M1: Protein Biochemistry and Bioinformatics
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iomE Institut für Organismische und Molekulare Evolutionsbiologie

JGU JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Contents and aims of the module

In module A, during a two week block of lectures at a PC computer pool (or using your own laptop if online), the students will receive an introduction to (i) a programming language of wide use in Bioinformatics (R / Python) and (ii) a logically ordered series of topics describing the computational analyses, data types and databases used in diverse aspects of the study of genes, genomes, gene expression, DNA-protein interactions, protein sequence and structure and protein-protein interactions. Special emphasis will be put in explaining how evolutionary analysis can be applied to these topics, and how these methods and databases can be used to predict protein function and mechanisms of disease. The progamming sections are optional for **Module C** students.

Contents: Introduction to programming (R/Python), sequence homology, multiple sequence alignments, sequence homology, phylogenetics, protein structure, protein domains, the Protein Data Bank (PDB), protein structure visualization (Chimera) and prediction, disordered proteins and low complexity regions, protein repeats, protein interaction networks (Cytoscape), gene expression analysis and gene annotation, proteomics.

In module B, the students will work four weeks on a bioinformatics project applying the material learned in module A. The students will develop a project under intensive supervision but at the same time will learn how to work individually, and how to find resources, databases, methods and bibliography appropriate for bioinformatics projects, optimally using programming when necessary, including the use of libraries developed for particular bioinformatics tasks. They will also learn how to analyze and represent data using a variety of tools. The project will be completed with a seminar where the students will introduce the background of the problem approached, present and discuss their results, and share the problems and difficulties encountered during the development of the project.

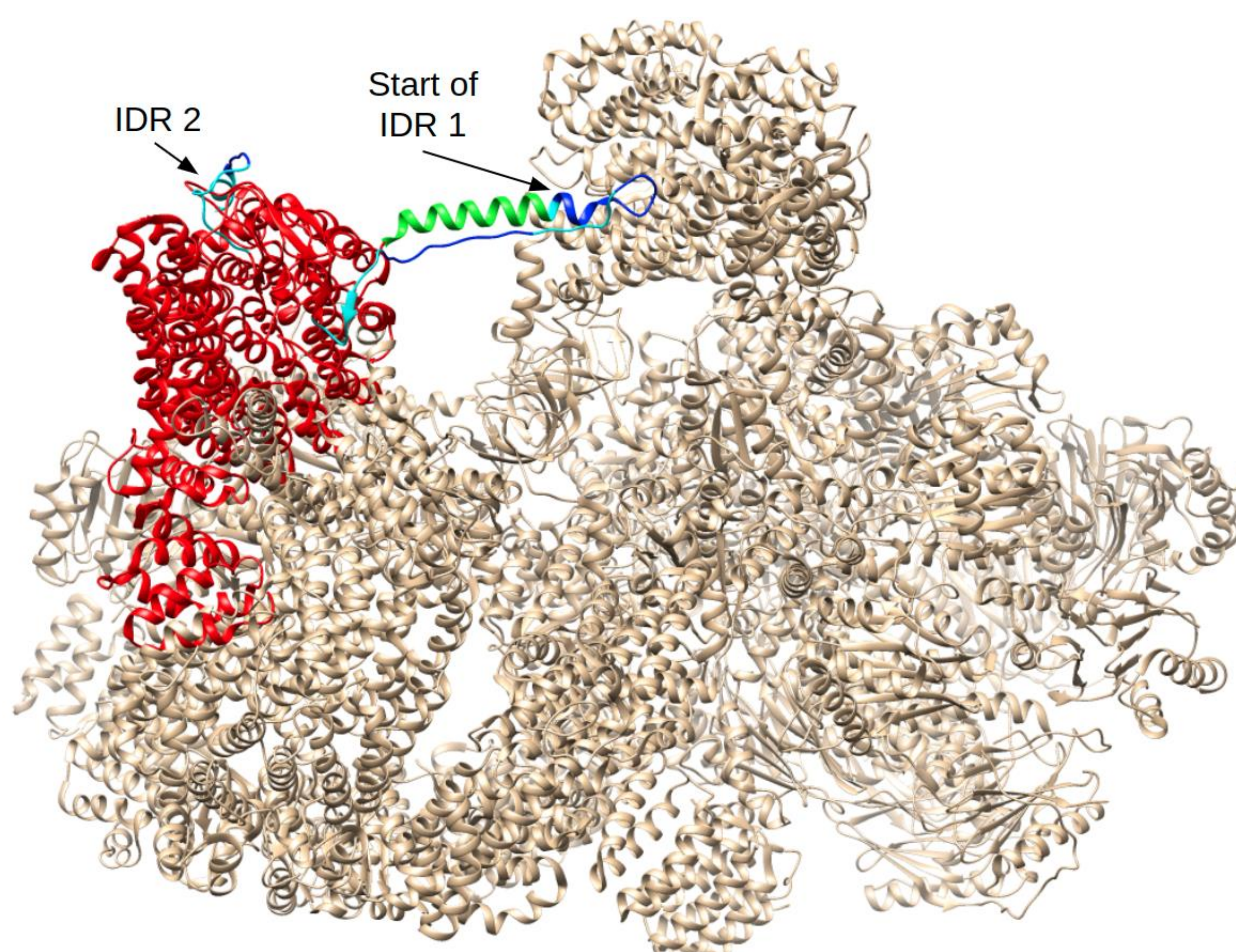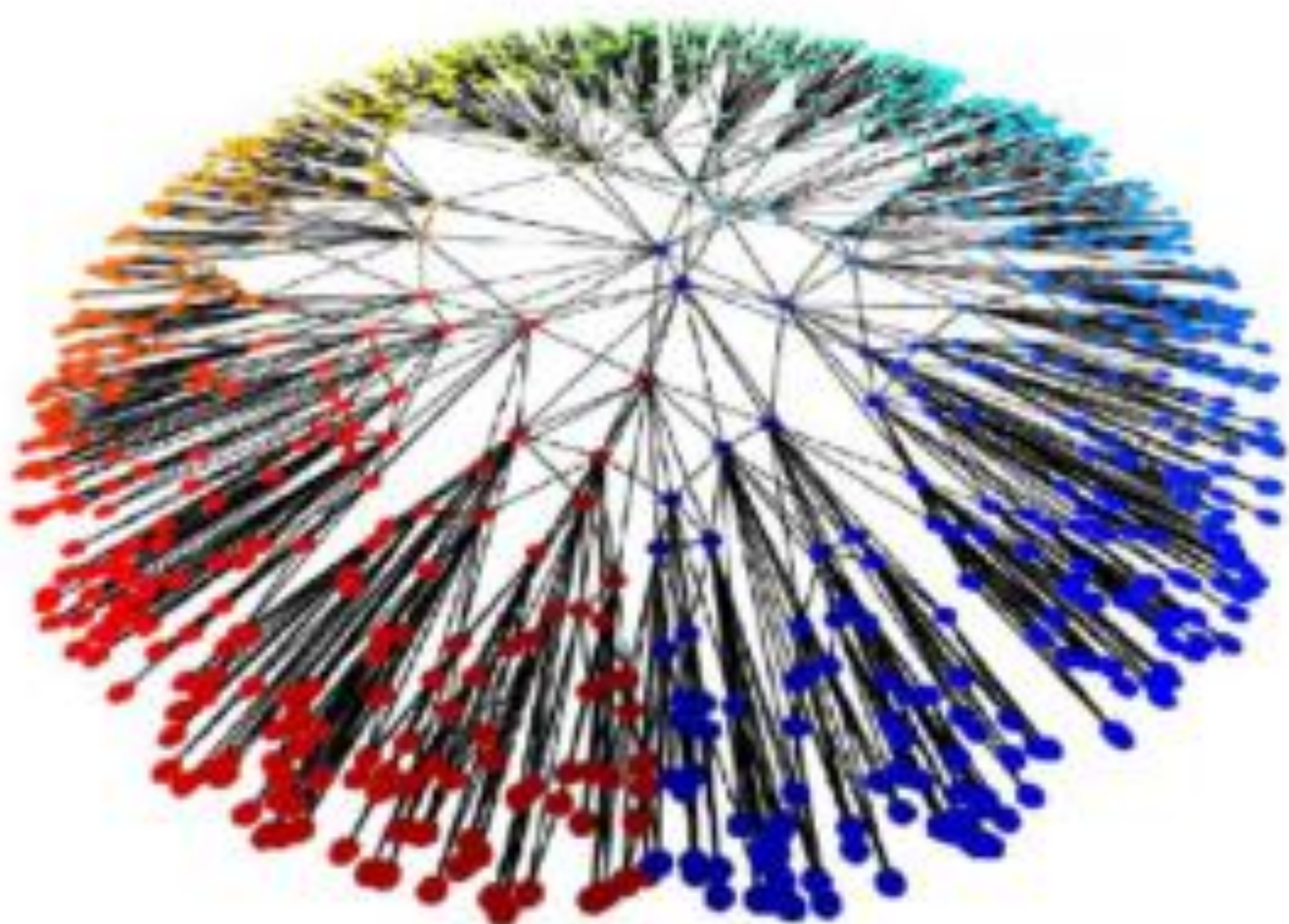## Requirements for credit points

Module A/C: written exam (German/English, 60 minutes; take home exam) and 20 minute seminar (English) to the colleagues about an assigned paper.
Module B: written report (minimum 10 pages) and 20 minute seminar to AG Andrade (English).
Module C:

Next course: WiSe 2022-2023 – December 2022

Teachers: Miguel Andrade, Hristo Todorov, Enrique Muro, Pablo Mier, Maximilian Sprang, Alex Anyaegbunam, Katja Luck, Stefan Tenzer, Ute Distler, Federico Marini, Emily Vagiona, Mariane Goncalves.