use other images, like a black cat, terminator, or a galaxy. Feel free to do that with your buddies, but I consider that inappropriate in this university teaching context.
- I will record some of the online sessions, for the benefit of those who cannot attend. I will tell you beforehand and you will see an indication of it in zoom. Please turn off camera and mic, if you don't want to be recorded (but remember the portrait image).

Max. number of participants: 30

Moodle: https://moodle.ruhr-uni-bochum.de/user/index.php?id=61070

Requirements: The mathematical level of the course is mixed but generally high, including calculus (functions, derivatives, integrals, differential equations, ...), linear algebra (vectors, matrices, inner product, orthogonal vectors, basis systems, ...), and a bit of probability theory (probabilities, probability densities, Bayes' theorem, ...). Programming is done in Python, thus the students should have a basic knowledge of that as well, or at least be fluent in another programming language.

Literature: For most topics a script will be available.

I3

Computational Modeling

ONE-WEEK PRACTICAL COURSE

AUTONOMOUS ROBOTICS (212401)

PROF. DR. RER. NAT. GREGOR SCHÖNER

TERM:	Winter 2024/25
MEETING TIME:	Preliminary Meeting: 06.02.2025 10.00 – 11.00; room NB 02/77
	Block: 10.02.25 – 14.02.25, 10 - 18
ROOM:	NB 02/77
CP:	3

This course can be used either in module C2 or in module I3.

E-learning course: https://www.ini.rub.de/elearning/?eid=457

The practical course gives an introduction to mobile robotics with a focus on dynamical systems approaches. The open-source simulation environment Webots is used to control e-puck miniature mobile robots, equipped with a differential drive, combined infrared/proximity sensors and a video camera. The course covers elementary problems in robot odometry, use of sensors and motor control. It then teaches basic dynamic methods for robot navigation, in which the robot's sensors are used for obstacle avoidance and approach to a target location.

The practical part of the lab course consists of a week of full-time work in which students solve programming tasks with simulated mobile robots. The students then write reports in which they describe and analyze the work they have done. The grade for the lab course is based on both the practical work and the report. Students will get support during programming.

Registration: Via E-Learning (registration period: 07.10.24 – 31.12.24)
A decision on participation will be published shortly afterwards via the e-learning portal.

Additionally, a registration for the exam is required. Registration deadlines can be found here:
https://informatik.rub.de/studium/pruefungsamt/pruefungstermine/

14

Cognitive Neuroscience

COLLOQUIUM

RESEARCH COLLOQUIUM NEUROPSYCHOLOGY (118916)
[FORSCHUNGSKOLLOQUIUM NEUROPSYCHOLOGIE]

PROF. DR. NIKOLAI AXMACHER

TERM:	Winter 2024/25
MEETING TIME:	Thursday 14 – 16 (First meeting: 17.10.2024)
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.

14

I4. Cognitive Neuroscience

COLLOQUIUM

BIOPSYCHOLOGY RESEARCH COLLOQUIUM (118914)

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

TERM:	Winter 2024/25
MEETING TIME:	Monday, 13 – 15 (First meeting: 14.10.2024)
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/.

14

I4. Cognitive Neuroscience

COLLOQUIUM

COLLOQUIUM: NEURAL BASIS OF LEARNING (118919)

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

TERM:	Winter 2024/25
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. CHRISTIAN MERZ

TERM:	Winter 2024/25
LECTURE:	Friday, 10 – 12 (First meeting: 18.10.2024)
ROOM:	IA 02/461
CP:	3

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=59553

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.

COLLOQUIUM: **BRAINS IN SPACE -** PROF. DR. SEN CHENG

The colloquium Brains in Space can be attended by all CogSci Students. You cannot receive any CPs in this colloquium but you can receive signatures for the participation in talks.

In this colloquium, speakers will present their research in various areas of spatial navigation, including behavioral, neuroscientific, and theoretical approaches. The goal is to foster interdisciplinary discussions along the lines of the review article "A Map of Spatial Navigation for Neuroscience" (Parra-Barrero et al., 2023) that proposes a taxonomy of spatial navigation processes in mammals. The talks will cover a diverse range of topics, from the neural underpinnings of navigation to complex navigation behaviors. Attendees will gain a better understanding of how the mammalian brain represents and navigates through space, as well as learn about several cognitive processes such as learning and memory through the lens of spatial navigation.

Takes place every week virtually on Tuesday from 16:00 to 17:30 CEST (central European summer time)

You an find a schedule of the colloquium here:

https://www.ini.rub.de/teaching/courses/colloquium_brains_in_space_an_interdisciplinary_research_colloquium_on_spatial_navigation_winter_term_2024/