ADVANCED DATA SCIENCE WITH PYTHON PROGRAM

An 11-week comprehensive program covering advanced data science techniques using Python and how to apply them in different domains

In order to become a top data scientist, besides knowing how to write programs, it is essential to know the more advanced algorithms and techniques, and how to apply them in different domains. DePaul University’s Advanced Data Science with Python Program is structured for anyone interested in pursuing or furthering a career in data science and who already has foundational skills. Students in this program will deepen their existing knowledge of data science and acquire practical skills for solving real-world data problems.

The program starts with a survey of machine learning techniques, including traditional statistical methods, advanced clustering and classification methods, artificial neural networks, and probabilistic models. Students will learn the mathematical foundations behind all machine learning and data science algorithms covered in the program.

In the second part of the program, students will learn the necessary skills to develop and apply their knowledge in practical fields such as image and video processing, natural language processing, and recommender systems using the Python programming language. The program will broaden students' skill-set of applied data science and give students the tools to further pursue concentrations in the so mentioned analytics and machine learning fields.

Classroom lectures and demonstrations will be complemented by reading and programming assignments. The software used in the program is all open-source or is freely available for download.

YOU WILL BE ABLE TO:

- Understand the role computation can play in solving problems
- Understand the mathematical foundations behind state-of-the-art machine learning algorithms
- Apply knowledge in practical use cases, justify architectural decisions and frameworks, and explain how they impact model performance using Python
- Learn how to work with text, image and video data
- Gain competence in some image and natural language processing algorithms, and how to implement them in Python
# ADVANCED DATA SCIENCE WITH PYTHON PROGRAM

## CURRICULUM
Students in the Advanced Data Science with Python Program are expected to do a considerable amount of work outside of class. Instructors will be accessible in person and through electronic mail. All work can be done using freely available software.

### DATA SCIENCE AND COMPUTATIONAL THINKING
Optimization problems, Graph-theoretic Models, Stochastic Thinking, Random Walks, Monte Carlo Simulation, linear regression, multivariate regression, and ridge regression.

### ADVANCED CLUSTERING
Clustering algorithms: K-means, DBSCAN, Gaussian Mixture Model, Fuzzy- C-means.

### ADVANCED CLASSIFICATION

### IMAGE AND VIDEO PROCESSING
Working with image data in Python. Introduction to Open Source Computer Vision Library (OpenCV).

Image and video processing in OpenCV.

### NATURAL LANGUAGE PROCESSING (NLP)
Natural language processing in Python. Working with text data. An introduction to Natural Language ToolKit (NLTK).

### RECOMMENDER SYSTEMS
A brief introduction to recommender systems and how to implement them in Python.

## GENERAL INFORMATION

### ADMISSION
Applicants are expected to have experience with basic Python programming (including how to create and use modules and packages). Applicants should also be familiar with basic concepts of machine learning such as classification and clustering. It is also beneficial, but not required, to have some experience using the Pandas, NumPy, and SciPy libraries.

A substantial commitment of time is required for this intensive course of study. Acceptance into the program 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 and replays several components of the classroom experience—audio, video, PC screen, and whiteboard—and incorporates them into one interface to provide an innovative rebroadcast system.
CLASSES
The Institute offers one section of the program each quarter. Classes meet one evening per week.

FACULTY
The faculty consists of a team of instructors from the College of Computing and Digital Media and experts from industry. Faculty will be available throughout the program both in person and through electronic mail.
COLLEGE OF COMPUTING AND DIGITAL MEDIA

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. Almost 4,000 students are enrolled in the college’s bachelor’s programs and more than 2,000 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 400 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.
- Computing B.A.
- Computer Science B.S.
- 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.
- Industrial Design M.F.A.
- Information Systems B.S.
- Information Technology B.S.
- Math and Computer Science B.S.
- Network Engineering and Security B.S.
- User Experience Design B.S.

Offerings at the graduate level include:
- Animation M.A.
- Business Information Technology M.S.
- Computational Finance M.S.
- Computer Science M.S.
- Cybersecurity M.S.
- Data Science M.S.
- Digital Communication and Media Arts M.A.
- Experience Design M.A.
- Film and Television M.S.
- Game Programming M.S.
- Health Informatics M.S.
- Human-Computer Interaction M.S.
- Information Systems M.S.
- Network Engineering and Security M.S.
- Product Innovation and Computing M.S.
- Software Engineering M.S.
- J.D./M.S. in Computer Science Technology

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

Ph.D. in Computer and Information Sciences
- Ph.D. in Human Centered Design

INSTITUTE FOR PROFESSIONAL DEVELOPMENT

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 Python
- Advanced SQL
- Artificial Intelligence for Enterprise
- Automated Software Testing
- Big Data and NoSQL
- Big Data Using Hadoop
- Big Data Using Spark
- Cloud Computing Technologies
- Cybersecurity Risk Management
- DevOps
- Data Analytics with Excel and Tableau
- Data Science for Business
- Data Science: Programming with Python
- Fundamentals of Statistics and Machine Learning Using R
- Fundamentals of R
- Incident Response and Digital Forensics
- Introduction to SQL
- iOS Developer
- Modern Information Technology
- Machine Learning and Deep Learning
- Modern .NET Web Development
- 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:

DePaul University
Institute for Professional Development
243 S. Wabash Avenue, Room 301
Chicago, IL 60604-2300

The Advanced Data Science with Python Program at DePaul University is an independent program of study and is not affiliated with, nor has it been authorized, sponsored, or otherwise approved by any other external entities.