6.047/6.878/HST.507 - Fall 2021 - Lecturer: Manolis Kellis. TAs: Samuel Sledzieski, Brian Xia - Lectures on Tues/Thurs at 1:00-2:30PM in 32-141
All homework due on Monday at 11:59pm

Psets	Week	Date	Topic		Lec	Topic	Read*
PS1 out on:L1-L5 on:R1-R3	1	Tue, Sep 7	Introduction			Registration Day	
		Thu, Sep 9			L1	Algorithms, Machine Learning, Networks, Course Overview	1
		Fri, Sep 10			R1	Recitation 1: Biology and Probability Review	
		Fri, Sep 10			M1	Please upload your Self-Intro profiles and go through your classmate's profiles - No meeting	milestn
	2	Tue, Sep 14	Module I: Genome Annotation	Foundations	L2	Dynamic Programming, Reusing computation, Iterative Functions, Exponential / Poly	2,3
		Wed, Sep 15			M2	Mixing and Mingling Social Gathering	attend
		Thu, Sep 16			L3	Database search, Rapid string matching, Hashing	3
		Fri, Sep 17			R2	Recitation 2: Multiple Alignment, Seq/Codon Language, Alignment Score Basis	
	3	Tue, Sep 21		Frontiers	L4	HMMs1: Evaluation, Parsing, posterior decoding, learning, HMM architectures	7,8
		Wed, Sep 22			M3	Relevant literature / paper description / summary (just submit, stay if you'd like feedback)	milestn
		Thu, Sep 23			L5	HMMs2: Applications, architectures, memory, gene finding, chromatin states	7,8
Due Mon Sep 27		Fri, Sep 24			R3	Recitation 3: HMMs, Conditional Random Fields (CRFs), Sequential modeling	
PS2 out on:L6-L9 on:R4,R5	4	Tue, Sep 28	Module II: Gene Expression and Epigenomics	Foundations	L6	Expression Analysis: Clustering/Classification, K-means, Hierarchical, Bayesian	15,16
		Wed, Sep 29			M4	Individual student project pre-proposal + networking teammate-finding session (do attend)	attend
		Thu, Sep 30			L7	RNA structure and function. RNA world, RNA-seq, transcript structure, RNA folding	14,15
		Fri, Oct 1			R4	Recitation 4: Expression analysis, supervised/unsupervised learning, Random Forests	
	5	Tue, Oct 5		Frontiers	L8	Epigenomics: ChIP-Seq, Read mapping, Peak calling, IDR, Chromatin states	19
		Wed, Oct 6			M5	Project Proposal Submissions (by team) (just submit, attend if you're still seeking partners)	milestn
Due Wed Oct 13		Thu, Oct 7			L9	Three-dimensional chromatin interactions: 3C, 5C, HiC, ChIA-Pet	22
		Fri, Oct 8			R5	Recitation 5: ENCODE, Epigenome Roadmap, ChromHMM, ChromImpute	
PS3 out on:L10-L13 on:R6,R7	6	Tue, Oct 12	Module III: Regulatory Genomics, Networks, Deep Learning	Foundations	L10	Regulatory Motifs: Discovery, Representation, PBMs, Gibbs Sampling, EM	17
		Wed, Oct 13			M6	Peer-Review Sessions (do attend)	attend
		Thu, Oct 14			L11	Network structure, centrality, SVD, sparse PCA, L1/L2, modules, diffusion kernels	20,21
		Fri, Oct 15			R6	Recitation 6: Motif Discovery / enumeration, Dimensionality Reduction, Network Kernels	
	7	Tue, Oct 19		Frontiers	L12	Deep Learning, Neural Nets, Convolutional NNs, Recurrent NNs, Autoencoder	20.7
		Wed, Oct 20			M7	Response to reviewers + revised proposal due (changes could be minor)	milestn
Due Mon Oct 25		Thu, Oct 21			L13	Deep Learning: interpretability, representation learning, Variational AutoEncoders, GANs	20.7
		Fri, Oct 22			R7	Recitation 7: Deep Learning Architectures, Representations, Frontiers	
PS4 out on:L14-L17 on:R8,R9	8	Tue, Oct 26	Module IV: Population Genetics and Disease Genomics	Foundations	L14	Population genetics: Linkage disequilibrium, pop struct, 1000genomes, allele freq	20.7
		Wed, Oct 27			M8	Data/Feasibility Demo Video: download datasets, parsing code, some visualization	milestn
		Thu, Oct 28			L15	Disease Association Mapping, GWAS, organismal phenotypes	31
		Fri, Oct 29			R8	Recitation 8: LD, Phasing, Imputation, Disease genetics, GWAS	
	9	Tue, Nov 2		Frontiers	L16	Quantitative trait mapping, molecular traits, eQTLs, mediation analysis, iMWAS	32
		Wed, Nov 3			M9	Project Feedback office hours (optional) (only show up if you need feedback)	optnl
Due Mon Nov 8		Thu, Nov 4			L17	Systems Genetics: Missing Heritability, Complex Traits, Dissect GWAS, Rank-enrich	4
		Fri, Nov 5			R9	Recitation 9: Heritability, genetics review	
PS5 out on:L18-L20	10	Tue, Nov 9	Module V: Comparative Genomics and Evolution	Foundations	L18	Phylogenetics: Molecular evolution, Tree building, Phylogenetic inference	27
		Wed, Nov 10			M10	Midcourse Report (only show up if you need feedback)	milestn
		Thu, Nov 11				Veterans Day	
		Fri, Nov 12			R10	Recitation 10: Phylogenetics / Phylogenomics / Comparative Genomics	
	11	Tue, Nov 16		Frontiers	L19	Comparative genomics and evolutionary signatures + Genome Evolution / Duplication	4,5.7
		Wed, Nov 17			M11	Project Feedback office hours (optional) (only show if you need feedback)	optnl
Due Fri Nov 19		Thu, Nov 18			L20	Phylogenomics: Gene/species trees, reconciliation, coalescent, ARGs	28
		Fri, Nov 19			R11	Recitation 11: Quiz Review	
	12	Tue, Nov 23	In-Class Quiz			In-Class Quiz (the only quiz - the class has no final exam) - covers L1-L20,R1-R9	
No more psets! (work on your final		Thu, Nov 25	Thanksgiving Break				
		Fri, Nov 26					
	13	Tue, Nov 30	Module VI: Current Research Directions	Foundations	L21	Single-cell genomics: technology, analysis, microfluidics, applications, insights	37
		Wed, Dec 1			M13	Presentation Tips - Intro, discussion, Slides, Presentation skills	optnl
		Thu, Dec 2			L22	Cancer Genomics, Single-cell Sequencing, Tumor-Immune Interface	35
		Fri, Dec 3			R12	Recitation 12: Hands-on Single-cell genomics, ScanPy, Seurat	
	14	Tue, Dec 7		Frontiers	L23	Genome Engineering with CRISPR/Cas9 and related technologies	36
		Thu, Dec 9			M14	Project Final Reports (Tuesday), Slides (Wednesday), and Presentations (Thursday) due	milestn

* readings refer to chapters in compiled 2018 scribe notes, available in the materials folder on Stellar
** recitation topics will be adjusted to respond to lecture and student needs