Course Syllabus

Code - Course Title	**BVA219 - Large Language Models**
Course Type	III. SEMESTER
Laboratory + Practice	3+2
ECTS	**6.0**
Language of Instruction	Türkçe
Course Type	Required 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 Large Language Models: Historical Development, Transition from Statistical Language Models to LLMs, and Milestones	
Week - 2		NLP Fundamentals: Word Embeddings Techniques, Limitations of RNN and LSTM Network Structures	
Week - 3		Transformer Architecture 1: Attention Mechanism, Self-Attention, and Multi-Head Attention Computations	
Week - 4		Transformer Architecture 2: Encoder and Decoder Structures, Positional Encoding	
Week - 5		Model Training Processes 1: Masked Language Modeling (MLM), Causal Language Modeling (CLM), and Pre-training Phase	
Week - 6		Model Training Processes 2: Instruction Fine-Tuning and Domain Adaptation	
Week - 7		Reinforcement Learning from Human Feedback (RLHF) and Alignment Algorithms (PPO, DPO)	
Week - 8		Midterm Exam	
Week - 9		Prompt Engineering 1: Basic Techniques, Role Prompting, and In-Context Learning Practices	
Week - 10		Prompt Engineering 2: Advanced Techniques, Chain-of-Thought, and Reasoning Templates	
Week - 11		Vector Databases and RAG (Retrieval-Augmented Generation): External Information Retrieval and Document-Based LLM Integration	
Week - 12		Model Optimization and Compression: Quantization Techniques (FP16, INT8, INT4) and Memory Management	
Week - 13		Parameter-Efficient Fine-Tuning (PEFT): Low-Rank Adaptation (LoRA) and QLoRA Architecture	
Week - 14		Ethics and Security in LLMs: Bias, Hallucination Management, Data Privacy, Safe Alignment, and End-of-Term Project Presentations	

Learning Outcomes

#	Learning Outcome
1	Upon successful completion of this course, students will analyze the historical development of large language models and NLP fundamentals, deeply investigate the Transformer architecture, attention mechanisms, and encoder-decoder structures, evaluate model pre-training, fine-tuning, and reinforcement learning from human feedback (RLHF) processes, design integrated RAG systems with vector databases by applying advanced prompt engineering techniques like chain-of-thought and in-context learning, perform model optimization using LoRA and quantization methods, and generate solutions for ethical and security issues such as bias, hallucination, and data privacy in AI systems.

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.