

Introduction to Bioinformatics Syllabus Spring 2021 (GS011143)

Instructors: Dr. Nicholas Navin, Dr. Ken Chen, Dr. Min Jin Ha

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Time: Tuesdays 1-3:00 pm

Classroom: Online

Textbook: optional: Bioinformatics & Functional Genomics 2nd edition (Jonathan Pevsner)

Calendar: <https://gsbs.uth.edu/academics/academic-calendar.htm>

Week	Date	Chapter	Lecturer	Topics
1	Jan. 12	Overview	Dr. Navin	<ul style="list-style-type: none">• Overview of Genomics and Next-Generation Sequencing Technologies• Human Genomics• Cancer Genomics• Computer set up
2	Jan. 19	UNIX	Dr. Navin	<ul style="list-style-type: none">• File system operations• Connecting to Servers• Manipulating Files• Text Editors
3	Jan. 26	Programming	Dr. Navin	<ul style="list-style-type: none">• String processing• Writing programs and functions• Variables and Data Structures• Logical Operators• File Input-Output
4	Feb. 2	Statistics 1	Dr. Ha	<ul style="list-style-type: none">• Discrete and Continuous probability distributions• Normal distribution• Mean and Confidence interval• Introduction to R
5	Feb. 9	Statistics 2	Dr. Ha	<ul style="list-style-type: none">• Statistical Inference: testing• Multiple testing• Feature Selection
6	Feb. 16	Statistics 3	Dr. Ha	<ul style="list-style-type: none">• Principal Component Analysis• Clustering (Hierarchical, k-means)
7	Feb. 23 Cancelled	Sequence Analysis	Cancelled due to winter storm	<ul style="list-style-type: none">• Human genome Assembly• Sequence Analysis algorithms• Genome Browsers
8	Mar. 2	Cancer Genomics	Dr. K. Chen	<ul style="list-style-type: none">• SNV calling• Functional Annotation• Mutational Signature

9	Mar. 9	Functional Cancer Genomics	Dr. K. Chen	<ul style="list-style-type: none"> • CNA Calling • SV calling • Medical relevance
10	Mar. 23	Biological Databases	Dr. Akbani	<ul style="list-style-type: none"> • cBioportal, Database Resources • COSMIC, Onco-mine and UCSC and TCGA • Direct Database Connections
11	Mar. 30	RNA-seq	Dr. Yiwen Chen	<ul style="list-style-type: none"> • Pre-processing of RNAseq vs DNaseq • gene expression levels and RPKM • identification of fusion transcripts
12	Apr. 6	Single-cell	Dr. Navin	<ul style="list-style-type: none"> • Seurat
13	Apr. 13	Intratumor heterogeneity and clonal evolution	Dr. Wenyi Wang	<ul style="list-style-type: none"> • Spatial/temporal intratumor heterogeneity • Inference of tumor purity, clonal composition from bulk tissue data
14	Apr. 20	Phylogenetics	Dr. Liang	<ul style="list-style-type: none"> • Overview of phylogenetic tree construction • Various methods (distance, neighbor joining, MP, ML) • Bootstrap analysis
15	Apr 27	Epigenetics	Dr. Rai	<ul style="list-style-type: none"> • Basic epigenomic methods • ChIP-seq analysis
16	May 4			No final exam