Applied Machine Learning

Course Title: Applied Machine Learning	
Description	Machine Learning (ML) is a specialized branch of Artificial Intelligence (AI) that focuses on creating algorithms and statistical models that enable computers to learn from data. ML systems identify patterns, extract knowledge, and use experience to improve their performance automatically. A significant technique within machine learning is Artificial Neural Networks (ANNs). Together, ML and ANNs drive many of the world's most advanced AI technologies — powering innovations in automation, robotics, healthcare, communication, transportation, and beyond.
Semester	Spring
Neptun code	GEIAK631-Ma
Instructor	Dr. Samad Dadvandipour, Associate Professor
Credit Hours	2+2
Attendance Requirement	Students must attend 75% of classes and pass two midterm pre-exams during the semester to obtain the necessary signature for eligibility to take the final exam
Examination	The final exam is required in both written and oral forms during the examination period announced by the faculty. Remark: The responsible tutors deliver the topics and lecture presentations during the semester. The PPT lecture presentations or a book in PDF format will be handed to the students via Neptune or email before the pre-exams and the final exam

Topics and Schedule

Week #	**Topic**
Week 1	Introduction to Machine Learning: ML, DL, and ANN-Types of ML
Week 2 & Week 3	Fundamentals of Machine Learning Algorithms: Gradient descent basics, Simple prediction/classification model/methods for solving specific problems
Week 4	Introduction to Artificial Neural Networks: Biological neuron vs. artificial neuron-Perceptron model & limitations
Week 5	Multilayer Perceptron (MLP): Network architecture
Week 6	Training ANNs: Backpropagation, Learning rate & initialization strategies
Week 7	Optimization & Regularization: Optimizers, Batch vs. Mini-batch vs. Stochastic training
Week 8	Using Frameworks: Training pipeline overview, TensorFlow
Week 9	Convolutional Neural Networks (CNNs): Popular CNN architectures
Week 10	Recurrent Neural Networks (RNNs) & Sequence Models
Week 11	Model Evaluation & Deployment: Evaluation metrics, accuracy, precision, recall
Week 12	ANN Applications in Real-World Domains
Week 13	Model: Image classifier, Fraud detection model, Analysers
Week 14	Final Project Presentation & Review: Students present ML-ANN-based projects that incorporate advanced ANN topics, such as XAI and GANs