

Syllabus [2025Year 2 Term]

Course Information

Course Title	Pattern Recognition Techniques	Credits	3
Course Code	556520-1	Required/Elective (For Undergraduate Courses)	Selective majors
Department or Major	Department of Mobile Systems Engineering	Language	English
Methods of Teaching		Lecture Room	월1,2,3/ 화4,5,6(국제506)
Time Allotment	Lecture(3) Experiments(0) Trainging & Practice(0) Performance(0) Designing & Planning(0)	Cyber Lectures	
Course Type	offline		
Cyber Lectures Preview			

Lecturer

Lecturer	Name	JaeYeon Park	Rank	Assistant Professor	Final Academic Degree	공학박사
	Department & college	Department of Mobile Systems Engineering		Office		
	Office Phone Number	—		e-mail	jaeyeon.park@dankook.ac.kr	
	Field of Interest					

Course Summary

Course Description	This course introduces students to the fundamental concepts and techniques of pattern recognition and machine learning. Topics include linear regression, classification, kernel methods, neural networks, and decision trees. The course will emphasize the theoretical foundations as well as the practical aspects of applying machine learning algorithms to real-world problems. By the end of the course, students will be able to understand, implement, and evaluate various machine learning models using the principles discussed.
Description Related Courses	Linear Algebra, Basic and Applications of Machine Learning (Strongly Recommended)
Course Goals	[Understanding Fundamental Concepts] – Students will gain a deep understanding of the core concepts in pattern recognition and machine learning, including probabilistic models, linear regression, and classification tech

	<p>niques.</p> <p>[Application of Algorithms Related to Pattern Recognition and Machine Learning]</p> <p>– Students will learn to implement machine learning algorithms such as SVM, neural networks, and decision trees using modern software tools.</p> <p>[Critical Evaluation on Pattern Recognition Algorithms and Machine Learning Models]</p> <p>– Students will develop the ability to critically evaluate the performance of machine learning models and understand the importance of regularization, model selection, and evaluation metrics.</p>
Projected Results	<p>[Implement Pattern Recognition Algorithms and Machine Learning Models]</p> <p>– Apply various machine learning algorithms, such as linear regression, SVMs, and neural networks, to practical problems using Python.</p> <p>[Data Analysis and Interpretation Skills]</p> <p>– Evaluate the results from machine learning models and interpret their effectiveness in different contexts.</p> <p>[Understand Theoretical Foundations]</p> <p>– Demonstrate a comprehensive understanding of the mathematical and statistical principles underlying the algorithms discussed in the course.</p>
Percentage of the original language classes(%)	
Cyber Lectures Preview	

Syllabus

Times	Lecture Topic	Lecture Goals	Lecture Methods	Assignments
1	Introduction to Pattern Recognition	Understand the basic concepts of pattern recognition, including classification, regression, and clustering. Learn the significance of preprocessing and feature extraction in improving model performance	강의, ppt	
2	Linear Regression	Explore linear models for regression, including the simple linear regression model and its limitations. Introduce the concept of basis functions to extend linear models	강의, ppt	
3	Basis Function & Linear Regression	Understand how basis functions can be used to create more flexible linear regression models, including polynomial and Gaussian basis functions	강의, ppt	

Times	Lecture Topic	Lecture Goals	Lecture Methods	Assignments
4	Maximum Likelihood Estimation	Learn the principle of maximum likelihood estimation (MLE) and its application in determining the parameters of probabilistic models	강의, ppt	
5	Maximum Likelihood Estimation	Delve deeper into MLE, exploring the derivation of the MLE for Gaussian distributions and understanding the concept of bias in estimators	강의, ppt	
6	Regularization & Linear Classification	Introduce regularization techniques to avoid overfitting in models. Understand linear classification methods and their application to classification problems	강의, ppt	
7	Linear Classification	Study linear models for classification, focusing on logistic regression and the role of the logistic sigmoid function in binary classification tasks	강의, ppt	
8	Midterm Exam			
9	Kernel Method & SVM	Explore kernel methods and support vector machines (SVM), focusing on the concept of the maximum margin classifier and its implementation	강의, ppt	
10	Kernel Method & SVM	Understand the dual representation of SVMs and the role of Lagrange multipliers in solving the optimization problem associated with SVMs	강의, ppt	
11	Mixture Models & EM	Learn about mixture models and the Expectation-Maximization (EM) algorithm as a method for finding maximum likelihood	강의, ppt	

Times	Lecture Topic	Lecture Goals	Lecture Methods	Assignments
		od estimates in models with latent variables		
12	Mixture Models & EM	Delve into the application of the EM algorithm in Gaussian mixture models and other latent variable models	강의, ppt	
13	Neural Networks	Introduction to neural networks, covering the basic architecture of a neural network and the backpropagation algorithm for training	강의, ppt	
14	Neural Networks	Explore deeper into neural network architectures, including multi-layer networks and various activation functions. Discuss the importance of regularization in neural networks	강의, ppt	
15	Final Exam			

Methods of Grading

sequence	Description	Percentage	Details
1	Mid-tem Exam	30%	
2	Final-exam	35%	
3	Pop Quizzes	0%	
4	Assignments	25%	
5	Reports	0%	
6	Presentations & Discussions	0%	
7	Attendance	10%	
8		0%	
9	Others	0%	
All		100%	

Core of Value

핵심가치	전공역량	역량정의	역량구분	값(%)
혁신 (Discovery)	창의적문제해결 (Creative problem-solving)	주어진 상황과 문제를 창의적으로 해결할 수 있는 능력	부역량	0%
혁신 (Discovery)	도전 (Challenging)	전공 지식을 새로운 분야와 융합하고 아우를 수 있는 능력		0%
혁신 (Discovery)	지식융합 (Knowledge convergence)	새로운 분야를 개척하거나 도전적으로 임할 수 있는 능력		0%
헌신 (Dedication)	세계시민 (Universal value)	세계 공동체 구성원으로 전공자로서 국제적 이슈에 대응할 수 있는 능력		0%
헌신 (Dedication)	상호협력 (Cooperation)	공동의 목적 달성을 위해 타인과 상호협력을 할 수 있는 능력		0%
헌신 (Dedication)	공동체 (Sense of community)	공동체의 구성원으로서 필요한 태도와 윤리의식을 가질 수 있는 능력		0%
능동 (self-Determination)	자기주도 (Self-Managing)	주어진 상황과 문제를 주도적이고 능동적으로 해결할 수 있는 능력		0%
능동 (self-Determination)	지식활용 (Knowledge application)	주어진 상황과 문제에 대해 논리적으로 파악하고 분석할 수 있는 능력	부역량	0%
능동 (self-Determination)	논리적사고 (Logical thinking)	전공관련 지식을 필요에 따라 다양하게 적용하고 활용할 수 있는 능력	주역량	0%
능동 (self-Determination)	의사소통 (Articulation)	대화를 통해 다양한 의견을 조율하고 합의를 이끌어 낼 수 있는 능력		0%

Textbook(s) & References

Description	Title	Author	Publisher
Required Textbook	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer

Memo

