M.S. in Data Science at Loyola University Maryland

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loyola.edu/datascience
What is Data Science?

- extracts knowledge and insights from data
- Evolving interdisciplinary field:
  - computer science, statistics, and business
- “data science is the art of turning data into actions”
Data Science Process

Brings together disparate data sources to recognize new opportunities and improve current practices.
Need for data scientists

- McKinsey Global Institute report (2011) concludes, "a shortage of the analytical and managerial talent necessary to make the most of Big Data is a significant and pressing challenge (for the U.S.)."
  - Large numbers of positions will only be filled through training or retraining.
  - Project a need more managers and analysts with deep analytical and technical skills “who can ask the right questions and consume the results of analysis of big data effectively”

- IBM Predicts Demand For Data Scientists Will Soar 28% by 2020 (from a Forbes article)

McKinsey Global Institute. "Big data: The next frontier for innovation, competition, and productivity", May 2011
Skills Gaps | Demand for data scientists is off the charts

Data science skills shortages are present in almost every large U.S. city. Nationally, we have a shortage of 151,717 people with data science skills. As more industries rely on big data to make decisions, data science has become increasingly important across all industries, not just tech and finance. In that sense, it’s a good proxy for how today’s cutting-edge skills like AI & machine learning may spread to other industries and geographies in the future.
What is the Need?

National need:

- Number of Job Openings: 32,665 positions in US (3,208 within 50 miles of Baltimore) on glassdoor.com (3/12/2020)

States With the Highest Volume of Data Science Jobs

Number of data science job postings, as listed on Indeed.com, March 2019.

1. California
2. Washington, DC
3. New York
4. Virginia
5. Washington
6. Texas
7. Massachusetts
8. Illinois
9. Maryland
10. Pennsylvania
11. North Carolina
12. Georgia
13. Colorado
14. New Jersey
15. Florida

https://www.springboard.com/blog/data-science-salaries/
Data Science Job Titles

This breakdown of job titles is based on data from Indeed.com, March 2019.

- Data Engineer: 47%, 91,768 positions
- Data Analyst: 34%, 33,894 positions
- ML Engineer: 6%, 16,272 positions
- Data Scientist: 13%, 9,049 positions

Total: 124,049 positions

https://www.springboard.com/blog/data-science-salaries/
Work Features

- Number 1 job for work-life balance

- Salary:
  - National average: $113,309
  - Baltimore area average: $108,038

How much can I expect to earn?

**Source** - O’Reilly 2017 Data Science Salary Survey
## Average Salaries by State and Job Title for the Top 15 Markets

<table>
<thead>
<tr>
<th>State</th>
<th>Data Scientist</th>
<th>Data Analyst</th>
<th>Data Engineer</th>
<th>Machine Learning Engineer</th>
<th>Number of 'data science' job postings</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>$142,338</td>
<td>$90,562</td>
<td>$138,215</td>
<td>$114,826</td>
<td>3,521</td>
</tr>
<tr>
<td>Washington, DC</td>
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<td>$73,015</td>
<td>$124,571</td>
<td>$134,467</td>
<td>1,683</td>
</tr>
<tr>
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<td>$71,589</td>
<td>$123,070</td>
<td>$117,268</td>
<td>1,322</td>
</tr>
<tr>
<td>Virginia</td>
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<td>$71,175</td>
<td>$97,059</td>
<td>$123,744</td>
<td>1,243</td>
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<td>Washington</td>
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<td>$117,345</td>
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<td>$150,430</td>
<td>1,075</td>
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<tr>
<td>Texas</td>
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<tr>
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<td>$70,529</td>
<td>$104,200</td>
<td>$160,110</td>
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<tr>
<td>Illinois</td>
<td>$106,135</td>
<td>$65,273</td>
<td>$103,113</td>
<td>$129,958</td>
<td>659</td>
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<tr>
<td>Maryland</td>
<td>$117,345</td>
<td>$67,377</td>
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<td>$128,970</td>
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<tr>
<td>Pennsylvania</td>
<td>$103,995</td>
<td>$63,977</td>
<td>$95,332</td>
<td>$115,838</td>
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<td>$117,345</td>
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<td>$116,591</td>
<td>$144,444</td>
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<tr>
<td>Georgia</td>
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<td>$69,707</td>
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<td>Colorado</td>
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<td>$67,377</td>
<td>$103,633</td>
<td>$128,000</td>
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<tr>
<td>New Jersey</td>
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<td>Florida</td>
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<td>$67,377</td>
<td>$116,591</td>
<td>$124,464</td>
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</table>

Sources: Glassdoor and PayScale, March 2019.

Application Areas

Why Loyola?

• creating ethical data scientists
• ethics integrated into the learning aims
• care for the whole person
• faculty-student relationships
• location, location, location
  • strong employers in Baltimore/Washington
  • NASA, NSA, NOAA, DOD, Lockheed Martin, Booz Allen Hamilton and many more
• educates students in an interdisciplinary
• field helping students adjust to changing times
• meets growing societal need
Program

• applied program
• cornerstone: 2-semester interdisciplinary practicum
• first semester: students design an individual or group project using data from an industrial partner
• second semester: complete the project
• work with companies, government agencies, and non-profits for projects with mentors
• program board: reviews design and completed project
Courses delivery

- Currently, each course is delivered in a hybrid format.
  - At least 50% of the course will be delivered in-person at the Columbia Graduate Center (some options at Timonium campus)
  - Up to 50% a class periods will be delivered on-line
  - Accommodates the busy schedule of part-time students

- Notes: 1. Given the current situation, some courses are currently being delivered fully online.
  2. Starting in Fall 2021 students beginning in the program will receive a fully online instruction.
Learning aims

• students will understand the underlying **principles of data science** and be able to **keep up with this expanding field**
• students will be proficient in **analyzing complex data from diverse sources** by discovering key relationships within the data
• students will be able to **model data using machine learning techniques**.
• students will be able to **model data using statistical models**
• students will be able to **predict future outcomes** that can be used to advise decision makers on their course of action
• students will be knowledgeable of general **ethical principles**, how these principles apply to data science, and the social context of data science
Specializations

- Technical Specialization
- Business Analytics Specialization
Mathematics/Statistics Prerequisites

• Introductory statistics
• The statistics prerequisite can be satisfied by taking GB 715 – Applied Business Statistics (or an approved introductory statistics course at another institution)
• To make the program accessible to a wide audience, there is no mathematics prerequisite
• But to be successful in data science a solid foundation in mathematics is essential. (e.g. discrete methods, linear algebra, calculus I, calculus II, ...)
Computing Background

• To make the program accessible to a wide audience, the program begins with an introductory programming course.
• This course will be waived for students with an appropriate background.
• Background to waive programming course:
  • Introduction to Computer Science/Programming (usually a 4-credit course)
  • Appropriate professional experience
  • Students are expected to be able to
    • use control structures including functions, if-statements, and loops to solve problems using Python
    • utilize lists
    • have some experience reading and writing files
# Data Science Technical Specialization

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Requirements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS701</td>
<td>Introduction to Programming (waiveable)*</td>
<td>3</td>
</tr>
<tr>
<td>CS703</td>
<td>Programming for Data Science</td>
<td>3</td>
</tr>
<tr>
<td>DS730</td>
<td>Introduction to Data Science</td>
<td>3</td>
</tr>
<tr>
<td>DS851</td>
<td>Business Intelligence and Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>ST710</td>
<td>Statistical Computing</td>
<td>3</td>
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<td>ST765</td>
<td>Statistical Models</td>
<td>3</td>
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<tr>
<td>DS795</td>
<td>Data Science Project Design</td>
<td>1</td>
</tr>
<tr>
<td>DS796</td>
<td>Data Science Project</td>
<td>3</td>
</tr>
<tr>
<td><strong>Additional Requirements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS737</td>
<td>Machine Learning</td>
<td>3</td>
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<tr>
<td>CS Elective</td>
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<td>3</td>
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<tr>
<td>ST Elective</td>
<td></td>
<td>3</td>
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<tr>
<td>CS/ST/GB Elective</td>
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<td>3</td>
</tr>
<tr>
<td><strong>Total Program Credits</strong></td>
<td></td>
<td>34 (31)</td>
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</table>
## Business Analytics Specialization

<table>
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<tr>
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<tbody>
<tr>
<td><strong>Core Requirements</strong></td>
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<td></td>
</tr>
<tr>
<td>CS701</td>
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<td>3</td>
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<tr>
<td>CS703</td>
<td>Programming for Data Science</td>
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<td>ST765</td>
<td>Statistical Models</td>
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<tr>
<td>DS795</td>
<td>Data Science Project Design</td>
<td>1</td>
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<td>DS796</td>
<td>Data Science Project</td>
<td>3</td>
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<tr>
<td><strong>Additional Requirements</strong></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>3 electives from Business or CS,ST</td>
<td>9</td>
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<tr>
<td><strong>Total Program Credits</strong></td>
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</tr>
</tbody>
</table>

*If CS701 is waived, an additional elective is required.*
Admission Process

- [http://www.loyola.edu/academics/data-science/admission](http://www.loyola.edu/academics/data-science/admission)
- Deadlines: Spring term – December 1; Fall term- May 15
- Online application
- Official transcripts from all colleges and universities attended
- Essay
- A number of merit-based scholarships will be awarded. No separate application is required.
Tuition and Financial Aid

$850/ credit

Financial Aid information available at:
www.loyola.edu/department/financialaid/graduate

Financial Aid Questions:
Brandon Gumabon, bggumabon@Loyola.edu, 410-617-2559
Danielle Ballantyne, dballantyne@Loyola.edu, 410-617-5205

Visit www.loyola.edu/datascience to begin your application

THANK YOU
Contact

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