Course Description

Research typically involves:

- **Deeply understanding a problem**: who faces a certain challenge and why?

- **(Re)-Defining the problem**: problems can seem tricky from one perspective. Solving problems is often about changing your perspective. This is usually the most time-consuming aspect of research: decomposing what was perceived as hard, too broad, or too complex into an elegant and tractable problem.

- **Understanding the space of solutions**: Why certain solutions don’t work? Perhaps they incorrectly characterized the problem? What techniques did others attempt that we can apply to the current situation? Why should these techniques work or not work?

- **Solving the problem and evaluating the solution**: This should follow naturally if you got the previous steps right!

The capstone research seminar and courses will follow this research progression and so most of your time will be spent on tackling the first three steps with the last capstone semester dedicated to the last step.

The space of problems we are interested in will be **limited to interactive data analysis**. This is my area of expertise but it is also a rich field that brings together many research communities together: data systems (DS), machine learning (ML) and human computer interaction (HCI).

This space focuses on how can we help users, from the data-science, python-hacking, stats-shooting experts to your grandfather, understand their data and its features as well as articulate their analysis needs from fun exploration to constructing robust predictive models. Thus, we need to build interactive data-analysis tools that work with the strengths and limitations of human perception and cognition but are powerful and efficient.

As your understanding of this space evolves, you will eventually be able to articulate a clear, well-defined research problem with any emphasis that interests you: The project can be around explaining ML models, cleaning messy data, scraping forums, generating stories, to tools for huddling around data.

With that end goal in sight, in the first two semesters you will read at least one research paper a week, critique it and occasionally discuss/present the paper to the research group.

Grading

**Capstone Seminar**
Research Critiques & Presentations (peer reviewed) 80%
Capstone Seminar Write-up (Lit survey heavy) 20%

**Capstone Course 1**
Focused Research Readings & Presentations (peer reviewed) 40%

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1It is usually harder to explain tech stuff to your grandfather than your Android-slinging grandmother.
Capstone Proposal & Project Report  60%

Capstone Course 2
Project Implementation  40%
Project Evaluation  40%
Project Write-up (in research paper form)  20%

If you miss a reading or presentation, you will receive no grade for that assignment and there will be no room for making up the lost marks. In the first semester, all students read the same paper and critique it every week. By the end of the seminar, you would have defined an area of interest. For example, “I’m interested in helping people analyze personal, multimodal data or explore the knowledge graph”, etc. In capstone course 1, you can focus your readings on your area of interest.

Note that you are co-graded on the seminar and the final capstone report and presentation by a secondary advisor.

Readings by Theme

This is a starting list that can change over the course of the semester.

General


Visualization


Example-Driven Interfaces & Mixed Initiative User Interfaces


**Machine Learning & Interpretability**


• Michael Nielsen. **Reinventing Explanation.** 2014. [URL](http://michaelnielsen.org/reinventing_explanation/).


**Debugging**


**Graphs**


**Uncertainty**


Time


Miscellaneous, Unusual but Cool


In addition to course readings, we will also be having tutorials on data visualization and UI design.

**Academic Integrity:** As set forth in NYU Abu Dhabi’s Academic Integrity Policy, the relationship between students and faculty at NYU Abu Dhabi is defined by a shared commitment to academic excellence and is grounded in an expectation of fairness, honesty, and respect, which are essential to maintaining the integrity of the community. Every student who enrolls and everyone who accepts an appointment as a member of the faculty or staff at NYU Abu Dhabi agrees to abide by the expectation of academic honesty.

The full policies and procedures relating to Academic Integrity may be found on the NYUAD Student Portal.