

3. 電気電子情報工学系 Electrical, Electronics and Computer Engineering Field			EEC-S5
授業科目名 Course Title	データ駆動理工学 Data-Driven Science and Engineering	単位数 Credit	2
担当教員 Instructor	森 眞一郎、山形 頼之、長谷川 達人、顧淳祉 MORI Shinichirou, YAMAGATA Yoriyuki, HASEGAWA Tatsuhito, GU Chunzhi,	開講学期 Semester	春 学 期 Spring
キーワード Keywords	Big Data, Parallel Processing, Machine Learning, Generative AI, Deep Learning, Anomaly detection, Software Analytics	曜日/時限 Day & Time	

授業概要 Course summary
<p>近年、さまざまな産業分野で データに基づく意思決定の重要性が高まっています。本講義では、こうした意思決定に必要なスキルを身に付けることを目的に、データ処理 (Data Processing)、データ駆動型ソフトウェアエンジニアリング (Data-Driven Software Engineering)、機械学習 (Machine Learning)、生成モデリング (Generative Modeling) などのトピックを取り上げます。一部の回では演習を行い、実社会で応用可能な技能の習得を目指します。</p> <p>In recent years, data-driven decision-making has grown increasingly important across a wide range of industries. This course equips students with the skills required for such decision-making by covering key topics including data processing, data-driven software engineering, machine learning, and generative modeling. Selected sessions feature hands-on exercises, enabling participants to acquire competencies that can be readily applied in real-world contexts.</p>
到達目標 Course goal
<ol style="list-style-type: none"> 1. Understand the fundamental of large data processing. 2. Understand the concept and basic algorithm of Machine Learning. 3. Understand the fundamental concepts of generative modeling and its applications. 4. Understand the role of data in modern software engineering practices. 5. Having experiences of writing program concerning to Data-Driven Science and Engineering
授業内容 Course description
<p>This lecture deal three / four topics in Data-Driven Science and Engineering.</p> <p>[Introduction to Data-Driven Science and Engineering]</p> <p>[Data Processing]</p> <ul style="list-style-type: none"> ● Binary data representation inside computer. Floating point representation. Computational Error ● Parallel Processing on multi-core CPU for Large Data Processing (Incl. laboratory project) <p>[Data-Driven Software Engineering]</p> <ul style="list-style-type: none"> ● Introduction to software engineering ● The role of data in software engineering ● Hands-on session <p>[Machine Learning]</p> <ul style="list-style-type: none"> ● Introduction of machine learning. ● Supervised learning algorithms. ● Machine learning programming by Python with scikit-learn. <p>[Generative Modeling]</p>

<ul style="list-style-type: none"> ● Introduction of artificial intelligence. ● Fundamentals of generative modeling. ● Recent applications of generative AI in image, text, and multimodal data generation. <p>Note. Depending on the background of the course attendees, the above contents may change.</p>
準備学習 (予習・復習) 等 Preparation / Review
<p>[Data Processing] Some assignments which require programming skill will be provided for preparation and review. [Data-Driven Software Engineering] Basic knowledge on Unix systems and networks is required. Python programming skills are also necessary. [Machine Learning] Require python basic programming skills. [Generative Modeling] Basic knowledge on calculus and linear algebra is required.</p>
授業形式 Class style
Lectures with exercises.
成績評価の方法・基準 Method of evaluation
Reports for each topic.
教科書・参考書等 Textbook and material
Hands on material will be delivered.
受講要件・予備知識 Prerequisite
<p>Programming experience in C and Python languages is mandatory. Due to the limitation of laboratory equipment, at most 5 students are acceptable. (Qualification test may apply to select 5 students, if necessary)</p>
その他の注意事項 Note
Lecture Style (Face to Face)