Artificial Intelligence and Machine Learning

Upgrade your data science skills and delve deeper into Python

THE UNIVERSITY OF CHICAGO

Artificial intelligence (AI) and machine learning have evolved from being just algorithms. They now involve statistics, data science, and several programming languages. Additionally, AI and machine learning are shaping the future of every industry at the cusp of the next industrial revolution.

Artificial Intelligence and Machine Learning

Artificial intelligence (AI) and machine learning are revolutionizing how society operates. Some companies already make full use of AI to benefit their customers. Amazon, for instance, uses algorithms to accurately predict what we might like to purchase. Apple has introduced smart assistant Siri to our phones, while Tesla vehicles have incorporated predictive capabilities and self-driving features. Throughout this course, you will discover how foundational data science models are leveraged to obtain increased technological power: more computing power, more complex layers, and different sampling techniques that will refine the accuracy of predictions.

Course Details

Tuition: USD $2,800

Format: Online with live, interactive sessions

Duration: Eight weeks

Language: English and Spanish

Instructor: Utku Pamuksuz, PhD; Artificial Intelligence and Machine Learning, the University of Chicago

About the Course

Our eight-week Artificial Intelligence and Machine Learning course guides participants through the mathematical and theoretical background knowledge they need for the machine learning at use in today's business world. Students will be exposed to fundamental principles in data investigation, exploration, supervised and unsupervised learning, and the functionalities in turning big data into intelligent, actionable insights through machine learning.

You will learn to:

- Design classification and regression models for prediction and reasoning

- Develop a comprehensive understanding of model interpretation and evaluation

- Perform unsupervised and supervised machine learning on large-scale, unstructured/structured data sets

- Understand important pattern discovery concepts, methods, and applications

Techniques and Tools

Who Should Attend?

Technical in nature, this course is intended for those who already have a working knowledge of Python and a solid understanding of linear algebra.

If you feel you do not have the previous experience required and are not comfortable working with these concepts, we recommend you take our **Statistics for Data Science** course to learn about the statistical elements applied to data science or our **Python for Data Science** program to learn how to code in Python.

Meet Your Instructor
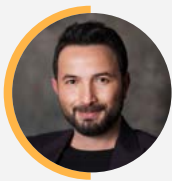
Dr. Utku Pamuksuz is an AI researcher with expertise in data science, business analytics, applied mathematics, and machine/deep learning. He is a frequent guest speaker, delivering keynote sessions in academic and professional seminars in Asia, Europe, and the United States on the application and development of data analytics in the areas of management, finance, strategy, healthcare, e-commerce, and quantitative marketing. Pamuksuz has served as a senior data scientist at State Farm as well as W.W. Grainger. He co-founded Inference Analytics in 2018.

Utku Pamuksuz, PhD; Artificial Intelligence and Machine Learning, the University of Chicago

Why the University of Chicago?

Becoming a member of the University of Chicago community means gaining access to world-class instructors and a cohort of curious, diverse individuals.

Through a firm grounding in core principles and a rigorous approach to problem-solving, our teaching method—the Chicago Approach—will give you the tools you need to make sense of complex data and turn ideas into impact. Course participants will receive a certificate of completion and join a global network of thought leaders.

The University of Chicago Approach to Online Learning

Our online courses are crafted to support your specific professional development goals. Courses combine e-learning with live, interactive sessions to strengthen your skill set while maximizing your time. We couple academic theory and business knowledge with practical, real-world application.

Through online sessions, you will have an opportunity to interact with University of Chicago instructors and your peers.

Career Outlook

A multitude of large corporations, including Accenture, Amazon, IBM, and Microsoft, are using AI and applying large-scale machine learning to boost innovation. Career opportunities for professionals dedicated to AI and machine learning have grown to include roles in the energy, farming, finance, manufacturing, and transportation industries. According to the World Economic Forum, AI/ML roles are the most in-demand in today's job market.

$136k
The average annual base pay for an investment advisor in the US

#1
The rank of AI and machine learning specialist among the most in-demand tech roles

38.1%
The projected CAGR of the global artificial intelligence market from 2022 to 2030

Potential AI and Machine Learning Roles

- AI Engineer
- AI Specialist
- Business Intelligence Developer
- Data-Mining Analyst
- Data Scientist

- Machine Learning Engineer
- Machine Learning Researcher
- Machine Learning Specialist

Weekly Schedule

The Artificial Intelligence and Machine Learning course covers the following topics:

Module 1: Dating with Data—Introduction to Predictive Analytics and the Evolution of ML

- Introduction to advanced data analytics, machine learning applications, and positioning in data-driven decision-making within the business world

- Types of decisions and tools—regression, classification, recommendation, and retrieval

- Connecting data, domain knowledge, business problem, and analytics

- Answering business questions—data visualization, nuances, and modalities

- Neural networks, deep learning, and reinforcement learning concepts

Module 2: Data Exploration and Pattern Detection via Partitioning—Unsupervised Big Data Algorithms

- Finding structure in data—clusters, density, and patterns

- Understanding why clustering analysis is useful

- Learning the mathematical background for distance metrics and its importance in machine learning, DBSCAN, HDBSCAN, optics, and expectation maximization

Module 3: Tackling Big Data Challenges—Data Transformation and Dimension Reduction

- Feature selection, extraction, and transformation

- Singular value decomposition (SVD),independent component analysis, and truncated SVD

- Data transformation, projection, and dimension reduction— understanding SVD

- Feature embeddings, text transformations, and topic models

- Unstructured data concepts—natural language processing fundamentals

- High-dimensional data visualization with UMAP and t-SNE

- Non-parametric data soothing—kernel density estimation

Module 4: From Training to Predictive Decisions— Supervised and Semi-Supervised Learning

- Basic notation, training and model development concepts, the theory of loss function, and learning as an optimization algorithm

- Gradient descent-bayesian networks

- Ridge and Lasso regression

- Descriptive classifiers—k-nearest neighbor and Naïve Bayes algorithm

- Binary class learning—logistic regression

- Hinge, Jacobian, Hessian, and logarithmic loss

Module 5: Evolution of Decisions through ML—Prediction with Support Vectors and Decision Trees

- Discriminative classifiers vs. descriptive classifiers

- Kernel trick and support vector machines

- Tree-based prediction algorithms

- Extracting classification and regression rules from decision trees

Module 6: The Wisdom of Crowds—Ensemble Learning

- From trees to forests—random forest theoretical approach
- Voting classifiers
- Bootstrap aggregation (bagging)
- Boosting methods

Module 7: Unlocking the Machine Black Box

- Essentials of model interpretation and the regularization concept in machine learning
- Performance evaluation metrics and cross-validation
- Generalization error—overfitting vs. underfitting
- Dealing with imbalanced data
- Anomaly detection realm
- Autoencoders—introduction to neural networks

Module 8: Applied ML—Recommendation Systems, Graph Networks, and Social Network Analysis

- Collaborative filtering
- Apriori algorithm
- Recommendation systems
- Homogenous vs. heterogeneous networks
- Graph theory—social network analysis

Course outline may be subject to change based on academic adjustments.

Learn more

To schedule an appointment with admissions, contact **admissions@online.professional.uchicago.edu** or alternatively you can let us know when we can call you **here**.

Visit **online.professional.uchicago.edu** to learn more.