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# Integrative Bioinformatics

## BIOINF 4220 (3 ECTS credits)

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Winter Semester 2018/19

11.03-22.03.2019, 9-17, C124

Instructor: Oliver Kohlbacher

Mail: pibi-ws1819@informatik.uni-tuebingen.de

Tel: 29-70457

Office: C317, Sand 14

Office Hours: Wed, 9-10

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### Overview

Many biological research questions are centered around trying to understand how small changes in the organisms genome and environment can result in major changes in the cellular and organismal phenotype. Examples for such changes in phenotype can be different body height/weight, pathogenesis, or altered metabolic rates. To gain insights into the mechanism regulating how an organism functions, ideally the full underlying biological system needs to be understood and modeled. To do so, available measurements of the different layers in the central dogma (transcription, translation) and further cellular function (metabolism) have to be integrated.

This course thus deals with one of the central tasks of bioinformatics: integration and unification of biological data from different sources. Specifically, we will work with data sets for genome, transcriptome, proteome and phenome measurements and try to coax out mechanistic insights into the correlation between the genome and downstream processes (altered gene expression and altered metabolism).

### Goals

- Data Integration using Python (and relevant packages)
- Genotype-Phenotype centered analyses (GWAS & PheWAS)
- Differential gene expression and pathway analysis
- Machine Learning with biological data

### Requirements

- Master in Bioinformatics (or at least the lectures Sequence Bioinformatics and Structure and Systems Bioinformatics)
- Proficient in a scripting language, preferably Python and/or willingness to pick the necessary skills prior (!!!) to the course

### Evaluation

- To pass the practical course a report will have to be handed in. The grade is based on this report and your performance during the course. Passing requires an overall grade of 4.0 or better.

### Materials

Slides will be handed out at the beginning of each lecture. Materials will be made available at the ILIAS page of the lecture.

### Key Dates

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**October (exact date t.b.a.)**

Preliminary meeting

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**11th March – 22nd March**

Practical Course

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**1st April**

Hand-in of report