科目ナンバリング	U-LAS30 20036 LE10						
授業科目名<英訳>	Fundamentals of Artificial Intelligence-E2 Fundamentals of Artificial Intelligence-E2			担当者所属職名・氏名	情報学研究科 特定准教授 LALA, Divesh Kanu		
群	情報学科目群			分野(分類)	(各論)	使用言語	英語
旧群		単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2026・後期	曜時限	火5	配当学年	全回生	対象学生	全学向

[授業の概要・目的]

Society is currently in the middle of an "AI boom", with machines seemingly able to perform tasks which would have been very difficult even a few years ago. In this course we explain what enables computers to successfully learn like a human does. We start from discussing fundamental machine learning models such as linear and logistic regression to more recent breakthrough architectures such as transformer models. We will also apply AI to conversational agents.

[到達目標]

Students will gain an understanding of machine learning techniques and architectures and also how to construct basic models. They will also know how to properly evaluate AI models using real data.

[授業計画と内容]

Society is currently in the middle of an "AI boom", with machines seemingly able to perform tasks which would have been very difficult even a few years ago. In this course we explain what enables computers to successfully learn like a human does. We start from discussing fundamental machine learning models such as linear and logistic regression to more recent breakthrough architectures such as transformer models. We will also apply AI to conversational agents.

1. Artificial intelligence (1 week)
We will discuss the current AI boom. What does it mean for society? Can we say that AI is truly "intelligent"? We will then explain how machine learning can be linked to concepts of human intelligence.

2. Data collection and analysis (1 week)
Collecting data is the first step in training machine learning models, so we will discuss how a wide range of data can be collected, either by using publicly available corpora or collecting it ourselves. We also show how to get quality data to match the goal of our AI models.

3. Machine learning basics (4 weeks)
In this set of lectures we focus on the fundamental concepts of machine learning. We review basic mathematics required to study machine learning, including vectors and matrices and begin with simple supervised linear and logistic regression models to introduce machine learning concepts. Best practices in training and testing models will also be provided. These will be accompanied with Python code so students can run their own models. We will also introduce the important concept of latent spaces through unsupervised learning.

4. Neural networks (2 weeks)
Once the concepts of machine learning are understood, we move on to neural networks, which are responsible

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for the breakthroughs in the current AI boom. We describe the basic architecture of these models and how they can be extended to tasks such as a image recognition and language processing.

5. Modern AI (2 weeks)
We will introduce two techniques which have revolutionized AI models in recent years. Firstly we look at transformer models which are the backbone behind large language models like ChatGPT. Then we will take a look at state-of-the art models for image generation. Emphasis will be placed on understanding the general concepts behind these techniques.

6. Evaluation (1 weeks)
We take a special look at the evaluation of AI models. Common mistakes related to bias and evaluation metrics will be discussed to reinforce good practice when testing and evaluating models.

7. Application: conversation (3 weeks)
AI has triggered the development of sophisticated conversational systems. We will discuss the techniques behind some of these systems. Students will also have the opportunity to create their own conversational system using LLMs and simple tools. Finally we discuss the influence of AI on society at large and future prospects.

8. Final exam

9. Feedback

[履修要件]

特になし

[成績評価の方法・観点]

Attendance and participation (20%), assignments (40%) and a final exam (40%).

[教科書]

使用しない

[授業外学修（予習・復習）等]

Students should aim to review course content for 30 minutes before and after class and if possible practice programming on their own machines using Python.

[その他（オフィスアワー等）]

[主要授業科目（学部・学科名）]