Computational Biology

Course No: BIOL6385.001.18S / BMEN6389.001.18S
Spring 2018
Biology Department, The University of Texas at Dallas

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Consult this page for class, recitation and exam dates, handouts, and solutions.

A printable version of course policy and syllabus is here. Updates to this document will be made on this website.

Slides will be updated after class. Students can view old versions before updated.

Course Schedule

The last day to drop the course without a "W" grade is Jan 24. The last day to drop a graduate course in any way is Mar 26. See the academic calendar for details.

Lecture	Topic	Handouts / readings	NB
Unit 1: Background and Statistical Inference			
Unit 1 Class 1	Introduction	Slides	CF gene discovery original paper, hosted at UNC here Mathematical Writing See R tutorial here, PERL tutorials here, Python tutorials here, and MATLAB tutorial here. A database of open source machine learning tools is at mloss.org, here. The not-so-short introduction to LATEX.
Unit 1 Class 2	Introduction (cont'd):Probability Theory	Class notes	
Unit 1	Introduction (cont'd)	Slides	

Class 3	Statistical inference		
Unit 1 Class 4	Bayes Nets I : Modelling and Estimation	Dirichlet Notes EM Paper	
Unit 1 Class 5	Bayes Nets II : Bayes net/Inference	Slides Bayesian Inference paper	
	Last day to drop course without a "W" grade.		
Unit 2: Sequence Alignment			
Unit 2 Class 1	Alignment I. Scoring Models	Slides	HW1 out HWK1 HWK1 Solutions
Unit 2 Class 2	Alignment II. Dynamic Programming and Global Alignment	Slides	
Unit 2 Class 3	Alignment III. Local alignment and heuristics	Random Path Analysis Square Functional equation handout 1 Square Functional equation handout 2	
Unit 2 Class 4	Karlin-Altschul Statistics and Score Significance	Local Alignment Handout Alignment Score Significance	
Unit 3: Markovian Models			
Unit 3 Class 1	Markov Nets I. Markov Chain	Slides Handout	
Unit 3 Class 2	Markov Nets II. HMM:Segmentation	Slides FB Algorithm Derivation	HWK 1 due HWK2 HWK Solutions
Unit 3 Class 3	Markov Nets III. HMM: Viterbi, Forward/Backward	Viterbi Algorithm Handout	

		HMM handout	
Unit 3 Class 4	HMM : Markov Nets IV. Baum-Welch algorithm	Pair HMM	
Unit 3 Class 4	Markov Nets V. Profile HMM	Profile HMM	
	Midterm Exam Review		HW2 due
	Midterm exam (in class)	Midterm Solutions	
Unit 3 Class 5	Markov Nets VI. HMM vs CRF	Slides Slides HMM vs CRF Handout	
Unit 4: Comparative Genomics and Evolution			
Unit 3 Class 6	Evolutionary models I	Slides	
	Spring break, no class		
	Spring break, no class		
Unit 4 Class1	Evolutationary Models II		
Unit 4 Class 2	Phylogenetic Trees I	Slides Handout	
Unit 4 Class 3	Phylogenetic Trees II		HWK3
Unit 5: Motif finding			
Unit 4 Class 4	Motif finding (Greedy, EM, Gibbs sampling)	Slides	
	Last date to withdraw with "W" grade (graduate students)		
Unit 5 Class 1	Evaluation of significance of motifs	Slides	
Unit 5 Class 2	Discriminant motif finding (DWE/DME) Functional motif finding (Regression, CART, MARS)		
Unit 6: Machine Learning			
Unit 5	SVM and Kernel method		

Class 3		ML Introduction SVM SVM_2017 CommentsSVM	
Unit 5 Class 4	Ensemble learning, Boosting (Random Forest)	Slides Slides_2017	
Unit 5 Class 4	Lasso, Sparsity, Regularization	Ridge_regression Lasso Handout	Notes
Unit 6 Class 1	Deep Learning tutorial	Slides	
Unit 6 Class 2	Deep Learning In Computational Biology	DeepBind DeepSea DeepVariant DeepLearning_ISL	HW3 due HWK3_solution
Unit 6 Class 3	Final Exam review		
	Final exam in class		

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