Machine Learning

SYLLABUS

Spring, 2025

Instructor: Jui-Hung Hung	Class Hours: R34
Office: EC439	Class Location: EC122
Email: juihunghung@gmail.com	Website: http://www.jhhlab.tw

Week	Date	Topics	Details covered	Notes
1	2/17	Introduction		
	2/20	Regression I	1. Linear model regression 2. Least Squares Error 3. Regularized least squares	Bishop Ch3
	Online		4. Newton's method 5. Hessian matrix	HW1
2	2/27	Probability	1. Random variable 2. Expectation and Variance 3. Joint and conditional probabilities 4. Independence 5. Bayesian inference 6. Naïve Bayes classifier	Bishop Ch1, 2
	Online		7. Information theory 8. KL divergence 9. Maximum entropy	
3	3/6	Distribution	1. Bernoulli and Binomial distribution 2. Beta/Dirichlet distribution 3. Maximum Likelihood Estimation for Gaussian 4. Conjugate prior 5. Online learning	Bishop Ch2
	Online		6. Gaussian integral 7. Gaussian distribution	Bishop Ch2 HW2
4	3/13		1. Bayesian inference for the Gaussian 2. Gaussian conjugate 3. Sequential estimation 4. Affine property of Gaussian	
	Online		5. Marginal Gaussian 6. Conditional Gaussian 7. Central Limit Theorem	
5	3/20	Regression II	1. Maximum a posteriori (MAP) 2. Bayesian linear regression 3. Sequential Bayesian learning 4. Fully Bayesian: predictive distribution	Bishop Ch3 HW3
	Online	Linear Models for	5. Decision theory	

		Classification	6. Bias-Variance decomposition 7. Bias-Variance trade-off	
6	3/27		1. Confusion matrix 2. Logistic regression	Bishop Ch4
	Online		3. KNN 4. Decision boundary	
7	4/3	Clustering Online (Tomb Sweeping Day)	1. Incomplete data 2. Specialized EM algorithm 3. General EM algorithm 4. Gaussian Mixture Model	Bishop Ch9
	Online		5. Theory behind the EM algorithm	HW4
8	4/10	Midterm (To be determined)		