

WHY DATA SCIENCE MATTERS: FIVE TRENDS INFLUENCING THE FIELD

WHITE PAPER



UNIVERSITY OF NOTRE DAME

MS-ACMS: DATA SCIENCE ONLINE PROGRAM

Get the Notre Dame Edge in data science with skills for immediate and long-term career growth in the field.

Whether you work in the private sector or in a not-for-profit, conversations these days may include the topics of Big Data¹, the Internet of Things², business intelligence and analytics.

Organizations are gathering more data than ever before. This data can help inform better business, public policy and personal decisions. However, this is only possible when data scientists contextualize information to bridge the gap between raw data and actionable insights. This white paper explores five trends that highlight the reasons why data science matters to organizations.



TREND 1:

DEMAND FOR DATA SCIENTISTS WILL INCREASE AS A WIDE RANGE OF INDUSTRIES RECOGNIZE THE POWER OF BIG DATA

Big Data is expected to become more widely adopted in businesses, as it has the potential to predict consumer behavior, create offers that are customized to “markets of one”³ and anticipate market trends. In order to actualize this potential, businesses and institutions must cultivate data-oriented cultures, as well as invest in and execute data-driven strategies.

As John Donovan, Chief Strategy Officer and Group President, AT&T Technology & Operations, best summarized, “More data creates more opportunities for every business, but that data is only good if it’s used properly. This means that more data scientists will be needed in every facet of a company. This global trend won’t slow down anytime soon.” In fact, the demand for Big Data analytical talent in the U.S. is projected to be 50% to 60% greater than supply by 2018.^{4,5} As organizations push to fill this shortage, they will need to hire more data scientists and managers and are willing to pay for talent. O’Reilly Media reports that 25% of U.S. data scientists will make over \$138,000 a year.⁶

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— JOHN DONOVAN
*Chief Strategy Officer and Group President,
AT&T Technology & Operations*

TREND 2:

THE NEED FOR DATA STORYTELLING IS SKYROCKETING

The most effective data scientists are storytellers. A research study in PLoS One found that scientific papers were more widely circulated and cited by scientists when they featured good storytelling.^{7,8} This same logic applies to disseminating data and business findings in a corporate setting. Data science professionals cannot simply provide analysis; they must express data-driven insights through effective storytelling and communication.

Today's data scientists have become critical team members because they are required to communicate data-based insights across organizational departments. They must explain how data should inform business decisions, convey the ethical implications

of data usage and advocate for privacy and security measures that are in an organization's and the public's best interest. Additionally, data scientists may need to contextualize data for compliance officers, by highlighting how data and regulations intersect and by recommending ways for their organizations to maintain regulatory compliance.

Statistical analysis and data mining retained the number two spot from 2016 in LinkedIn's list of top skills for 2017. However, data presentation entered the top 10 for the first time.⁹ It remains clear that data scientists cannot just apply algorithms to information; they also need the skills to contextualize this information for different audiences.

TREND 3:

EFFECTIVE DATA SCIENCE OCCURS AT THE INTERSECTION OF DOMAIN EXPERTISE AND QUANTITATIVE ANALYSIS

Research from the McKinsey Global Institute found that a major contributor to the data science talent shortage is the lack of "business translators."¹⁰ These are individuals who are skilled at linking data analytics with practical business questions, a core competence for effective data scientists. They apply strategic, critical thinking to their work, while ensuring that data science initiatives follow an ethical framework that incorporates privacy issues.

Since data is pervasive across many different organizational departments,

business translators will be required in multiple functional areas. McKinsey Global Institute estimates that over the next decade, U.S. organizations will seek to hire two to four million of these business translators. This was validated by Donovan who recognized that, "We need experts in a variety of specialties, including network function virtualization, software defined networking, security, and the Internet of Things. Every one of these areas is reliant on data and the ability to precisely analyze it for our business and customers."

TREND 4:

BIG DATA CAN BE USED FOR THE COMMON GOOD

Different industries and sectors are discovering the power of data science to promote the common good.¹¹ In 2017, for example, data science usage is expected to grow in healthcare to predict virus outbreaks and patient behavior and to improve epidemic outcomes.¹² Health and wellness teams can gather helpful insights by aggregating individuals' anonymized health information into Big Data repositories.

Data science experts from the University of Notre Dame are using their expertise to help health researchers develop more precise diagnostic tests and treatments and gain insight into the effects of patient behavior on the progression of diseases:



PROFESSOR STEVEN BUECHLER,

from the University of Notre Dame's Department of Applied and Computational Mathematics and Statistics, applied data science to the field of molecular biology to improve the accuracy of diagnoses and identify targeted therapies to help breast cancer patients.¹³

ASSISTANT PROFESSOR JUN LI,

working with an interdisciplinary team of Notre Dame researchers, has designed rigorous statistical tests that may shed more light on treatments for diseases like Alzheimer's disease, cystic fibrosis, liver diseases and diabetes.¹⁴



PROFESSOR NITESH CHAWLA,

of the University of Notre Dame's Department of Computer Science and Engineering, is working towards a future where data science will help individuals with pre-diabetic symptoms. Professor Chawla studied what types of behaviors led similar patients to avoid diabetic diagnoses and which behaviors lead to the development of full-blown diabetes.¹⁵

THE EVIDENCE IS CLEAR. DATA SCIENCE CAN PLAY A CRITICAL ROLE IN IMPROVING HEALTHCARE—ONE OF MANY DISCIPLINES THE FIELD IS POSITIVELY IMPACTING.

TREND 5:

DATA SCIENCE IS THE KEY TO DERIVING MAXIMUM VALUE FROM THE INTERNET OF THINGS (IOT)

As the number of Internet connected devices grows, the volume of data generated will continue to increase. Companies need data scientists who are experts at data blending to derive benefits from this information. The best data scientists understand how to blend information from social media, mobile apps, CRM records and other sources to identify hidden patterns and useful insights. Data scientists will also need to be prepared to address the new challenges posed by the IoT, including data governance issues, standards development and security.

ADVANCING YOUR CAREER IN DATA SCIENCE WITH NOTRE DAME

In order to meet the demands of businesses and organizations looking to hire more data scientists, many professionals are looking for ways to advance their careers in the data science field. The University of Notre Dame's online Master of Science in Applied and Computational Mathematics and Statistics (MS-ACMS): Data Science Specialization program, completed at half-time pace through a flexible, online format, is an ideal way for busy professionals to build their data science knowledge.

AN INTERDISCIPLINARY CURRICULUM DESIGNED FOR SHORT AND LONG-TERM SUCCESS

The program goes beyond computation and programming. Students learn to utilize data to influence policy, consumer experiences, business operations and more. Building upon the foundational math requirements necessary for admission into the program, program participants boost their quantitative intelligence and develop the deep mathematical and statistical foundations that supports thorough data comprehension. This knowledge will survive fads, trends and changing technology applications.

Since companies and organizations are seeking data scientists with a unique blend of technical, analytical and presentation

skills, Notre Dame's MS-ACMS: Data Science program is designed to train students in all of these domains. The program provides students with a strong mathematical and technical education. However, Notre Dame also leverages its experience as a liberal arts university by building communication and storytelling skill development into the curriculum. The student-centered curriculum is delivered on a custom-built online platform that enables social interaction during live, synchronous courses. This provides students with critical opportunities to enhance their communication skills and work with other professionals from a variety of backgrounds.

REAL WORLD APPLICATION AND UNPARALLELED FACULTY

The Notre Dame MS-ACMS: Data Science program is designed with real-world application. The program enables students to explore ways that Big Data can be used to help society address real challenges related to disciplines like healthcare, education, environmental science and information security. Students see firsthand how data science informs public policy and programs.

Students also learn how different types of businesses manage Big Data and use data analytics to make decisions and inform new product development. To bring industry insights to life for program participants, Notre Dame is proud to collaborate with AT&T. Through this alignment, students benefit from a degree offered by a university renowned for its academic excellence and a program informed by industry experts.

Summarizing the value of this relationship, Donovan expressed, "There's a growing need for skilled data scientists—both at AT&T and

virtually every major industry around the world. Our hope is this collaboration creates a premier degree program that will prepare graduates for careers as data scientists in a wide range of industry fields including management, marketing, information technology, government policy, healthcare, finance, education and scientific research."

The program has been designed by award-winning faculty from the Departments of Applied and Computational Mathematics and Statistics, Computer Science, Psychology and Management. The faculty team has extensive experience addressing challenging data science problems, using tools such as network science, machine learning and statistical bioinformatics. This type of expertise ensures students are participating in a program that will prepare them for new challenges arising in the data science field.



CONCLUSION

The demand for data scientists is growing and many individuals are considering entering or advancing their career in the field. However, not every aspiring data scientist has the quantitative intelligence, mathematical and statistical foundation and communication skills needed to thoroughly understand and translate information into key insights understood by the rest of the organization. Notre Dame's MS-ACMS: Data Science program helps students become three-dimensional data scientists that perform at the highest levels of the field, supporting business decisions and using data science to promote the common good.

DOWNLOAD THE STUDENT PROSPECTUS TO LEARN MORE ABOUT:

- *The flexible program format, structure and curriculum*
- *The application and admissions process*
- *An exciting collaboration with AT&T*
- *How to get the Notre Dame Edge in Data Science*

[Download Prospectus ↗](#)

END NOTES

- ¹ *What is big data?*
Retrieved from <https://www-01.ibm.com/software/data/bigdata/what-is-big-data.html>
- ² **Chivukula, Bharadwaj "Brad."** (2016, October 7). *The Top 5 Trends in Big Data for 2017.* Retrieved from <http://www.information-management.com/news/big-data-analytics/the-top-5-trends-in-big-data-for-2017-10029956-1.html>
- ³ *Market of One.*
Retrieved from <http://www.businessdictionary.com/definition/market-of-one.html>
- ⁴ **Manyika, James, et. al.** (2011, May). *Big Data: The next frontier for innovation, competition, and productivity.* Retrieved from <http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/big-data-the-next-frontier-for-innovation>
- ⁵ **Hansen, Drew.** (2016, October 21). *How to Become a Data Scientist in 2017.* Retrieved from <http://www.forbes.com/sites/drewhansen/2016/10/21/become-data-scientist/#42e7b02e5b1b>
- ⁶ *2016 Data Science Salary Survey.*
Retrieved from <http://www.oreilly.com/data/free/2016-data-science-salary-survey.csp>
- ⁷ **Hillier, Ann, et. al.** (2016, December 15). *Narrative Style Influences Citation Frequency in Climate Change Science.* Retrieved from <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0167983>
- ⁸ **Squires, Bethy.** (2016, December 26). *How Storytelling Changes the Way You Think About Science.* Retrieved from https://broadly.vice.com/en_us/article/how-storytelling-changes-the-way-you-think-about-science
- ⁹ **Fisher, Catherine.** (2016, October 20). *LinkedIn Unveils The Top Skills That Can Get You Hired in 2017, Offers Free Courses for a Week.* Retrieved from <https://blog.linkedin.com/2016/10/20/top-skills-2016-week-of-learning-linkedin>
- ¹⁰ **Chakraborty, Sumit.** (2016, December 7). *McKinsey finds it's all talk and little action with data analytics in most companies.* Retrieved from <https://www.techinasia.com/mckinsey-finds-data-analytics-sham>
- ¹¹ **[TEDx Talks].** (2014, February 27). *Big Data for the Common Good: Nitesh Chawla at TEDxUND.* [Video File]. Retrieved from <https://www.youtube.com/watch?v=eBJmj2cJrpE>
- ¹² **Dipper, Andrew.** (2016, December). *Data Science Trends to Look Out for in 2017.* Retrieved from <http://www.kdnuggets.com/2016/12/data-science-trends-2017.html>
- ¹³ *Fighting to Beat Breast Cancer.*
Retrieved from <https://www.nd.edu/fighting-for/2011/fighting-to-beat-breast-cancer/>
- ¹⁴ *Notre Dame interdisciplinary researchers receive \$1.1 million grant from NIH.* (2016, September 12). Retrieved from <http://chemistry.nd.edu/news/notre-dame-interdisciplinary-researchers-receive-11-million-grant-from-nih/>
- ¹⁵ **[Notre Dame Development].** (2015, June 15). *Nitesh Chawla Interview - Notre Dame Day 2015.* [Video File]. Retrieved from <https://www.youtube.com/watch?v=LjUpz-FFkGA>