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PLACE AND TIME: Room DIA004, Mondays 11:15-13:00 (part A) and 14:15-16:00 (part B)

INSTRUCTOR: Ali H. Sayed, Email: ali.sayed@epfl.ch
TEACHING ASSISTANT: malek.khammassi@epfl.ch

COURSE MATERIAL: I will cover several chapters from the text by A. H. Sayed, *Inference and Learning from Data*, 3 vols., Cambridge University Press, 2022.

PRE-REQUISITES: Some familiarity with matrix theory, linear algebra, and probability. Reviews on these topics are available in the course reference.

GRADING: 4 homework assignments (50%) and 2 exams during the semester worth 25% each.

TOPICS: Core concepts on inference and learning from data. Emphasis is on foundations and statistical limits of learning.
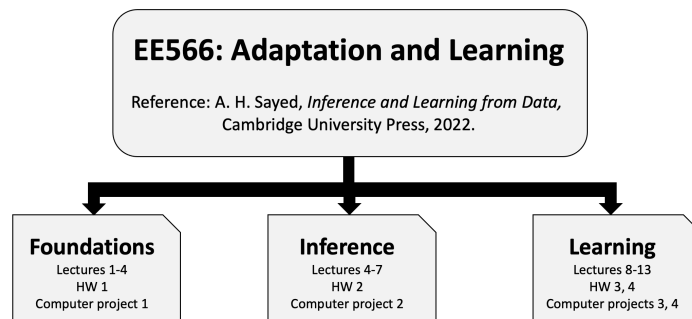
LECTURE	TASK	DATE	TENTATIVE TOPICS	
1A		Feb. 17	Vector Differentiation.	
1B			Convex Functions; Sub-gradients	
2A		Feb. 24	Proximal Operator.	**FOUNDATIONS**
2B			Gradient-Descent Algorithms.	
3A	HW1 due	Mar. 3	Stochastic Optimization.	
3B			Recommender Systems.	
4A		Mar. 10	Adaptive Gradient Methods.	
4B			Gradient Noise.	
5A		Mar. 17	Convergence Analysis.	
5B			Mean-Square-Error Inference.	
6A	HW2 due	Mar. 24	Bayesian Inference I.	**INFERENCE**
6B			Bayesian Inference II.	
7A	EXAM OUT	Mar. 31	Linear Regression.	
7B			Maximum Likelihood.	
8A	EXAM IN	Apr. 7	Least-Squares.	
8B			L2-Regularization.	
9A		Apr. 14	L1-Regularization.	
9B			Nearest-Neighbor Rule. K-means Clustering.	
	NO CLASSES	Apr. 21	EASTER HOLIDAY	
10A	HW3 due	Apr. 28	Naïve Bayes.	
10B			Principal Component Analysis.	**LEARNING**
11A		May 5	Logistic Regression.	
11B			Perceptron. Support Vector Machines.	
12A		May 12	Kernel Methods.	
12B			Generalization Theory.	
13A, B		May 19	Neural Networks.	
14A, B	HW4 due	May 26	Generative Networks.	