

**CS412 MACHINE LEARNING 2020/2021 SUMMER**

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<b>Course E-mail</b>	cs412@sabanciuniv.edu
<b>Lectures</b> @Zoom	Mondays 08:40-11:30 Tuesdays 08:40-10:30 Wednesdays 08:40-10:30
<b>Recitation</b> @Zoom	Tuesdays 10:40-13:30
<b>Course Description</b>	This is an introductory machine learning course that aims a solid understanding of the fundamental issues in machine learning (overfitting, bias/variance), together with several state-of-art approaches such as decision trees, linear regression, k-nearest neighbor, Bayesian classifiers, neural networks, logistic regression, and classifier combination.
<b>Learning Objectives</b>	<ul style="list-style-type: none"><li>• Understand the basic concepts, issues, assumptions and limitations in machine learning (e.g. overfitting, error measures, curse of dimensionality, etc.).</li><li>• Have a working knowledge of the basic mathematics (probability, expectation, entropy, basic linear algebra, etc.) and algorithms behind common machine learning techniques; together with their suitability in given situations.</li><li>• Given a machine learning problem, be able to implement and evaluate one of the standard machine learning algorithms (e.g. decision trees, neural networks, SVMs) using Python.</li></ul>
<b>Learning Outcomes</b>	<ul style="list-style-type: none"><li>• Have a solid understanding of the basic concepts, issues, assumptions and limitations in machine learning and how they apply to various machine learning techniques.</li><li>• Have a working knowledge of the basic mathematics (probability, expectation, entropy, basic linear algebra, etc.) and algorithms behind common machine learning techniques; together with their suitability in given situations.</li><li>• Given a machine learning problem, select, implement and evaluate one of the appropriate machine learning algorithms (e.g. decision trees, neural networks, SVMs) using Python.</li></ul>

**COURSE CONTENT**  
(Planned, Subject to Change)

<b>Week</b>	<b>Dates</b>	<b>Topics</b>
1	05-06-07.07.2021	Course Logistics Introduction to Machine Learning Machine Learning Concepts Decision Trees
2	12-13-14.07.2021	Decision Trees Nearest Neighbor Classifier Linear Regression
3	26-27-28.07.2021	Probability Review & MLE and MAP Bayes Classifier
4	02-03-04.08.2021	Logistic Regression Bias Variance Tradeoff Neural Networks - Introduction Neural Networks - Learning
5	09-10-11.08.2021	Neural Networks - CNN Performance Metrics
6	16-17-18.08.2021	Classifier Combination (Ensemble Methods) Support Vector Machines (SVMs)

**GRADING**

<b>Item</b>	<b>Weight</b>	<b>Description</b>
Final Exam	35%	Online proctored exam. Exam rules will be declared.
Quizzes	30%	Five online proctored quizzes (each ~20 minutes). Rules will be declared.
Homeworks	20%	Four written or programming homeworks. Must be completed individually. Copying the work of others or from other sources is not permitted.
Group Project	10%	Hands on practical experience with groups of two to four people. Copying the work of others or from other sources is not permitted.
Attendance	5%	Based on Zoom attendance. You must attend the synchronous Zoom lectures with your SU account.
<b>Total</b>	<b>100%</b>	Overall total grade must be $\geq 35$ (over 100) AND final exam grade must be $\geq 30$ (over 100) to pass the course.