Course number	G-LAS12 80010 LE10		
Course title (and course title in English)	Statistical Learning Theory Statistical Learning Theory	Instructor's name, job title, and department of affiliation	Graduate School of Informatics Professor,KASHIMA HISASHI
Group	Interdisciplinary Graduate Courses	Field(Classification)	Statistics, Informatics and Data Science
Language of instruction	English	Old group	
Number of credits	2		
Number of weekly time blocks	1	Class style	Lecture (Face-to-face course)
Year/semesters	2025 • First semester		
Days and periods	Mon.1	Target year	Graduate students
Eligible students	For science students		

(Students of Graduate School of Informatics, Graduate School of Engineering cannot take this course as liberal arts and general education course. Please register the course with your department.)

[Overview and purpose of the course]

This course will cover in a broad sense the fundamental theoretical aspects and applicative possibilities of statistical machine learning, which is now a fundamental block of statistical data analysis and data mining. This course will focus first on the supervised and unsupervised learning problems, including a survey of probably approximately correct learning, Bayesian learning as well as other learning theory frameworks. Following this introduction, several
probabilistic models and prediction algorithms, such as the logistic regression, perceptron, and support vector machine will be introduced.
Advanced topic such as online learning, structured prediction, and sparse modeling will be also introduced.

[Course objectives]

Understanding basic concepts, problems, and techniques of statistical learning and some of the recent topics.

[Course schedule and contents)]

1. Statistical Learning Theory
1-1. Introduction to classification & regression: historical perspective, separating hyperplanes and major algorithms
1-2. Probabilistic framework of classification and statistical learning theory: Learning Bounds, Vapnik-Chervonenkis theory

2. Supervised Learning
2-1 Models for Classification: Logistic Regression, Perceptron, Suppo **r** t Vector Machines
2-2 Regularization: Sparse Models (L1 regularization), Bayesian Modeling
2-3 Model Selection: Performance Measures, Cross-Validation, and Other Information Criterion

3. Advanced topics
3-1 Structured Prediction: Conditional Random Fields, Structured SVM
3-2 Online learning
3-3 Semi-supervised, Active, and Transfer Learning

Continue to Statistical Learning Theory(2)↓↓↓

Statistical Learning Theory(2)

[Course requirements]

None

[Evaluation methods and policy]

Reports and final exam.

[Textbooks]

Instructed during class

[References, etc.]

（References, etc.）

Hastie, Friedman, Tibshirani 『The Elements of Statistical Learning』 （Springer）
Shai Shalev-Shwartz and Shai Ben-David 『Understanding Machine Learning: From Theory to Algorithms』（Cambridge University Press）

[Study outside of class (preparation and review)]

Basic knowledge about probability and statistics

[Other information (office hours, etc.)]

[Essential courses]