# Intro to Data Science for Government and Nonprofits
## Fall 2025
### School of Public Affairs and Administration
### Rutgers University- Newark

**Professor:** Tiana Marrese, PhD
**Email:** TBD
**Office Hours:** By appointment requested through **email**. I am happy to accommodate your schedule, please provide at least a 24-hour window for us to find a time.
**Course Website:** Canvas

## COURSE DESCRIPTION
This course introduces students to data tools that are important in today's government and nonprofit environments. It focuses on key quantitative skills including data interpretation, visualization, management, and analysis. Throughout the class, students will learn and demonstrate responsible data practices that can be directly applied to professional contexts. Students will engage with real-world datasets and problems to explore the ways that data science can positively inform decision making, management practices, and policy.

## LEARNING OBJECTIVES
By the end of this course, students will be able to:
- Meaningfully engage with and interpret figures displaying quantitative data such as scatter plots, bar charts, and line graphs.
- Critically assess data curation, visualization, and storage processes.
- Read, graph, and analyze data provided within an Excel worksheet.
- Locate and utilize publicly available data resources.
- Effectively collaborate with AI platforms to accomplish tasks.
- Verbalize how their work/interests intersect with data science practices.

## PREREQUISITES
This course is intended for all backgrounds. Previous training in math, computer science, or statistics is not required. All necessary material to pass the course will be self-contained within the span of the semester. Students with previous knowledge in related fields are welcome to join to strengthen their current understandings; optional assignments for growth beyond base lectures can be provided upon request. The course will utilize a variety of computer applications including Microsoft Excel, PolicyMap, and chatGPT; students will develop competencies across multiple tools. Traditional coding on platforms such as R and python will not be included.

## COURSE MATERIALS
**Required Textbooks:**
1. None
   a. Many "intro to data science" textbooks are geared towards individuals that will pursue data science careers. While I am confident that you would be able to master this material if needed, 80% of the content will probably not be relevant for your current professional aspirations. This class, instead, will

provide specific reading material each week ranging from chapters in statistical textbooks to NIH policy memos to open-source resources on data management. Students are expected to read all the required weekly material posted on canvas

**Supplemental Texts**
1. M Ball, R., Rague, B. (2022). The Beginner's Guide to Data Science. Springer, Cham. https://doi.org/10.1007/978-3-031-07865-1_2
   a. The first four chapters of this book are most relevant for the course. Please reference them if you want further explanations about the concepts we cover.

**GRADING**
**Grade Categorization**

| | |
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| Class Participation | 10% |
| Weekly Knowledge Assignments | 60% |
| Data Brief (Final Project) | 30% |

**Grading Policy**
The grading scale for this course is:

| Grade | Range |
|---|---|
| A | 90-100 |
| B+ | 85-89.9 |
| B | 80-84.9 |
| C+ | 75-79.9 |
| C | 70-75.9 |
| D | 60-69.9 |
| F | Below 60 |

*Class Participation* (10%): Critical thinking and thoughtful dialogue are more important than ever before. Each week, students will be given the opportunity to develop these skills. Students are expected to actively engage with lessons by asking questions and adding their own thoughts during class. In addition to general participation, students will take turns during the middle 10 weeks presenting their knowledge assignments to the class. These are casual discussions meant to showcase student work and further class learning through an exchange of ideas. Students should email the professor if they are worried about fulfilling this grade category.

Please note that in addition to participation, class attendance is mandatory. Students should email the instructor if they are unable to attend lecture for any reason.

*Weekly Knowledge Assignments* (60%): There will be 10 weekly assignments provided on Canvas. These are hands-on projects that reinforce skills taught in class. This includes interpreting graphs, creating original figures, practicing data management, and analyzing policy through a data lens. Base assignments will provide pre-selected data and outline the minimum required tasks. Students are encouraged to go beyond the base assignments by incorporating their

own data or expanding the assignment in ways that are most related to their interests. Students going beyond the base assignment should provide further explanation as necessary.

*Data Brief* (30%): Work throughout the semester will feed into a final project of a data brief. Data briefs are data-based publications that inform organizations, policymakers, and the public about a specific topic. The goal is to take a large and complex informational landscape and distill key features into a comprehensible memo.

The final product should be 6-8 pages (1500-2000 words), double-spaced, 12-point font. The content of the data brief should either be (1) a concise summary of a current policy or data context OR (2) a concise recommendation given a data context. This assignment should demonstrate the student's ability to apply class insight to a relevant setting.

Recommended General Outline:
-Introduction (research topic, audience, bottom line up front)
-Background (data, sources, background information, methodology, etc.)
-Findings and relevant figures (original content)
-Future steps and conclusions

## GENERAL COURSE POLICIES
### Readings and Lessons
Students are expected to complete required readings and watch lecture videos each week. These will be posted in the respective weekly modules in Canvas. Material throughout the semester will build on previous lessons so it is vital that students stay on top of the relevant week's content.

### Communication
All lectures, assignments, and other material will be distributed on Canvas. Completed works should be submitted through Canvas. Questions for the instructor about assignments, class material, or office hours should be sent via email.

### Late Submissions, Make-up Assignments, Attendance
For each 24 hours after an assignment's submission deadline, 20% will be deducted from the final grade. Pass/fail components will be marked as fail if they are late. Students should alert the professor as soon as possible if they believe a major conflict will prevent their ability to submit or complete an assignment. For justified emergencies (illness or family emergency), extensions may be permitted. Class attendance is mandatory. Students should contact the instructor if they are unable to attend lecture for any reason.

### Course Outline
Material for this course is subject to change. The instructor reserves the right to modify throughout the semester. If changes occur, they will be announced in advance.

### AI Usage
General artificial intelligence (GAI) is a rapidly changing tool. It is recognized that such applications can now mimic and outperform humans in many traditional academic assignments. This course will not police or ban the use of such platforms for assignments, rather students are

expected to coproduce with AI when appropriate and cite their usage. The only unacceptable implementation of AI is direct copying of content produced by AI without refinement or citation. If direct copying is caught or a student fails to note their usage of AI, the respective assignment will automatically receive a 0. Further guidance on AI usage will be provided in class.

## RESOURCES
The Rutgers' Code of Student Conduct is available at http://studentconduct.rutgers.edu/disciplinary-processes/university-code-of-student-conduct/.

### Research Support[1]
The Dana Library offers many services and tools to Rutgers-Newark students. One of the most valuable services available is specialized research assistance. Offering expertise in our field is the Public Administration Librarian, Ms. Roberta (Bobbie) Tipton, whose phone number is 973-353-5910 and email is tipton@libraries.rutgers.edu.
Ms. Tipton has also built an extensive Library Guide for our field of work, available at https://libguides.rutgers.edu/pubadmin. This Library Guide addresses items like finding articles, newspapers, and books, lists of various nonprofit and government organizations, sources of data and government documents, materials related to the public policy process and technology in government, and writing and reference tips.

### Writing Support
*Graduate Students*
For any further help with writing skills or editing, graduate students may reach out to the School of Public Affairs and Administration Writing Center, which provides writing tutoring and writing workshops to all graduate students currently enrolled in SPAA.
The SPAA Writing Center is located in the Center for Urban and Public Service (CPS) Room 125. An appointment can be made via email to tlh135@newark.rutgers.edu or calling 973-353-2571. Information can be found at https://spaa.newark.rutgers.edu/writing-career-development-center.

### Disputes about Grades
If a student believes that an assignment or final grade was received in error due to fault or oversight of the instructor, the work will be reviewed to determine if a change is warranted. This request for review for a grade change must be made in writing via a signed memo within 10 calendar days of the graded assignment being returned to the student but must occur before the final day of the semester.
-       The MPA Handbook outlines the processes of a formal grade appeal of the final course grade. A copy of the Handbook is available on the SPAA website.

### Academic Integrity
As explained in the Rutgers University Academic Integrity Policy, "scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any

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[1] All of the following support and resources come from the MPA Template. Please advise instructor if you have suggestions of any additions resources that may be relevant.
Emas, R. (2018). Generic MPA Syllabus Template.

work or materials that are attributable in whole or in part to another person, taking an examination for another person, or any act designed to give unfair advantage to a student or the attempt to commit such acts".
-        The Rutgers' Academic Integrity Policy is available at http://academicintegrity.rutgers.edu/academic-integrity-policy/.

**<u>Accommodation and Support Statement</u>**
Rutgers University Newark (RU-N) is committed to the creation of an inclusive and safe learning environment for all students and the University as a whole. RU-N has identified the following resources to further the mission of access and support:

**For Individuals Experiencing Disability:** The Office of Disability Services (ODS) works with students with medical, physical, and/or mental conditions who encounter disabling barriers to determine reasonable and appropriate accommodations for access. Students who have completed the process with ODS and have approved accommodations are provided a Letter of Accommodation (LOA) specific to each course. To initiate accommodations for their course students must both provide the LOA and have a conversation with the course instructor about the accommodations. This should occur as early in the semester as possible. More information can be found at the RU-N ODS website (ods.newark.rutgers.edu). Contact ODS at (973) 353-5375 or via email at ods@newark.rutgers.edu.

**For Individuals who are Pregnant**: The Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy. Students may contact the Office of Title IX and ADA Compliance at (973) 353-5063 or via email at TitleIX@newark.rutgers.edu.

**For Short-term Absence Verification:** The Office of the Dean of Students can help with absencesrelated to religious observance, emergency or unavoidable conflict (illness, personal or family emergency, etc.). Students should refer to University Policy 10.2.7 for information about expectations and responsibilities. The Office of the Dean of Students can be contacted by calling (973) 353-5063 or emailing deanofstudents@newark.rutgers.edu.

**For Individuals with temporary conditions/injuries:** The Office of the Dean of Students can assist students who are experiencing a temporary condition or injury (broken or sprained limbs, concussions, recovery from surgery, etc.). Students experiencing a temporary condition or injury should submit a request using the following link: https://temporaryconditions.rutgers.edu.

**For Gender or Sex-Based Discrimination or Harassment:** The Office of Title IX and ADA Compliance can assist students who are experiencing any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking. Students can report an incident to the Office of Title IX and ADA Compliance by

calling (973) 353-1906 or emailing TitleIX@newark.rutgers.edu. Incidents may also be reported by using the following link: tinyurl.com/RUNReportingForm. For more information, students should refer to the University's Title IX Policy and Grievance Procedures located at https://uec.rutgers.edu/wp-content/uploads/60-1-33-current-1.pdf

**For support related to Interpersonal Violence:** The Office for Violence Prevention and Victim Assistance (VPVA) can provide any student with confidential support. VPVA is a confidential resource and does not have a reporting obligation to Title IX. Students can contact the office by calling (973) 353-1918 or emailing run.vpva@rutgers.edu. VPVA also maintains a confidential text-based helpline available to students; students can text (973) 339-0734 for support. Students do not need to be a victim/survivor of violence to receive assistance; any student can receive services, information, and support.

**For Crisis and Concerns:** The Campus Awareness Response and Education (CARE) Team works with students in crisis to develop a plan of support plan and address personal situations that might impact their academic performance. Connect with the CARE Team by using the following link: tinyurl.com/RUNCARE or emailing careteam@rutgers.edu.

For Psychological Support (Stress, Mood, Family Issues, Substance Use concerns and other personal challenges): The Rutgers University-Newark Counseling Center provides individual therapy and support groups for students dealing with psychological issues. To schedule an appointment, email counseling@newark.rutgers.edu or call (973) 353-5805. Additional support is available to any RU-N student through Uwill services:
- Umatch: Teletherapy with flexible scheduling, starting with a free account.
- Uhelp: Crisis support at 833-646-1526 (available 24/7/365)
- Urise: Wellness-based video collection with a free account.

Access Uwill@RUN at https://my.rutgers.edu using your netid. Services are confidential and free.

**For emergencies**, call 911 or Rutgers University Police Department at (973) 353-5111.

**Other Support and Resources**
Office of International Student and Scholar Services
- Site: http://ncas.rutgers.edu/oiss
- Office: Conklin Hall- Room 216
- Email: oiss@newark.rutgers.edu
- Phone: (973) 353-1427

LGBTQ and Intercultural Resource Center
- Site: http://lgbt.newark.rutgers.edu/
- Office: Paul Robeson Campus Center- Room 328 and Conklin Hall- Room 232
- Email: interculturalrutgers@gmail.com
- Phone: (973) 353-3416

[Rutgers Center for Gender, Sexuality, Law and Policy](https://cgslp.rutgers.edu/)
- o Site: [https://cgslp.rutgers.edu/](https://cgslp.rutgers.edu/)
- o Office: 123 Washington Street
- o Email: cgslp@law.rutgers.edu

[Rutgers Newark Counseling Center](http://counseling.newark.rutgers.edu/)
- o Site: [http://counseling.newark.rutgers.edu/](http://counseling.newark.rutgers.edu/)
- o Office: Blumenthal Hall- Room 101

[pantryRUN Food Pantry](https://myrun.newark.rutgers.edu/node/226)
- o Site: [https://myrun.newark.rutgers.edu/node/226](https://myrun.newark.rutgers.edu/node/226)
- o Office: Paul Robeson Campus Center- Room 236
- o Email: pantry_run@newark.rutgers.edu
- o Phone: (973) 353-5231

[Health Services](http://health.newark.rutgers.edu/)
- o Site: http://health.newark.rutgers.edu/
- o Office: Blumenthal Hall- Room 104
- o Phone: (973) 353-5231

[Veterans Affairs](https://www.newark.rutgers.edu/resources-student-veterans)
- o Site: [https://www.newark.rutgers.edu/resources-student-veterans](https://www.newark.rutgers.edu/resources-student-veterans)
- o Office: Paul Robeson Campus Center- Room 316A
- o Email: lazaro.paul@rutgers.edu
- o Phone: (973) 353-5515

## COURSE CALENDAR

This is a rough outline of the semester. For the most up-to-date information on topics and assigned work, please refer to canvas.

| Week | Date | Guiding Question, Topics, Readings<br>Readings should be completed before class. | Assigned Work<br>Assignments are usually due before the start of the following class. Refer to canvas for exact date and time. |
|------|------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| 1 | | **What is data science?**<br>• Course Introduction<br>  o Ways of knowing<br>  o The quantitative approach<br>  o What does it mean to operationalize and measure<br>• Syllabus<br>  o Grades, attendance, policies<br>  o How to effectively use AI in this course<br><br>**Readings:**<br>• Ways of knowing handout | **Discussion Board**<br>• Introductions |
| 2 | | **How do I read and interpret data?**<br>• Brief refresher on statistical concepts<br>• How to read a figure<br>• How to write up interpretations<br>• Causation versus correlation<br>• Critical questions for figures<br><br>**Readings:**<br>• Causation versus correlation handout | **Knowledge Assignment**<br>• Choose two figures from class or your own work, write up interpretations (250 words, combined)<br><br>**Discussion Board**<br>• Post one of the figures and interpretations. Comment on others (comments should total 150 words combined) |
| 3 | | **What are publicly available data and prebuilt tools – summary figures?**<br>• How to formulate a research question<br>• What is publicly available data? | **Knowledge Assignment**<br>• Access one of the government sources from class. Find two graphics: (1) a pre- |

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| | | • Navigating relevant data resources<br>• Data variables and their interpretation<br><br>**Readings:**<br>• Research question handout<br>• Publicly available data handout | built summary figure and (2) a figure that you built by selecting specific variables. Write up interpretations for these two figures (250 words, combined)<br><br>**Discussion Board**<br>• Post one of the figures and interpretations. Comment on others (comments should total 150 words combined). |
| 4 | | **What are publicly available data and prebuilt tools – geographic figures?**<br>• Special considerations for geographic figures<br>　○ Geography and time<br>　○ Units of analysis<br>　○ Revisiting causal language<br>• Publicly available geographic tools<br>• PolicyMap introduction | **Knowledge Assignment**<br>• Access one of the government sources from class. Find two **geographic** graphics: (1) a pre-built figure and (2) a figure that you built by selecting specific variables. Write up interpretations for these two figures (250 words, combined)<br><br>**Discussion Board**<br>• Post one of the figures and interpretations. Comment on others (comments should total 150 words combined). |
| 5 | | **What are publicly available data and prebuilt tools – geographic figures? [cont.]**<br>• PolicyMap | **Knowledge Assignment**<br>• Using PolicyMap, create the following for the same geographic location:<br>　○ Same variable, two different |

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| | | | time periods (2 graphs)<br>o Same time period, two different units of aggregation (2 graphs)<br>o Layered variables (1 graph)<br>• Choose two figures and write up interpretations (250 words, combined)<br><br>**Discussion Board**<br>• Use this space to ask your classmates questions that you have about PolicyMap or figure interpretation (questions and comments should total 200 words combined). |
| 6 | | **How do I use Excel – building figures?**<br>• Introduction to excel<br>• Introduction to raw data and summary statistics<br>• Figure creation in excel<br><br>**Readings:**<br>• Intro to Excel handout | **Knowledge Assignment**<br>• Using the data provided, create (1) a bar plot and (2) a line plot. Interpret these figures and be sure to reference the data dictionary (250 words, combined)<br><br>**Discussion Board**<br>• Post one of the figures and interpretations. Comment on others (comments should total 150 words combined). |
| 7 | | **How do I use Excel – data analysis?**<br>• Excel functions and short-cuts | **Knowledge Assignment** |

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| | | • Pivot tables<br>• Excel potential<br>• Best practices with excel<br><br>**Readings:**<br>• Creating figures handout | • Recreate the summary statistics, figures, and pivot tables from today's class. Built a unique pivot table. |
| 8 | | **How do I use Excel – data cleaning?**<br>• Retrieving raw data<br>• Examples of improper data cleaning<br>• Assumptions- why we have them and how they shape our conclusions | **Knowledge Assignment**<br>• Spend 3 hours, try to retrieve and clean raw data from a source discussed in class. Write up your experience (250 words)<br><br>**Discussion Board**<br>• Answer the following prompt and respond to others (300 words combined)<br>   o In what ways does your work (or interest) overlap with data? What assumptions are made in the data and what impacts can this have? |
| 9 | | **What is data management?**<br>• What is data management?<br>• Why is data management important?<br>• Internal data management<br>• Working with sensitive data<br>• Using other people's "refined" data<br><br>**Readings:**<br>• Government memo handout | **Knowledge Assignment**<br>• Using the data provided, create a data management policy. Reference outline. |
| 10 | | **What does coproducing with AI mean?**<br>• What is General AI | **Knowledge Assignment** |

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| | | • When should we use AI<br>• When does AI fail<br><br>**How do we put it all together?**<br>• What is a data brief?<br><br>**Readings:**<br>• AI podcast | • Create a 1-page outline of your proposed data brief. Spend 1 hour talking with one AI platform about your idea and approach. Spend 1 hour talking to another AI platform.<br><br>**Discussion Board**<br>• Write up your experience with using AI to coproduce your data brief outline. What was surprising? What was concerning? Comment on other posts (300 words total) |
| 11 | | **How do we use data to understand policy (I)?**<br>• Data brief outlines and examples<br>• Quantitative data and policies | **Knowledge Assignment**<br>• Locate the data sources you will use for your data brief. Create two graphics from this data and write up their interpretations (200 words)<br><br>**Discussion Board**<br>• Post a summary of your data brief idea. Talk about your research question, contextual information, and planned findings/figures (250 words) |
| 12 | | **How do we use data to understand policy (II)?** | **Discussion Board**<br>• Comment on classmates' posts |

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| | | • Policy/program outcomes and assessment | from last week's discussion board (250 words) |
| 13 | | Review and Final Project Preparation | **Final Assignment**<br>• Data brief |