

# ANALYTICS (DATA)

## Degrees Offered: M.S., Graduate Certificate

*This program is offered in Durham.*

The full-time, 11-month Master of Science in Analytics program immerses students in the skills necessary to become effective analytics professionals, including: quantitative tools, applications and reasoning, critical thinking and presentation/communication skills. This program places heavy emphasis on student application of knowledge and skills through a two-semester practicum where students work in teams to complete an industry or government sponsored real-world analytic problem. In addition, the program emphasizes student professional development with respect to written and oral communication, leadership, and career development. Students specialize in a domain of interest by choosing a "cluster" made up of two courses in a specific area of study. Currently the program offers business, health, and sports clusters. For more information, view the MS Analytics program flyer.

## Admission Requirements

Applicants are expected to hold a Bachelor's degree as verified by official transcripts with a minimum GPA of 3.0 from an accredited undergraduate/graduate degree institution(s), at least one statistics course, three letters of recommendations, current CV, Completion of the four essay questions, and an interview with an Analytics Program faculty.

<http://www.unh.edu/analytics/>

## Programs

- Analytics (M.S.) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/analytics/analytics-ms>)
- Public Policy and Analytics Dual Degree (M.P.P./M.S.) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/analytics/analytics-public-policy-dual-degree-mpp-ms>)
- Analytics (Graduate Certificate) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/analytics/analytics-certificate>)
- Data Science (Online Graduate Certificate) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/analytics/data-science-online-certificate>)

## Courses

### Analytics (DATA)

#### DATA 800 - Introduction to Applied Analytic Statistics

**Credits:** 3

This course is designed to give students a solid understanding of the experience in probability, and inferential statistics. The course provides a foundational understanding of statistical concepts and tools required for decision making in a data science, business, research or policy setting. The course uses case studies and requires extensive use of statistical software.

#### DATA 801 - Foundations of Data Analytics

**Credits:** 3

This course introduces students to the principles and practice of analytics. The course emphasizes software tools used in the field of data science and covers topics such as data exploration and imputation, linear modeling, time series forecasting, customer segmentation, multivariate techniques and predictive modeling. Prereq: DATA 800.

#### DATA 802 - Analytical Tools and Foundations

**Credits:** 3

The course introduces students to the tools used in applications of data analytics programming, data management, visualization, and web analytics. Students learn how to use SAS and R programming as well as data visualization tools in a case analysis based environment. Base SAS programming focuses primarily on data extraction from various sources, web scraping, data cleaning and management. The emphasis is on making students proficient in statistical programming languages like SAS, SQL, R, and Python. Prereq: DATA 800.

#### DATA 803 - Introduction to Analytics Applications

**Credits:** 3

The course introduces students to various analytics applications including web analytics, Data Mining, Simulation and Text Mining. Students learn these techniques through hands-on case studies from various industries. Prereq: DATA 800.

#### DATA 812 - Health Analytics

**Credits:** 3

This course introduces students to the field of health analytics and data science. It expands upon introductory statistical and data manipulation methods to include data mining, predictive analytics, cluster analysis, trend and pattern recognition, and data visualization. It couples data skills with interpretive and communication skills. Students will also be exposed to basic statistical programming. There will be a graduate component of the course (812) where students will work on advanced concepts and complete a separate culminating project.

#### DATA 820 - Programming for Data Science

**Credits:** 3

In this class, students will build their foundational toolbox in data science: upon completion, students will be able to use the computer from the command line; practice version control with GIT & GitHub; gain a mastery of programming in Python; data wrangling with Python and perform an exploratory data analysis (EDA) in Python. All learning objectives are achieved through active application of these techniques to real world datasets. Pre- or Coreq: DATA 800.

#### DATA 821 - Data Architecture

**Credits:** 3

In this class, students will learn the foundations of databases and large datasets: upon completion, students will be able to explore out-of-ram datasets through traditional SQL databases and NoSQL databases. Students will also be introduced to distributed computing. All learning objectives are achieved through active application of these techniques to world datasets. Prereq: DATA 800; DATA 820.

**DATA 822 - Data Mining and Predictive Modeling****Credits:** 3

In this class, students will learn foundations of practical machine learning: upon completion, students will be able to understand and apply supervised and unsupervised learning in Python to build predictive models on real world datasets. Techniques covered include (but not limited to): preprocessing, dimensionality reduction, clustering, feature engineering and model evaluation. Models covered include: generalized linear models, tree-based models, bayesian models, support vector machines, and neural networks. All learning objectives are achieved through active application of these techniques to real world datasets. Prereq: DATA 800; DATA 820 Pre- or Coreq: DATA 821.

**DATA 860 - Data Visualization Foundations****Credits:** 3

This course provides foundational knowledge about human visual intelligence and cognition, and how it informs the best practices of data visualization and communication. Subjects to be covered include – understanding and evaluating the data to be displayed; the importance of, and techniques for, creating personas and researching mental models; when to use a table versus when to use a graph; the correct use of color and layout. Building on these fundamentals students will also learn the best practices of report and dashboard design development, testing and deployment, and will apply this knowledge to create several projects and graphical displays of data using the Tableau software application. Prereq: statistics (any college level).

**DATA 888 - Special Topics****Credits:** 3

This course will explore the purpose, design, and analysis of a real-world data science project guided by faculty. Students will be provided a collection of data sets and systematically work through data cleaning, data merging, and the application of a variety of data science methods. The outcome of the course will be an iterative, faculty-guided exploration. The outcomes of the class will be a formal presentation for public consumption using data science visualizations. Prereq: Permission.

**DATA 896 - Self-Designed Analytics Lab I****Credits:** 3

This is the first of a two course self-designed thesis sequence offered under the master's of science degree in analytics. The nature of the class will be applied learning directly around a student directed analytic thesis project. Students will have a choice of either bringing an analytical problem of their interest or one assigned by the instructor out of the ongoing projects in the lab. The student chosen problem will be vetted thoroughly and a decision will be made based on the depth of the proposed data management and analysis proposed submitted in the proposal. Once approved by the committee, the students will collect, clean, merge and create readable analytical files for the project and write a formal 2000+ words report on the data mining part of the project. Prereq: DATA 803 and permission.

**DATA 897 - Self Designed Analytics Thesis Lab II****Credits:** 3

This is the second of a two course self-designed thesis sequence offered under the master's of science degree in analytics. The nature of the class is applied learning directly around a student directed analytic thesis project. The class requires competency in two areas for the successful completion of the course. Students will have completed the data collection, cleaning and management and created readable analytic files for the project of their choice in the first of the two course sequence. Students are primarily responsible to apply modern analytical tools and techniques like predictive modeling, segmentation, and network analysis etc. They are also required to write a formal 2000+ word report on the findings of the project. The report is expected to include modern data visualization synthesized with analysis results. Prereq: DATA 803.

**DATA 900 - Data Architecture****Credits:** 3

The module-driven course builds off previous introductory analytics coursework and exposes students to advanced level concepts and techniques with respect to big data, data management, architecture, mining, privacy, and security concerns. Prereq: DATA 800.

**DATA 901 - Analytics Applications I****Credits:** 3

This is the second of the four advanced core courses. This course is partly geared towards analytical business problem solving. This course covers the following broad topics areas: Text Mining, Visualization, Customer analytics and Segmentation, Financial Analytics, Optimization, and Risk analytics. The course is taught by different faculty and industry experts. Prereq: DATA 800.

**DATA 902 - Analytics Methods****Credits:** 3

This is the third of the four advanced core courses. The module-driven course builds off previous introductory analytics coursework and exposes students to advanced level programming and data management, predictive modeling, experiment design, multivariate techniques, probability and statistical inference. Prereq: DATA 800.

**DATA 903 - Analytics Applications II****Credits:** 3

This is the last of the four advanced core courses. The module-driven course covers the following broad topic areas: survival analysis, propensity score matching, time series and forecasting, simulation, survey and psychometrics, and web analytics format. This course is taught by a mix of Analytics Program faculty and industry experts. Prereq: DATA 800.

**DATA 911 - Analytics Practicum I****Credits:** 3

This course introduces students to the practicum project and synthesizes learning from the curriculum into the analysis of their team projects. It includes applied skills in data cleaning, data mining, and analysis, but also professionalization, including business writing, presentation skills and messaging. Prereq: DATA 800.

**DATA 912 - Analytics Practicum II****Credits:** 3

This course continues the practicum learning experience with teams applying principles and tools to address their assigned project question. In addition, this course continues to develop the professional skills of students culminating in the delivery of a professional team presentation to their sponsor agency of their results. Prereq: DATA 800.

**DATA 950 - Population Health Analytics****Credits: 3**

This on-line course provides students with a foundation in population health principles, strategies and analytics. It provides a tool kit of analytic solutions that address lowering the cost of high needs patients, improving health outcomes, and sustaining population health. The instructional methodologies include brief lectures, multi-media resources, case studies, simulations, hackathons, virtual site visits, discussion forums, use cases, and a demo day.

**Faculty**

See <http://www.unh.edu/analytics/faculty-staff> for faculty.