

HUB XC410 B1: Spark! Data Science for Good Practicum Syllabus

Topics in Civic Tech: Housing

General Information

Instructors

Name	Role	Email
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Course

- Class Location: HAR 424
- Class Time: 6:30 - 9:15pm ET Th
- Course Dates: Fall 2022
- Course Credits: 4

Course Description

Prerequisites

Technology-focused major students will be assigned to work on one of two project types: Data Science or Software Engineering. Social Science major students will provide the social science expertise to projects.

For the Software Engineering track, to ensure that students get the most out of this class, we require students to have taken CS411 (Software Engineering), ideally DS519, or have equivalent experience. You must have a strong programming background. Familiarity with web and/or mobile application development is helpful, though not required.

On the data side, Ideally, students would have completed CS506 or CS365 or have equivalent knowledge, however students taking this class must have some prior familiarity with programming at the level of CS 105, 108, CS110, 111, 112 or equivalent. CS 132 or equivalent (MA 242, MA 442) is required.

For Social Science students, the instructors expect you have taken at least your degree required statistics course and have knowledge of social science experiment creation, management, etc.

Please consult with course staff during office hours if you have questions about the prerequisites.

Course Description

DS4G Practicum enables students to tackle real world data challenges related to a more equitable and just society. Students will work in teams on projects provided by a variety of partners from the public sector including government agencies, nonprofits and researchers. Projects will vary depending upon partner needs but will be focused on producing a technical artifact that may include researching and developing robust data pipelines to publish public data sets, creating interactive tools or applications, or completing data-focused research. All projects should address pressing societal challenges in the public sphere.

While each student team will have a unique experience based on the requirements of their assigned project, the course will encompass five distinct parts:

1. Teamwork, collaboration, and project/ client management
2. Computing and Data science: data collection, data engineering, data preprocessing, and analytics and/ or software development
3. Testing, refinement, delivery, and documentation of technical artifacts
4. Research synthesis and presentation of the final deliverable

The projects will begin with a human and community centered design process with the stakeholders most impacted or impacting the proposed project topic or output. Desk research and stakeholder interviews will help students understand the root causes of the societal issues that will be addressed through the course. The course will conclude with final presentations of findings to the partners, and a final work product or technical artifact which will include thorough documentation of work completed and a well crafted policy memo summarizing findings or the solution and the associated research and design process. By applying their computing and data science skills to real world challenges or questions sourced from public sector partners, students will help to unlock new data intelligence or technical solutions that can contribute to more just communities.

Learning Outcomes

At the conclusion of the course, students will have acquired both content knowledge on the root causes of a specific societal challenge, its consequences, and remedies, as well as hard skills related to designing and building technology or data applications that may contribute

to better public understanding, engagement, or other benefits sought by the project partner.

Hub Learning Outcomes

Creativity/Innovation (CRI)

BU students across all fields of study will benefit from learning how to think in new ways, imagine new possibilities, take new approaches, and/or make new things. Creative activity is a source of deep human satisfaction and common good. In addition, the ability to generate and pursue new ideas is quickly becoming a prerequisite for entry into the skilled workforce, which places a premium on applicants' creative skills and potential for contributing to creativity's more applied offspring, innovation. BU graduates should understand how the creative process moves from need or desire to design, to draft, to redesign, to execution; they will have personal experience of taking risks, failing, and trying again; and, in this way, they will have developed the patience and persistence that enables creativity to come ultimately to fruition.

Learning Outcomes

- *Students will demonstrate understanding of creativity as a learnable, iterative process of imagining new possibilities that involves risk-taking, use of multiple strategies, and reconceiving in response to feedback, and will be able to identify individual and institutional factors that promote and inhibit creativity.*
- *Students will be able to exercise their own potential for engaging in creative activity by conceiving and executing original work either alone or as part of a team.*

The Spark!/MetroBridge interpretation of the creativity and innovation component will take place primarily through the design phase of the course when students will work with partners to conceptualize or refine the creation of a technical artifact that will be developed in response to the needs presented by the partner through the original project scope.

The output of the design phase will be a roadmap of tasks and deliverables that will be developed during the semester. The solution will also require validation through engagement of stakeholders impacted or impact the project; this step will follow the completion of the research phase of the course.

The prototype presentation will take place approximately halfway through the course. Included in this deliverable will be wireframes, dataset(s) identification and any other building blocks necessary prior to the development / implementation phase of the project. The remainder of the course will be spent on intensive implementation of the project.

Research and Information Literacy (RIL)

Scholarly research—the process of posing problems, designing effective investigative strategies, collecting and evaluating information, drawing conclusions, and presenting findings—drives the creation and dissemination of new knowledge in and across all academic disciplines,

professions, and walks of life. Today's information explosion places a particular requirement on anyone doing research to develop the abilities associated with information literacy—knowing how to locate needed information, assess the accuracy of sources, and use them to good effect. BU's mission as a research university embraces the conviction that research and information literacy should be central to an undergraduate education. By learning from scholars on the BU faculty how new knowledge is created and disseminated, and by conducting or participating in research, BU students join a community of inquiry with a commitment to the pursuit of knowledge that crosses borders and connects generations.

All Writing, Research, and Inquiry courses (found in the Communication capacity) also develop the learning outcomes of the Research and Information Literacy area and fulfill one Hub unit in each of these areas.

Learning Outcomes

- *Students will be able to search for, select, and use a range of publicly available and discipline-specific information sources ethically and strategically to address research questions.*
- *Students will demonstrate understanding of the overall research process and its component parts, and be able to formulate good research questions or hypotheses, gather and analyze information, and critique, interpret, and communicate findings.*

Spark!/MetroBridge teams will achieve this learning outcome through focused research and engagement with stakeholders to understand and, ultimately, validate the problem and proposed solutions and respond to in-depth feedback. Once the initial project proposal or scope is confirmed and team collaboration and project management practices are established, teams will craft a discovery and research plan for gathering important underlying context knowledge through desk research, stakeholder input, and expert feedback on the issue that will be addressed through the creation of a technical artifact.

This assignment is designed to help students gain a deep understanding of the broader context within which the client's need exists. The deliverables for this assignment include a research and stakeholder engagement plan and a final report and presentation of the key findings from the research. Students will reflect upon the input they have received and the work completed during this phase may result in an adapted project proposal or scope. The students will engage with community partners throughout the project journey to gain input and insights on key assumptions and realities of stakeholders and document these insights through the sprint retrospectives.

Teamwork/Collaboration (TWC)

Training in and the practical experience of teamwork teaches the process of innovation, develops leadership, and fosters knowledge of one's own strengths and appreciation for those of others. Collaboration defines the 21st-century workplace. Employers rely increasingly on teams—groups of people with different backgrounds and training who

tackle projects jointly—and they identify the ability to collaborate with these diverse groups as an essential skill for almost every position. Civic life in an increasingly interdependent world also calls more and more for the ability to collaborate with people from different backgrounds and with different perspectives, build consensus, and compromise for the good of a broader purpose.

Learning Outcomes

- *As a result of explicit training in teamwork and sustained experiences of collaborating with others, students will be able to identify the characteristics of a well-functioning team.*
- *Students will demonstrate an ability to use the tools and strategies of working successfully with a diverse group, such as assigning roles and responsibilities, giving and receiving feedback, and engaging in meaningful group reflection that inspires collective ownership of results.*

The application of teamwork and collaboration learning outcomes will be centered around the successful completion of a technology artifact using agile development principles. The teamwork and collaboration process will be assessed through the development and evaluation of team agreements to reinforce practices of high performing teams. Students will have an opportunity to give and receive feedback at the beginning of the semester, mid-semester, and at the end and will be expected to proactively solve team issues using the feedback and decision-making tools provided. Team members are expected to contribute equally throughout the course of the project. Tasks will be distributed among team members based on their technical areas of knowledge or their contribution to the qualitative elements of the project.

While students will have specific roles within the group, course content will cover the design, architecture and development of software or data science artifacts as a whole, allowing students to appreciate the work of each member of the team. Throughout the course of the semester, students are expected to provide each other with continuous feedback; pair programming and code review will allow individual team members to work together and provide critical feedback on others' code, to improve the functionality of their projects. Students will practice the scrum approach to agile development, a common software industry approach to teamwork, collaboration, and project management. This will include weekly planning sessions, scrum meetings, and retrospectives aimed at continuous product delivery.

Writing-Intensive Course (WIN)

Writing-Intensive Courses enable students to build upon and practice skills learned in the First-Year Writing Seminar and, in some instances, in Writing, Research, and Inquiry courses. Writing is fundamental, the most important form of expression that BU undergraduates must develop. In almost every professional setting, BU graduates must be able to express their ideas

in clear, coherent prose. Effective writing demands the honing of skills, but it also cultivates ways of thinking, evaluating evidence, constructing responsible and convincing arguments, and generating creative ideas. As effective writers, BU graduates will pay close attention to the potential readers of their writings; as responsible writers, they will take ownership of their message and the means of communicating it, and hold their writing to high standards of truth, accuracy, validity, and humaneness.

While learning to craft written arguments is essential in the First-Year Writing Seminar, the Writing, Research, and Inquiry courses, and most courses designated as Writing-Intensive, the latter also accommodate students' learning to write to the standards of majors and professions, such as journalism, that place a premium on the difference between arguments and expository accounts.

Writing-Intensive Courses have the First-Year Writing Seminar as a prerequisite and develop at least learning outcomes 1 and 2 below.

Learning Outcomes

- *Students will be able to craft responsible, considered, and well-structured analyses supported by written arguments, using media and modes of expression appropriate to the situation.*
- *Students will be able to read with understanding, engagement, appreciation, and critical judgment.*
- *Students will be able to write clearly and coherently in a range of genres and styles, integrating graphic and multimedia elements as appropriate.*

Written products will include both team and individual assignments. Student teams will identify and articulate the tool or data set needed by the client, and related research questions or hypotheses, a mid-term presentation on progress for stakeholder feedback, and a final presentation synthesizing their research. Individuals will also produce short reflection piece following attendance at a community meeting or zoning hearing to understand the broader societal context of housing, and a brief policy memo summarizing their findings.

Course Format

In addition to regular lectures, we will also have labs. During labs, we will work on assimilating material covered in lecture into our projects. Labs are meant to be hands-on team, work sessions.

There will be four phases of the course:

- **Preparation:** Team agreements, scope and methodology

- **Discovery:** Research and stakeholder engagement
- **Design:** Detailed specifications for the proposed technical artifact including any of the following elements, as necessary: user flow, user stories, data identification, wireframes, product specifications
- **Delivery:** Development sprints to ensure completion of the prototype and final report by end of semester

This course has neither a mid-term nor a final exam. Performance will be graded based on

Team Resources

Students are also able to access computing services e.g. AWS credits, etc. They must be requested at this link and we will assess the request and get back to your team as soon as possible. <https://tinyurl.com/computing-intake>

Each team is allowed up to \$200 for incidental expenses directly associated with implementing their project (i.e. not pizza, etc.). You can submit receipts or procurement requests through this form: <https://bu.campusgroups.com/>. For questions, please email Spark Finance team at buspark@bu.edu.

Books and Other Course Materials

A functioning laptop with a power cord, about 800 MB of free space and administrative privileges to install software. Bring your laptop to each and every class. Please do not hesitate to see us privately if you have any concerns about this requirement. We're happy to help.

There is no required textbook for this course. However, there are required readings. Usually articles found on the Internet.

Courseware

- Blackboard
- Piazza: TBD

Strongly recommended reading and engagement:

- Desmond, Matthew. *Evicted: Poverty and Profit in the American City*. Penguin Books, 2017. Find it at the [library](#).
- [Minimum Standards of Fitness for Human Habitation \(MA State Sanitary Code\)](#)
- [10 Best Practices for Analytics Success \(MIT\)](#)
- [What's the Best Approach to Data Analytics? \(Harvard\)](#)

Please do not hesitate to reach out privately if you have any concerns about obtaining the required or recommended equipment and materials so we can try to help.

Assignments and Grading

Assignments serve the purpose of tracking team and project progress. Occasionally, there will be assignments to cement material learned in class.

%	Category	Grading Elements
20%	Teamwork & Collaboration <i>Individual grade</i>	Attendance: class, scrums, labs, client mtgs Sprints: Assigned & completed tasks Peer Evaluation (mid-term + final) Partner Evaluation
15%	Research Phase <i>Team Grade</i>	Research Plan Stakeholder engagement Research Report or Presentation
15%	Design Phase <i>Team Grade</i>	Project Scope Project Specifications Inputs: user stories, data set identification, wireframes, final report outline as outlined in specifications Vision Presentation
40%	Project Implementation <i>Team Grade</i>	Final Project Weekly sprints Data Projects: data collection and processing, data analysis. data infrastructure + pipeline Software projects: code quality & organization, code documentation Final Report / Policy Memo
5%	Client <i>Team Grade</i>	Project Proposal/ Scope Mid-Term Presentation Final Presentation
5%	Documentation <i>Team Grade</i>	Google Drive Clear technical labeling and documentation to ensure reproducibility

Assignments

Further details will be found in the gradescope assignments. Some projects will have slightly different requirements for assignments than outlined here.

Research Phase

1. Research Plan: Research plan outlines desk research, background readings, stakeholders to interview and rationale, public events to attend, and benchmarks of similar work produced in same or other geographies

2. Public Meeting/Stakeholder Consultation - Personal Reflection: Observing a public meeting will help you to become familiar with how public meetings are conducted, who the players are, and observe the politics of the issues the project seeks to address in real life
 - a. Students are required to attend a remote city council hearing, community meeting or zoning hearing related to the core issues their project will address to gain insight into the array of stakeholders engaged in (or resistant to) housing production. Please note the date, time and 'host' of the meeting, and provide a brief reflection [500 words] that answers the following questions:
 - i. Issues: What are the issues being discussed?
 - ii. Stakeholders: Who are the identifiable actors and what interests are they representing? Are anyone's interests not being represented?
 - iii. Goals: What are the various parties trying to accomplish? What was the outcome of the meeting?
3. Stakeholder Interviews - 5 interviews with stakeholders impacted or impacting the issue you are working on
 - a. The stakeholder interviews synthesis template will include student reflections on the feedback, assumptions identified, and anything that may have surprised them.

Design Phase

1. Proposed scope: outline of the user/ client goals, high level vision of the final deliverable, detailed specifications for the product. Additional elements will need to be included in the specifications depending on if the project is a data science project (data set identification or APIs, tech stack, analysis questions, etc.) or a software engineering project (user flow, user stories, wireframes, tech stack).
 - a. Validation: 5 Stakeholder interviews to validate need and/or provide input on the proposed technical artifact.
 - b. Presentation: Project Vision presentation
 - c. Final Scope of work: signed by client/partner

Delivery Phase:

- 1) Midterm technical artifact + documentation
- 2) Midterm report/presentation
- 3) Final technical artifact + documentation
- 4) Final report/presentation

Mentoring and Office Hours

Office hours with instructors are listed above. We are also available on Slack or email for scheduling and questions.

Class And University Policies

1. Course members' responsibility for ensuring a positive learning environment (e.g., participation/ discussion guidelines).
2. **Attendance & Absences.**

Due to the sequential & collaborative nature of the product creation experience and the goal of completing a product demo by the end of the semester, attendance is required. Missing more than 3 classes may affect your final grade. If you must miss class for any reason, please email ahead of time. Makeup exams are not offered, except in instances of emergencies (prior travel plans do not count).
3. **Assignment Completion & Late Work.**

Assignments are due the Monday before class at 11:59 PM and may be submitted up to 24 hours late with a 5% late penalty. No late submissions will be accepted after 24 hours. Assignments must be submitted on Gradescope.
4. **Academic conduct, plagiarism and fabrication**

You may discuss homework assignments with classmates, but you are solely responsible for what you turn in. Collaboration in the form of discussion is allowed and encouraged. We understand that there may be teams working on projects together and they must document which team member completed different tasks. Any use of 3rd party software, APIs, or algorithms in your product creation should be through third party licensing terms, open source licensing terms, or references. It should be clearly documented. This includes using snippets of software or the complete software.

We – both teaching staff and students – are expected to abide by the guidelines and rules of the [Academic Code of Conduct](#).
5. **Disability Accommodations**

If you are a student with a disability or believe you might have a disability that requires accommodations, please contact the [Office for Disability Services](#).
6. **Sexual Misconduct**

Boston University is committed to fostering a safe, productive learning environment. Title IX and our school policy prohibit discrimination on the basis of sex, which regards sexual misconduct — including harassment, domestic and dating violence, sexual assault, and stalking. We understand that sexual violence can undermine students' academic success, and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. Confidential support and academic advocacy resources can be found with the Center for Sexual Assault Response & Prevention.
7. **Equal Opportunity**

This course celebrates diversity and welcomes all. BU has strict guidelines on

classroom behavior and practices when it comes to treatment of students and guests on the basis of race, color, religion, sex, gender identity, sexual orientation, age, mental or physical disability, genetic information, military service, national origin, or due to marital, parental, or veteran status. Discrimination for any of these reasons is prohibited. Please refer to the [Equal Opportunity/Affirmative Action Policy](#) for more details.

8. Positive Classroom Experience

At your discretion, please alert one or both of your instructors to anything related to preferred pronouns, preferred name or nickname, and/or any extenuating circumstances or triggers that might affect your classroom experience. We want to make sure you have the most positive experience in the classroom as possible. This course affirms people of all gender expressions and identities. If you prefer to be called a different name than what is on the class roster, please let us know. Feel free to correct us on your preferred gender pronoun. If you have any other questions or concerns, please do not hesitate to let us know.

9. Social Climate

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. Furthermore, please notify one or both of your professors, if you are comfortable in doing so. This will enable us to provide any resources we may possess.

It is not unusual for students to feel stress, and about 15% of students experience depression, anxiety or other mental health concerns. Please know that we are here to help you find the resources to help you get through this stressful time.

If work shown in this class, professional or student-generated, offends you in any way, please mention it in class or talk to us privately about it so that we can all learn from each other. This is not to say we will ever restrict freedom of speech or water down an aggressive or edgy idea, but we want to discuss anything that someone deems troublesome or offensive.

10. Student athletics

All student-athletes should be provided with a sheet from Student-Athlete Support Services regarding absences throughout the semester. These sheets should be handed in as soon as possible to avoid potential conflicts and so arrangements can be made to provide for missed lecture notes, classwork, or discussion.

11. Recording of classes

We strive to record every class for later review. However, the recordings are a byproduct of the in-person lecture and, as such, are useful for review and the occasional replacement but should not be considered a true substitute for in person attendance.

Finally, there are many [resources available](#) to students. For example:

- The College of Communication has a [Diversity, Equity and Inclusion](#) Committee as well as a DEI student group and [Facebook group](#). All are welcome.

The College of Engineering has an [Inclusion and Outreach program and team](#).

Class Schedule (Subject to Change)

See Gradescope for specifics on assignment due dates, details, and rubrics. Many of the lectures will have dedicated time for team work but it is not listed here. As a result, be sure to be prepared to work on your project during every lecture (computers, notes, etc).

Date	Topics	Assignments
Sep 08	<ul style="list-style-type: none"> • Introduction, Logistics, Expectations (attendance, cheating, grading) • Intro to Housing • Intro to public data/data science/analytical methods 	<ul style="list-style-type: none"> • Complete home inspection
Sep 15	<ul style="list-style-type: none"> • Partner pitches • Data Lecture: Exploratory Data Analysis & Data Science Tech Stack • Data Lecture: Data Science and CS jargon you will likely encounter • Housing Lecture: Housing Codes and Standards 	<ul style="list-style-type: none"> • Review recommended readings in syllabus • Familiarize yourself with Excel & Google Sheets
Sep 22	<ul style="list-style-type: none"> • Project Management: High performance Teams, Agile Development • Data Lecture: Sourcing and Managing Data (a demonstration) • Housing Lecture • Team Assignment & Team Formation 	<ul style="list-style-type: none"> • Continue conversations with client partners and develop clear scope of project needs • Continue analysis of client project
Sep 29	<ul style="list-style-type: none"> • Housing Lecture • Housing Data Resources • Data Mining, Cleaning, and Transformation (ETL process) 	TBD
Oct 06	<ul style="list-style-type: none"> • Data Bias & Linking datasets • Analytical Techniques/Tools 	TBD
Oct 13	<ul style="list-style-type: none"> • Presentation Skills Lecture • Housing Special Topic(s) 	<ul style="list-style-type: none"> • Finalize Midterm presentations and be prepared to share next week
Oct 20	<ul style="list-style-type: none"> • Midterm Presentations • Tech: Special Topic(s) 	TBD
Oct 27	<ul style="list-style-type: none"> • Peer Review • Visualizing Data & Tools, Best Practices • Presenting Data to Your Audience 	TBD
Nov 03	<ul style="list-style-type: none"> • Team Work 	TBD

Nov 10	<ul style="list-style-type: none"> • Team Work 	TBD
Nov 17	<ul style="list-style-type: none"> • Game Theory discussion • Advanced Housing • Advanced Data Science: Machine Learning & Artificial Intelligence 	TBD
Nov 24	<ul style="list-style-type: none"> • Thanksgiving Recess. No class. 	TBD
Dec 01	<ul style="list-style-type: none"> • Wrap-up lectures in housing and data science • Team work 	<ul style="list-style-type: none"> • Finalize Final presentations and be prepared to share next week
Dec 08	<ul style="list-style-type: none"> • Final Presentations • Class Feedback • Team Feedback (& PM) • Next Steps -- Assign tasks to be completed over Finals Week 	TBD