

BIOC8145 Bioinformatics Module

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Office Hours: Upon Request

Course Instructors: Stefan Bekiranov, Michael Guertin, Chongzhi Zang, Nathan Sheffield, Gabriel Alencar and Aakrosh Ratan

Time: MWF 3 – 3:50pm

Location: Online via Zoom. Courses will be scheduled on the BIOC 8145 Collab site. You can launch Zoom via Collab or by clicking on the link provided to you via email for each class. To launch Zoom via Collab, click on the Online Meetings tab in the lower left corner.

Course materials (including lectures, reading and assignments) will be made available on the BIOC 8145 GitHub page: <https://github.com/stefbekir/bioc8145>.

Course Description:

BIOC 8145 provides the statistical and programming background as well as introduction to software tools that enable analysis of functional genomics data sets. The course will focus on identifying single nucleotide and structural variants from genomic data, gene expression changes from RNA-seq and PRO-seq data, factors that regulate gene expression including transcription factors (TFs), histone modifications and chromatin state from ChIP-seq and ATAC-seq data and cellular composition and single cell gene expression from scRNAs-seq. Students will learn UNIX basics, statistics associated with each analysis approach, programming in R, and analysis of RNA-seq, PRO-seq, scRNA-seq, ChIP-seq and ATAC-seq data using R/Bioconductor and UNIX-based software tools. Students will also learn how to perform TF DNA motif and GO/pathway enrichment analysis.

Week 1 (3/25 – 3/27): Introduction to UNIX & R Programming (Bekiranov)

Week 2 (3/30 – 4/03): R Programming & Statistics Overview (Bekiranov)

Week 3 (4/06 – 4/10): Analysis of ChIP-seq Data (Zang)

Week 4 (4/13 – 4/17): Analysis of RNA-seq and PRO-seq Data (Guertin)

Week 5 (4/20 – 4/24): Analysis of ATAC-seq Data (Sheffield)

Week 6 (4/27 – 5/01): Analysis of scRNA-seq Data (Alencar)

Week 7 (5/04 – 5/08): Single Nucleotide and Structural Variant Analysis (Ratan)

Homework: Students will be given tutorials/workflows/programming assignments which they will be required to complete each week of the course. Completed assignments will be uploaded to the Collab site.