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).

### 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.

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## 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 college maintains special-purpose laboratories as well as dedicated classrooms equipped with state-of-the-art audio/visual equipment.

In addition, the college’s Course OnLine (COL) system records classroom lectures that take place on campus, allowing students to replay lectures online. COL captures all classroom elements from audio and video to whiteboard notes and the instructor’s supplemental materials. This system gives students the flexibility to review class content or watch a lecture they may have missed.
CLASSES
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 faculty consists of a team of instructors from the Jarvis College of Computing and Digital Media and experts from industry. Faculty are available throughout the program both in person (for classes that meet on campus) and through e-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. More than 3,500 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.

**Undergraduate programs 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.
- Industrial Design B.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.

**Graduate programs include:**
- Animation M.A. / M.F.A.
- Artificial Intelligence M.S.
- Business Information Technology M.S.
- Computational Finance M.S.
- Computer Science M.S.
- Computer Science Technology J.D./M.S.
- Creative Producing M.F.A.
- Cybersecurity M.S.
- Data Science M.S.
- Digital Communication and Media Arts M.A.
- Documentary M.F.A.
- Experience Design M.A.
- Film and Television M.S. / M.F.A.
- Film and Television Directing M.F.A.
- Game Design M.F.A.
- 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.
- Screenwriting M.F.A.
- Software Engineering M.S.

**Ph.D. Programs:**
- Computer and Information Sciences
- 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:

**Career Changers:**
- Career Change Program

**Artificial Intelligence & Machine Learning:**
- Advanced Data Science with Python
- Artificial Intelligence for Enterprise
- Data Science for Business
- Machine Learning and Deep Learning
- Robotic Process Automation

**Big Data Analytics:**
- Big Data and NoSQL
- Big Data Using Spark
- Data Analytics with Excel and Tableau
- Data Visualization with Tableau
- Data Science: Programming with Python
- Fundamentals of R
- Fundamentals of Statistics and Machine Learning Using R

**Cinematic Arts:**
- Web Series Development

**Cloud Computing and DevOps:**
- Cloud Computing Technologies
- DevOps

**Cybersecurity:**
- Cybersecurity Risk Management
- Incident Response and Digital Forensics

**Database Technologies:**
- Advanced SQL
- Introduction to SQL
- SQL Server® Business Intelligence
- SQL Server® Database Administration

**Mobile Application Development:**
- iOS Developer

**Software Development and Software Testing:**
- Advanced Python
- Automated Software Testing
- Modern .NET Web Development
- Web Development with JavaScript and HTML5

**APPLICATION PROCEDURE:**

Prospective students should complete the online application for the program of interest and pay a $40.00 application fee (non-refundable) online during the application process. Alternatively, prospective students may complete the printable application (PDF) and email it to 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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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.