

SPRINT COURSES

NICHE TOPICS | ONE WEEK | ONE CREDIT



TEXAS A&M UNIVERSITY
Engineering

In response to the rapid adoption of artificial intelligence (AI), machine learning (ML), and other computing-related technologies, the College of Engineering, in collaboration with the Texas A&M Institute of Data Science, is piloting sprint courses during Fall 2023. These offerings aim to familiarize students with emerging tools in engineering and beyond. Sprint courses are short: one credit, one week (August 14–18), and the one credit will count toward your fall semester load. Each focus on a narrow subject: reinforcement learning, online learning, machine learning for computer vision, cybersecurity and the Internet of Things. Furthermore, instructors for sprint courses are area experts and have been encouraged to adopt course delivery mechanisms that parallel the rapid development cycles found in engineering fields. This is an exciting opportunity to learn and get ahead.

***We hope that you join us in this journey and register for a sprint course this fall.
Registration is on Howdy, with a target date of August 7, 2023.***

SPRINT COURSE TOPICS

Reinforcement Learning: Algorithms and Applications (ENGR 689-604)

Dr. Dileep Kalathil, *Electrical and Computer Engineering*

Engineering systems are moving towards an autonomous future. One key aspect of any autonomous system is the intelligent agents who can adaptively learn and take sequential decisions in an uncertain and stochastic environment. Reinforcement learning (RL) is a powerful paradigm for modeling such intelligent systems and learning optimal control policies. Reinforcement learning is extremely useful in several areas, starting from the classical stochastic control problems to the most recent applications in robotics, games, healthcare and self-driving cars. This course offers a rigorous introduction to reinforcement learning algorithms and its applications.

Bandit Algorithms for Online Learning (ENGR 689-602)

Dr. Srinivas Shakkottai, *Electrical and Computer Engineering*

Bandit problems are present in settings where decision-making involves learning and collecting new data. Such systems have an inherent tension between exploitation (using previously collected information to make the “best” decisions now) and exploration (making decisions that are not necessarily optimal, but better explores the search space to collect fresh data). Applications abound in a variety of settings, including online advertising, A/B testing, drug testing, recommendation systems, online resource allocation, reinforcement learning and autonomous driving. This course will present a rigorous framework for online learning via bandit algorithms.

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Machine Learning for Computer Vision (ENGR 698-603)

Dr. Yalong Pi, *Texas A&M Institute of Data Science*

This course introduces machine learning techniques applied specifically to computer vision. Students will learn fundamental concepts and algorithms that enable computers to understand and interpret visual data. The course covers topics such as image classification, object detection, image segmentation and image generation, all through the lens of machine learning. Students will explore popular machine learning models and algorithms, including convolutional neural networks (CNNs) and deep learning architectures, which have revolutionized computer vision tasks. Emphasis is placed on practical implementation and hands-on experience, with students working on real-world computer vision projects using popular libraries and frameworks. By the end of the course, students will gain a strong understanding of machine learning methods in the context of computer vision, enabling them to develop cutting-edge computer vision applications.

Survey of Cybersecurity (ENGR 689-601)

Mr. Shreyas Kumar, *Computer Science & Engineering*

This course aims to provide students from any major with a comprehensive overview of the field of cybersecurity. The course will cover various aspects of cybersecurity, including concepts, principles, threats, challenges and best practices. Security rockstars from the industry will present short talks and students can network with them. Topics will include the security thought process, threats and attack vectors, threat response and security compliance. In addition, we will introduce notions of ethics and privacy and review emerging trends in cybersecurity.

Advances in Internet of Things (ENGR 689-605)

Dr. Rabi Mahapatra, *Computer Science & Engineering*

This course provides an overview of Internet of Things (IoT) systems and their various components. Students will gain an understanding of the architecture and layers that make up IoT systems, including the device layer, connectivity layer, middleware layer and application layer. They will explore the role of IoT platforms in simplifying the development and management of IoT applications. The course will delve into IoT sensing networks and the importance of data collection from the environment. Students will learn about emerging attributes in IoT, such as AIoT, which combines AI technologies with IoT systems for intelligent data analysis and automation. They will also explore cognitive IoT, where systems can perceive, reason, and learn autonomously, and multi-modal modeling, which integrates data from various sources for a comprehensive understanding of the physical world. The course will also cover the concept of edge computing, IoT data analytics, and critical aspects of security and privacy in IoT. By the end of the course, students will develop a foundation in IoT systems and their key components, preparing them for careers in this rapidly expanding field.