Machine Learning and Deep Learning Program
An eleven-week program covering machine learning and deep learning for IT professionals

DePaul University's *Machine Learning and Deep Learning Program* is designed for IT professionals who want to understand the fundamental principles of machine learning and deep learning and be able to apply them to their businesses. The program is suitable for data scientists and analytics professionals wanting to make the transition from business intelligence to modern data analytics and to bring their machine learning knowledge to the next level—deep learning. The program focuses on machine learning, transfer learning, automated machine learning, and deep learning. The program covers theoretical concepts as well as building of practical skills through several labs where the student will build his own models, and tune and deploy models. The program will prepare students with the necessary skills to create efficient machine learning and deep learning applications to solve business problems and improve business processes.

Program content consists of lectures and demonstrations complemented with hands-on labs. Reading assignments, case studies, group discussions, and projects will be assigned. In order to maximize learning, students will be required to bring their own laptop computer to every class session. Several cloud-based products for machine learning and deep learning will be explored. While access to most of these cloud services will be provided to students in class, there may be some cloud services that are only accessible via the use of the student’s own credit card. Students should expect to spend a small fee to access these services.

**YOU WILL BE ABLE TO:**

- Identify basic concepts, algorithms, and methods in the fields of machine learning and deep learning
- Understand the capabilities provided by various big data analytics frameworks integrated with different machine learning and deep learning platforms offered by Google, Amazon, Microsoft, IBM, etc.
- Clean and analyze data using programming languages, packages, and tools like Python, R, SQL, etc.
- Create effective visualizations to maximize comprehension of complex data sets
- Distill vast stores of complex, unstructured data into actionable insights to support data-driven initiatives
- Gain insight into the use of machine learning and deep learning along with advanced analytics to identify customer behavior patterns and make the best use of available data
- Recognize problems that can be solved with deep learning and select appropriate techniques for problem solving
- Use various deep learning algorithms and tools to build models to solve business problems
- Master deep learning for computer vision and object detection
- Master the most popular tools like Tensorflow, Keras, PyTorch, H2O, etc.
- Describe how organizations are leveraging automated machine learning through case studies.
MACHINE LEARNING AND DEEP LEARNING PROGRAM

CURRICULUM
Each student will have a flexible environment to access different tools, along with sample code and scripts to learn best practices and real-world scenarios. In order to maximize learning, students will be required to bring their own Apple or Windows laptop to every class session. Classroom lectures and demonstrations will be complemented by reading assignments, hands-on exercises, case studies, and projects.

MACHINE LEARNING and DEEP LEARNING OVERVIEW
Introduction to machine learning and deep learning concepts, terminologies, algorithms, processes, model building, training and deployment. Review and discuss different real-world scenarios across different industry sectors.

PREDICTIVE ANALYTICS
Discuss the customer lifecycle and how predictive analytics can play a major role in all its stages. Run different use cases in Python to explore data and different algorithms. Tips and best practices for implementing predictive customer analytics will be addressed. Apply learning from the use cases to help understand and predict customer behavior and to acquire and keep customers.

MACHINE LEARNING
Analyze the impact of aspects of business data - such as missing values, outliers, etc. Review and explore different algorithms along with building linear regression models, classification models, etc. for the task of prediction and feature selection. Handle large sets of features and select between models of various complexity.

AUTOMATED MACHINE LEARNING (AutoML)
Introduce different AutoML methods and tools ranging from simple open source prototypes to industry-scale software products. Discuss the similarities and differences between Data Scientist and Citizen Data Scientist. Access self-service machine learning models, and several offerings for Machine Learning-as-a-Service (MLaaS) in the cloud.

TRANSFER LEARNING
Transfer learning is a popular approach in deep learning where pre-trained models are used as the starting point in computer vision and natural language processing tasks, given the vast computing and time resources required to develop neural network models on these problems.

DEEP LEARNING
Develop and evaluate different deep learning algorithms, such as convolutional neural network (CNN) and recurrent neural network (RNN). Apply deep learning algorithms to build complex models.

GOOGLE TENSORFLOW
An introduction to deep learning fundamentals using Google TensorFlow. Use complex algorithms to develop deep learning models, train models and integrate trained models into applications.

KERAS
A high-level API to build and train deep learning models including first-class support for TensorFlow-specific functionality. Keras makes TensorFlow easier to use without sacrificing flexibility and performance.

PYTORCH
One of the newest deep learning frameworks which is gaining popularity due to its simplicity and ease of use. PyTorch is very popular for its dynamic computational graph and efficient memory usage.
**AMAZON SAGEMAKER**
Launch the AWS Deep Learning AMI along with machine learning and deep learning models leveraging high performance GPUs. Build complex models to solve business problems.

**MICROSOFT AUTOML**
Implement machine learning solutions without extensive programming knowledge. Use Azure machine learning service to design and run your automated ML training experiments in the cloud.

**IBM WATSON ANALYTICS**
Acquire hands-on experience with IBM Watson Analytics along with use cases across a variety of industries.

**H2O**
Leading open source, distributed in-memory machine learning platform with linear scalability. H2O supports the most widely used statistical and machine learning algorithms including gradient-boosted machines, generalized linear models, and deep learning. AutoML has functionality that automatically runs through all the algorithms and their hyper-parameters to produce a leaderboard of the best models.

**GENERAL INFORMATION**

**ADMISSION**
The program is suitable for data scientists, business analytics and other IT professionals who already have a basic understanding of machine learning concepts. Basic experience with Python programming is also required. Experience using cloud services is assumed. In addition, students must bring their own laptop computers running either Windows or Mac OS to class.

A substantial commitment of time is required for this intensive course of study. Final admission will be determined by the admissions committee on the basis of an applicant's overall qualifications, including work history and educational background.

**FACILITIES**
To promote the learning process, the Institute maintains special-purpose laboratories as well as dedicated classrooms equipped with state-of-the-art audio/visual equipment.

In addition, the college’s unique Course OnLine (COL) technology allows students to replay classes over the Internet. COL captures the essential elements of our on-campus classes—the lecture itself and information displayed in class and written on the board—incorporated into a flexible interface, available online a few hours after the class session ends.

**SCHEDULE**
The Institute offers one section of the program each quarter. Classes meet one evening per week. The option to take the program entirely online is also available.

**FACULTY**
The program is taught by Marco Chou. Mr. Chou has been an adjunct lecturer at DePaul University for many years, and has more than 30 years’ experience in the IT industry specializing in database administration, information management, cloud computing and big data analytics. Since 2013 he has developed big data analytics and data science technologies programs for DePaul’s Institute for Professional Development. Mr. Chou will be available throughout the program both in person and through electronic mail.
The college, through its School of Cinematic Arts, School of Computing, and its School of Design, offers a variety of programs at the undergraduate and graduate levels. Over 3,000 students are enrolled in the college’s bachelor’s programs and over 2,700 students are enrolled in the master’s and Ph.D. programs making the college’s graduate program one of the largest in the country. The college offers more than 300 courses each quarter, many in the evening, and primarily in the Loop and Lincoln Park Campuses. Most of the degree programs are also available exclusively online.

**Offerings at the undergraduate level include:**
- Animation B.A. / B.F.A.
- Computer Science B.S.
- Computing B.A.
- Cyber-Physical Systems Engineering B.S.
- Cybersecurity B.S.
- Data Science B.S.
- Film and Television B.A. / B.F.A.
- Game Design B.S.
- Game Programming B.S.
- Graphic Design B.F.A.
- Information Systems B.S.
- Information Technology B.S.
- Interactive and Social Media B.S.
- Math and Computer Science B.S.
- Network Engineering and Security B.S.

**Offerings at the graduate level include:**
- Animation M.A.
- Applied Technology M.S.
- Business Information Technology M.S.
- Computational Finance M.S.
- Computer Science M.S.
- Cybersecurity M.S.

**Master’s of Fine Arts**
- Animation
- Creative Producing
- Film and Television
- Documentary
- Game Design
- Screenwriting

**Ph.D. in Computer and Information Sciences**
- Technology and Innovation
- Web Development with JavaScript and HTML5

The Institute for Professional Development was formed by the college in 1984 to assist both individuals and businesses in keeping pace with the rapid development of computer technologies. The Institute currently offers a variety of intensive certificate programs in these areas:

- Advanced SQL
- Big Data and NoSQL
- Big Data Using Hadoop
- Big Data Using Spark
- Cloud Computing Technologies
- Data Science for Business
- Introduction to SQL
- IPv6
- Java™ Developer
- Modern Information Technology
- Modern .NET Web Developer
- SQL Server® Business Intelligence
- SQL Server® Database Administration
- Technology and Innovation
- Web Development with JavaScript and HTML5

**APPLICATION PROCEDURE:**

You do not have to be an existing DePaul student to take this certificate program. All interested parties must apply for admission. Prospective students may complete the [online application](#) and pay the (non-refundable) $40.00 application fee online during the application process. Alternatively, prospective students may print, complete and return the [printable application](#) via mail or email (ipd@cdm.depaul.edu), and mail the (non-refundable) $40.00 application fee (check or money order made payable to DEPAUL UNIVERSITY) to:

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