Course Syllabus

Code - Course Title	**BVA223 - Deep Learning Fundamentals**
Course Type	III. SEMESTER
Laboratory + Practice	2+1
ECTS	**3.0**
Language of Instruction	Türkçe
Course Type	Area Elective Courses
Course Instructor(s)	ÖĞR. GÖR. AHMET MÜCAHİD ARVASİ

Mode of Delivery	Face to face
Prerequisites	There are no prerequisites or corequisites for this course.

Course Syllabus

Weeks	Learning Outcomes	Topics	Teaching Methods
Week - 1		Introduction to Deep Learning: Basic Concepts and Historical Development of Artificial Neural Networks	
Week - 2		Feedforward Neural Networks (FNN): Perceptron Architecture and Working Principle	
Week - 3		Multi-Layer Structures (MLP) and Activation Functions (Sigmoid, ReLU, Tanh)	
Week - 4		Model Training 1: Loss Functions and Gradient Descent Methods	
Week - 5		Model Training 2: Backpropagation Algorithm and Its Mathematical Foundations	
Week - 6		Optimization Techniques (Adam, RMSprop) and Learning Rate Management	
Week - 7		Overfitting and Regularization: Early Stopping and Dropout Methods	
Week - 8		Midterm Exam	
Week - 9		Data Augmentation and Model Validation Techniques	
Week - 10		Introduction to Convolutional Neural Networks (CNN): Image Processing Fundamentals and Filters	
Week - 11		CNN Architectures: Pooling Layers and Feature Extraction	
Week - 12		Recurrent Neural Networks (RNN): Time Series Analysis and Sequential Data Processing	
Week - 13		Advanced Recurrent Structures: Long Short-Term Memory (LSTM) and GRU Architectures	
Week - 14		Deep Learning with Big Data: Distributed Model Training, Hardware Accelerator (GPU/TPU) Usage, and Project Presentations	

Learning Outcomes

#	Learning Outcome
1	Upon successful completion of this course, students will gain the competence to grasp the basic concepts of deep learning and the development process of artificial neural networks to design multi-layer architectures with feedforward networks and activation functions, optimize model training using the backpropagation algorithm, loss functions, and gradient descent methods, apply regularization techniques such as early stopping and data augmentation to prevent overfitting, model and train convolutional (CNN) and recurrent (RNN/LSTM) neural networks for image processing and time series analysis tasks, and design distributed model training processes using hardware accelerators in big data environments with modern deep learning libraries.

Sustainable Development Goals

No content has been provided.

Course Theme

No content has been provided.

AKTS Workload

Activity	Duration (Hour)	Count	Workload
Teorik Derse Katılım	0	0	0
Sınıf Dışı Çalışma (Ön Hazırlık & Pekiştirme Amaçlı)	0	0	0
Ödevler	0	0	0
Proje - Rapor - Sunum Hazırlama	0	0	0
Ara Sınav Hazırlığı (sınav süresi dahil)	0	0	0
Final Sınavı Hazırlığı (sınav süresi dahil)	0	0	0
Uygulama (Laboratuvar, Müzik/Enstrüman Uygulaması, Atölye/Saha Çalışması vb.)	0	0	0
Staj Uygulaması	0	0	0
		Calculated ECTS	**0**

Assessment Method and Passing Requirements

No content has been provided.