

Applied Machine Learning

| Course Title: Applied Machine Learning | |
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| 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 | |

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 |
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| 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 |

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