

Foundations of Machine Learning (ECE 5984)

- Course Logistics-

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Course Description

Machine learning studies how to make computers learn from data or experience. It has become a key component of modern Artificial Intelligence (AI) system and has been successfully used in many industrial applications, such as self-driving cars, assistative robots, chatbots, advanced searching, advertising, and so on. This course introduces key concepts and foundations of machine learning and various popular algorithms being used in the real-world problems. It is designed to give students **not only practical machine learning algorithms but also in-depth mathematical and algorithmic grounding in the methods.**

Prerequisites

- Calculus and Linear Algebra (GEDB001, GEDB002, GEDB003 or equivalents)
- Probability (ICE 2003 or equivalent)
- Basic programming skills
 - Python!

English Only

- This is an 'English only' course.
 - I will use English all the time
 - You are allowed to speak in Korean, e.g. asking questions. I will try my best to translate it and answer the questions

Grading

- Class attendance and participation - [10%]
 - Bonus points for active participants
 - I will use the 'electronic attendance check' provided by SKKU
- Homework - [40%]
 - 6 programming assignments - python
 - If you don't make your hands dirty, you will never learn
- Final exam - [50%]

Tentative Schedule

(W1) Introduction	(W9) Neural networks (1)
(W2) Linear regression, Gradient descent	(W10) Neural networks (2)
(W3) Probabilistic perspective (MLP, MLE, Bayesian)	(W11) SVM
(W4) Logistic Regression	(W12) SVM, Kernel methods
(W5) Regularization (1)	(W13) K-means, GMM
(W6) Regularization (2) / Generative learning algorithms (1)	(W14) GMM, EM algorithm
(W7) Generative learning algorithms (2)	(W15) PCA
(W8) Midterm break	(W16) Final Exam

TA and Contacts

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- Email only - I **will not** check the i-campus message
- Subject line must start with '[ECE 5984]'

Textbooks and References

- No textbooks, but just for your reference
- CS229 lecture notes (<https://cs229.stanford.edu/syllabus.html>)
- CS4780 lecture notes
(<https://www.cs.cornell.edu/courses/cs4780/2018fa/lectures/>)
- [PRML by Christopher Bishop at Microsoft Research](#)
- [Machine Learning by Kevin Murphy \(Machine Learning | The MIT Press\)](#)
- [Probabilistic Machine Learning: An Introduction by Kevin Murphy](#)
- [Elements of Statistical Learning: data mining, inference, and prediction. 2nd Edition. \(stanford.edu\)](#)

Good Luck!