

**DATA ANALYTICS AND VISUALIZATION**

General Course Information:

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| Faculty name/title: | Dr. Andres Fortino |
| NYU email address: | [agf249@nyu.edu](mailto:agf249@nyu.edu) |
| Course title/number: | Data Analytics and Visualization \ MASY-GC5000-200 |
| Semester/Year | January 2021 |
| Credits as applicable: | 3 |
| Session: | 1 |
| Number of Classes: | 1 |
| Dates/Day(s): | **1/4/21-1/21/21** |
| Time: | 06:20pm -- 09:20pm EST/EDT |
| Mode of Delivery: | Online - Synchronous |
| No Class Dates: | Martin Luther King, Jr. Birthday - January 18, 2021 |
| Special Notes: | Class dates:  M-F 1/4/21 - 1/8/21  M-Th 1/11/21 – 1/14/21  Tu-Th 1/19/20 - 1/21/21 no class 1/18/21 |
| Office Hours: | Students will have an opportunity to schedule via phone or email. |

Course Description:

This seminar will enhance curriculum by identification, analysis and application of special topics pertinent to the Management and Systems degree. The specific titles and content of each seminar will change to reflect emerging areas of interest, which can only be determined at the time of offering. The course may be used to satisfy the elective degree requirement. Applicability to specific concentrations will be noted in the course schedule and is at the department’s discretion.

# Course Prerequisite

Course Structure/Method:

# Additional Course Description:

This course prepares students to support management decision making by the insightful use of data analytics. Students learn to use the tools of data science and apply them to support decision making. They learn to translate business questions into well framed analytical questions. Students learn how to apply the data mining architecture Knowledge Discovery in databases (KDD) architecture to undertake data analysis initiatives. Students apply the CoNVO model to analysis business information needs by analyzing the context and needs of organizations and envision modeling approached, design and create machine learning models and deploy the models to achieve successful organizational outcomes. Students apply supervised and unsupervised machine learning techniques to convert data into information, explore datasets, analyze, summarize, and visualize data, creating interactive exploratory analytics and preliminary predictive analytics to develop actionable insights.

This is an Online - Synchronous lecture and lab class. You derive the greatest benefit from the class by being present in class every week, following the instructions of your faculty on the processes, procedures and methods of business analytics. Then practicing them during class session or the lab session under faculty direction to master them. You get further opportunities to master the concepts by doing all the homework assignments. NYU Classes is the only learning management system we will use. You are expected to log-in to NYU Classes frequently for course announcements, assignments and Zoom access. Zoom is the remote instruction platform used at NYU. This is an individual-efforts class, no teamwork. You are welcomed to consult with colleagues on deliverables but you will derive the greatest return on your investment of time and tuition if you always do your own work. That is the way to transform into a professional in this field. And the efforts you put in to master the material will pay great dividends when you interview for a job and begin working in the field. This is your opportunity to become a professional. Your faculty member is always available to consult when you have problems and can’t complete an assignment because you did not understand something.

Course Learning Outcomes:

At the conclusion of this course, students will be able to:

* Prepare data sets including data scraping, cleaning, and shaping
* Frame analytical business questions
* Convert data to information, including data exploration, summarization and visualization
* Analyze data using contingency tables, predictive analytics, linear and logistical regression clustering and decision trees
* Conduct hypothesis testing using inferential tests

Communication Policy:

Please always send any email communication to my faculty NYU email address ([agf249@nyu.edu](mailto:agf249@nyu.edu)). It is always best to communicate through NYU Classes course-mail as that leaves an official record of all our communication which protects you. All NYU students taking classes for credit must use their NYU email to communicate with faculty at all times. The use of NYU Classes course-mail supports your student privacy and FERPA rights. If you follow this process all inquiries will be answered within 24 hours.

Students have the opportunity to add their pronouns, as well as the pronunciation of their names, into Albert. Students can have this information displayed to faculty in Albert, NYU Classes, and other NYU systems. Students can also opt out of having their pronouns viewed by their instructors.

<https://www.nyu.edu/students/student-information-and-resources/registration-records-and-graduation/forms-policies-procedures/change-of-student-information/pronouns-and-name-pronunciation.html>

Course Expectations:

## Attendance

Students are expected to attend all classes. Excused absences are granted in cases of documented serious illness, family emergency, religious observance, or civic obligation.  In the case of religious observance or civic obligation, this should be reported in advance.  Students are responsible for assignments given during any absence.  A student who has three unexcused absences may earn a Fail grade.

Students who join the course during add/drop are responsible for ensuring that they identify what assignments and preparatory work they have missed and complete and submit those per the syllabus.

University Calendar Policy on Religious Holidays: <https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/university-calendar-policy-on-religious-holidays.html>

**Classroom Expectations**

As graduate students, you are expected to conduct yourselves in a professional manner and engage and collaborate with your classmates. For online courses using the Zoom meeting room, here are our guiding principles:

* Dress as if you are in the Classroom.
* Keep your microphone muted unless asking a question or engaging in discussion.
* Check your video and audio when entering your class session.
* Think background, minimize distractions around you.
* Look into the camera instead of looking at the screen.
* Type quietly, mute if necessary.
* Don’t eat during a Zoom class session and refrain from engaging in any activity such as smoking, consuming alcohol, etc. that you would not engage in if the class was in person.

SPS classrooms are diverse and include students who range in age, culture, learning styles, and levels of professional experience. To maintain an inclusive environment that ensures all students can equally participate with and learn from each other, as well as receive feedback and instruction from faculty during group discussions in the classroom, all course-based discussions and group projects should occur in a language that is shared among all participants.

**Assignments**

**Assignments** – Module Assignments – 1 Assignments (35%)

Each of the major modules of the class will be concluded with an assignment in the form of an exercise to assure the student have mastered the material presented. Instructions for the assignments are posted to the NYU Classes class website. The main assignment is worth 35 percent towards the final grade. Late assignments will receive a 20% penalty in the grade. Assignments submitted more than one week late will receive no credit.

* Assignment 1 – Case Study 1 SFO – Marketing Analysis (35%)
  + Assignment 1A – SFO Deliverables (individual) 5%
  + Assignment 1D – SFO Proposal (team) 10%
  + Assignment 1E – SFO Analysis and Models (team) 20%
* Assignment 2 – Kaggle Competition Titanic Disaster (Individual) - Optional

**Labs (homework assignments)** – 5 graded Labs (50%) as homework assignments. The answers to the labs will be entered in the appropriate Quiz in the NYU Classes class website. We will start the lab at the end of each session, if the lab is not completed within the session, each student will have an additional 24 hours from the end of the lab to complete the lab work and enter a complete set of answers to the labs.

* + Lab 1 - Data Wrangling 10%
  + Lab 2 - Framing Analytical Questions 10%
  + Lab 3 - Descriptive Statistics 10%
  + Lab 4 - Linear Regression 10%
  + Lab 5 - Predictive Models 10%

**Final** – There will be a short 1 hour in-class final. (5%). A practice final exam will be made available for you to practice taking the final exam.

**Reflection Quizzes as Review** (10%)**:**

There are12 required REs (Reflection Exercises, 1% each for taking them, not based on the score). To help you remember. You must complete 10 out of the 12 RE’s for a full score.

**Technology Policy**

All class sessions require use of Zoom. All class sessions also require use of technology (e.g., laptop, working webcam, and microphone) for learning purposes.

**Class Participation**

Participation means contributing to the discussion versus simply speaking in class or offering a random comment in the online forum; it also means actively listening and building on the questions and discussion points of your classmates. As graduate students, you are expected to conduct yourselves in a professional manner and engage and collaborate with your classmates**.**

## Required and Recommended Material:

**Required course texts:**

Lantz, Brett. Machine learning with R: Expert techniques for predictive modeling. Packt Publishing Ltd, 2019. [L]

# Recommended additional text:

Online Statistics Education: An Interactive Multimedia Course of Study, <http://onlinestatbook.com/2/index.html>, 2017. Use this as an online reference for further explanations of concepts. (FREE) [OSE]

Shron, M. (2014). *Thinking with Data* (1st edition.). O’Reilly Media (electronic version may be obtained at NYU Library). [S]

# Software:

**REQUIRED – R, RStudio, RCommander,** <https://cran.r-project.org/>

Jamovi, <https://www.jamovi.org/download.html>

# Data sets:

Data sets for class exercises and assignments will be available through NYU Classes class website

Assessment Strategy:

**Assignments**

**Assignments** – Module Assignments – 1 Assignments Required (35%)

Assignment 1 – Case Study 1 SFO – Marketing Analysis (35%)

Assignment 1A – SFO Deliverables (individual) 5%

Assignment 1B – SFO Proposal (team) 10%

Assignment 1C– SFO Analysis and Models (team) 20%

Assignment 2 – Kaggle Competition Titanic Disaster (Individual) - Optional

**Labs (homework assignments)** – 5 graded Labs (50%) as homework

Lab 1 - Data Wrangling 10%

Lab 2 - Framing Analytical Questions 10%

Lab 3 - Descriptive Statistics 10%

Lab 4 - Linear Regression 10%

Lab 5 - Predictive Models 10%

**Final** – There will be a short 1 hour in-class final. (5%).

**Reflection Quizzes as Review** (10%)**:** There are12 required REs

NYUSPS Policies

“NYUSPS policies regarding the Family Educational Rights and Privacy Act (FERPA), Academic Integrity and Plagiarism, Students with Disabilities Statement, and Standards of Classroom Behavior among others can be found on the NYU Classes Academic Policies tab for all course sites as well as on the University and NYUSPS websites. Every student is responsible for reading, understanding, and complying with all of these policies.”

The full list of policies can be found at the web links below:

* University: <http://www.nyu.edu/about/policies-guidelines-compliance.html>
* NYUSPS: <https://www.sps.nyu.edu/homepage/student-experience/policies-and-procedures.html#Graduate1>

**Center for Student Accessibility**

If you are a student who is requesting accommodations, please contact New York University’s Moses Center for Students Accessibility (CSA) at 212-998-4980 or mosescsa@nyu.edu. You must be registered with CSA to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csa. The Moses Center is located at 726 Broadway on the 3rd floor.

Health and Wellness

To access the University's extensive health and mental health resources, contact the NYU Wellness Exchange. You can call its private hotline (212-443-9999), available 24 hours a day, seven days a week, to reach out to a professional who can help to address day-to-day challenges as well as other health-related concerns.

Academic Integrity and Plagiarism Policy

All students are expected to be honest and ethical in all academic work. This trust is shared among all members of the University community and is a core principle of American higher education. Any breaches of this trust will be taken seriously. A hallmark of the educated student and good scholarship is the ability to acknowledge information derived from others. Students are expected to be scrupulous in crediting those sources that have contributed to the development of their ideas.

Plagiarism involves borrowing or using information from other sources without proper and full credit. Students are expected to demonstrate how what they have learned incorporates an understanding of the research and expertise of scholars and other appropriate experts; and thus recognizing others' published work or teachings—whether that of authors, lecturers, or one's peers—is a required practice in all academic projects.

Students are subject to disciplinary actions for the following offenses which include but are not limited to:

* Cheating
* Plagiarism
* Forgery or unauthorized use of documents
* False form of identification

Use the link below to read more about Academic Integrity Policies at the NYU School of Professional Studies. [Academic Policies for NYU SPS Students](https://www.sps.nyu.edu/homepage/student-experience/policies-and-procedures.html#Graduate1)

TURNITIN

TurnItIn is a plagiarism detection software used to verify academic originality. It is available only to degree courses and students.  
Some assignments in this course may be checked for plagiarism using Turnitin.

NYU School of Professional Studies Graduate Grading Scale

Grading for graduate programs is by letter grade: A, A-, B+, B, B-, C+, C, C-, and F.  For NYUSPS’s complete graduate grading policies, including criteria for a grade of incomplete, taking a course on a pass/fail basis, and withdrawing from a course, see: <https://www.sps.nyu.edu/homepage/student-experience/policies-and-procedures.html#Graduate1>

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| Letter | % | GPA | Descriptions | Definitions |
| A | 95-100 | 4.0 | Exceptional | Demonstrates exceptional mastery of all learning outcomes of the course and thorough and complete understanding of all concepts. |
| A- | 90-94 | 3.7 | Excellent | Demonstrates highly competent mastery of all learning outcomes of the course and strong understanding of all concepts. |
| B+ | 87-89 | 3.3 | Very Good; exceeds course standards | Demonstrates mastery of all learning outcomes of the course and understanding of core concepts. |
| B | 83-86 | 3.0 | Good; meets course standards | Demonstrates mastery of some learning outcomes; understanding of some core concepts could be improved. |
| B- | 80-82 | 2.7 | Somewhat Satisfactory; meets some course standards and requires improvement | Demonstrates basic understanding of some learning outcomes; improved understanding of all core concepts is needed. |
| C+ | 77-79 | 2.3 | Less than Satisfactory; requires significant improvement | Demonstrates partial understanding of all learning outcomes and core concepts; requires significant improvement. |
| C | 73-76 | 2.0 | Unsatisfactory; requires substantial improvement | Demonstrates partial understanding of some learning outcomes and core concepts; requires substantial improvement. |
| C- | 70-72 | 1.7 | Unsatisfactory; requires extensive improvement | Demonstrates poor understanding of all learning outcomes and core concepts; requires extensive improvement. |
| F | Below 70 | 0.0 | Fail | Demonstrates minimal to no understanding of all key learning outcomes and core concepts; work is unworthy of course credit towards the degree. |

NYU Classes:

To learn more about NYU Classes, visit the [Training and Support website](https://wikis.nyu.edu/display/nyuclasses/), or browse the NYU ServiceLink website for support articles relating to [NYU Classes.](http://www.nyu.edu/servicelink/service/NYU%2BClasses) For technical support, contact the [IT Service Desk](http://www.nyu.edu/its/askits/helpdesk) (available 24/7/365) at 212-998-3333 or [AskITS@nyu.edu](mailto:AskITS@nyu.edu).

Class Schedule

**Start/End Dates: 1/4/21 – 1/21/21**

## **Session 1**, 01/04/21, Week 1

## Module 1: What is Data Analytics?

Form teams of four for Case 2 the team case

Reading: [KM] 1, [RC] 1

Assignment due: **Assignment 1A: (Individual) SFO Deliverables**

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## **Session 2**, 01/05/21, Week 1

Module 2: Data Wrangling - data scraping and data cleansing

Reading: [RC] 1

Assignment due: **Assignment 1B: (Team) SFO Deliverables**

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## **Session 3**, 01/06/21, Week 1

Module 3 Data Analytics – Framing Analytical Questions

The CoNVO Model and Framing Questions

Reading: [RC] 3

Assignment due:

## **Session 4**, 01/07/21, Week 1

Module 4: Descriptive Analytics

Introduction to R

Reading: [S] 1-4

Assignment due: **Lab 1: Data wrangling**

## **Session 5**, 01/08/21, Week 1

Module 5: Descriptive Analytics

Contingency Tables and Chi-Squared

Lab 3: Descriptive Stats, Chicago Crime

Reading: [KM] 3, 4, [RC] 3-5

Assignment due: **Lab 2: Framing Questions**

## **Session 6**, 01/11/21, Week 2

Module 6: Predictive Analytics A

Supervised ML - Linear Regression

Assignment due: **Assignment 1D: (Team) SFO Proposal**

Assignment due: **Lab 3: (Individual) Descriptive Stats Chicago Crime**

## **Session 7**, 01/12/21, Week 2

Module 7: Predictive Analytics B

Supervised ML - Logistical Regression and Forecasts

Reading: [KM] 4, 5, 6, [RC] 7-8

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## **Session 8**, 01/13/21, Week 2

Module 8: Machine Learning

Decision Trees and Clustering

Reading: [RC] 10-12

**Session 9**, 01/14/21 5, Week 2

Module 9: Inferential Statistics

Reading: [KM] 9

**No Session:** 01/15/21, Week 2

Assignment due: **Lab 4: Regression**

**NO CLASSES** – Monday 1/18/21

Assignment due: **Assignment 2: Titanic Kaggle Competition** (Optional)

## **Session 10**, 01/19/21, Week 3

Module 10: Data Visualization

Reading: [KM] 7, 8, 9, [RC] 16-2

Assignment due: **Lab 5: Telecomm Churn**

## **Session 11**, 01/20/21, Week 3

Module 11: Text Analytics

Reading: [RC] 21,

**Module 12**: 01/21/21, Week 3

Module 12: Building Models

Session 13: 01/20/21 Week 3

Final Exam **IN CLASS 1 hr.**

Assignment due: **Final Exam Practice (optional)**

Assignment due 1/25: **Assignment 1 E (Final): (Team) SFO Project**

Course Schedule

Table

Description automatically generated

***At the discretion of the faculty, the syllabus may be modified to better meet the needs of the students and to achieve the learning outcomes established in the syllabus***.