**COLLEGE OF ENGINEERING, UIC**

**CS, 424, Visualization & Visual Analytics, 4/3 (grad / undergrad)**

**I. Instructor & Course Details**

**Instructor Name**

Email address: Fabio Miranda

Drop-In Office Hours: 11am – 1pm (over Zoom)

Drop-In Hours location: https://uic.zoom.us/j/3114569024?pwd=WUFsT3pwV2ZSZ3Rvb3pYdDUxUjNkdz09

**Course Modality and Schedule**

We will meet in-person at 8:00 AM to 9:15 AM in the Lecture Center Building C - Room C004

### II. Course Information

**Catalog Course Description and Prerequisite/corequisite Statement**

This course provides an introduction to the field of visualization, including scientific visualization, information visualization, visual analytics, and the effective use of interactive visualization for analytical reasoning. The course is designed to balance theory and practice, covering both design and implementation aspects of visual analytics systems. Topics include: basic principles of data visualization; exploratory data analysis; data management for visualization; embedded, juxtaposed and coordinated views; visual analytics systems; machine learning for visualization; spatial and uncertainty visualization; techniques for big data visualization. The course will also include an introduction to data analysis libraries and frameworks, and web technologies for visualization.

### Course Goals and Learning Outcomes

By the end of the course, students will have a good understanding of the basic principles of visualization and visual analytics and will be able to articulate advantages and disadvantages of visual design choices for different data types. They will also be able to design and implement web-based visual analytics systems by combining visualization, data management, data mining and machine learning techniques that work in tandem to enable interactive exploration of multidimensional and heterogeneous datasets.

Learning outcomes:

* Understand the state of the art in visualization and visual analytics.
* Acquire, clean and transform data to satisfy visualization requirements.
* Design and implement visualizations.
* Create web-based interactive visualizations using modern technologies.

**Required and Recommended Course Materials**

Visualization Analysis and Design, AK Peters (Optional)

**Respect for Copyright**

Please protect the copyright integrity of all course materials and content. Please do not upload course materials not created by you onto third-party websites or share content with anyone not enrolled in our course.

### III. COURSE POLICIES & CLASSROOM EXPECTATIONS

### Grading Policy and Point Breakdown

This course includes four assignments to make sure the student is familiar with the main components of visualization and visual analytics systems. The assignments will balance theory and practice, covering both design and implementation aspects. The student can either choose a different dataset for each assignment, or re-use the same dataset over the four assignments -- potentially further exploring and augmenting findings, insights, techniques, and/or methods. A list of datasets will be made available, but students are free to use their own dataset of interest.

Students will present their final assignments to the class, following the course schedule. Students will also present and write a one-page report evaluating of two different visualizations, from well-known sources. For assignments and visualization evaluations, students can optionally work in groups. Detailed instructions will be made available following the evaluation schedule. We will use GitHub Classroom for the projects.

- Assignment 1: 10%

- Assignment 2: 20%

- Assignment 3: 20%

- Assignment 4 / final project: 25%

- Vis critique report: 15%

- Participation: 10%

**Policy for Missed or Late Work**

Since students will need to present their projects to the class, it is very important that they are submitted by the deadlines, otherwise it will be difficult to schedule new presentation slots. If you are unable to complete a project by the deadline, a documented compelling excuse (such as illness, hospitalization) is required.

### Attendance / Participation Policy

**Policy:**

This course includes a class participation grade that will take into consideration the student's contribution to a productive environment, either in the classroom or office hours. Attendance is important, but **this is a subjective assessment**, and does not mean that the student needs to participate in *every* classroom discussion. It does mean, however, that they need to actively engage with the instructor or classmates in some capacity (classroom, discord, office hours, emails). More importantly, rather than only penalize absences (by subtracting points), students will be rewarded for good attendance and participation.

Students who struggle with the material and activities, but that take advantage of other opportunities provided (e.g., office hours, mentoring), can be successful in this course.

Please email me if you face an unexpected situation that may impede your attendance, participation in required class and exam sessions, or timely completion of assignments.

**Other Course Policies**

### Academic Integrity

As a student and member of the UIC community, you are expected to adhere to the [Community Standards](https://dos.uic.edu/community-standards/) of [academic integrity](https://dos.uic.edu/community-standards/academic-integrity/), accountability, and respect. Please review the [UIC Student Disciplinary Policy](https://dos.uic.edu/wp-content/uploads/sites/262/2021/09/Student-Disciplinary-Policy-2021.pdf) for additional information.

**Email Expectations**

Students are responsible for all information instructors send to your UIC email and Blackboard accounts. Faculty messages should be regularly monitored and read in a timely fashion.

### IV. COURSE SCHEDULE

**Weekly Schedule of Class Topics, Assignments, Assessments, Due Dates, and Deadlines**

**Week 1**: Course introduction & the importance of visualization

**Week 2**: Data & attribute types, channels, tasks, analysis loop

**Week 3**: Data questions and transformations

**Week 4**: Exploratory data analysis with computational notebooks + Lab

**Week 5**: Web technologies for visualization (JavaScript + D3 + Svelte.js) + Lab

**Week 6**: Interaction & multiple views + Lab

**Week 7**: Grammars for visualization (Part 1) + Lab

**Week 8**: Spatial visualization (Part 1)

**Week 9**: Project updates

**Week 10**: Spatial visualization (Part 2) + Lab

**Week 11**: Visual analytics systems -- integrating visualization and analytics (invited talks)

**Week 12**: Grammars for visualization (Part 2) + Lab

**Week 13**: Data management for visualization

**Week 14**: Machine learning & data mining for visualization

**Week 15**: Final project presentations

#### **Disclaimer**

This syllabus is intended to give the student guidance on what may be covered during the semester and will be followed as closely as possible. However, as the instructor, I reserve the right to modify, supplement, and make changes as course needs arise. I will communicate such changes in advance through in-class announcements and in writing via Blackboard Announcements.

### V. ACCOMMODATIONS

### Disability Accommodation Procedures

UIC is committed to full inclusion and participation of people with disabilities in all aspects of university life. If you face or anticipate disability-related barriers while at UIC, please connect with the Disability Resource Center (DRC) at [drc.uic.edu](https://drc.uic.edu/), via email at [drc@uic.edu](mailto:drc@uic.edu), or call (312) 413-2183 to create a plan for reasonable accommodations. To receive accommodations, you will need to disclose the disability to the DRC, complete an interactive registration process with the DRC, and provide me with a Letter of Accommodation (LOA). Upon receipt of an LOA, I will gladly work with you and the DRC to implement approved accommodations.

### Religious Accommodations

Following [campus policy](https://oae.uic.edu/religious/), if you wish to observe religious holidays, you must notify me by the tenth day of the semester. If the religious holiday is observed on or before the tenth day of the semester, you must notify me at least five days before you will be absent. Please submit [this form](https://oae.uic.edu/wp-content/uploads/sites/32/2019/07/StudentReligiousAccomodationRequestForm.pdf) by email with the subject heading: **“YOUR NAME: Requesting Religious Accommodation.”**

### VI. CLASSROOM ENVIRONMENT

**Inclusive Community**

UIC values diversity and inclusion. Regardless of age, disability, ethnicity, race, gender, gender identity, sexual orientation, socioeconomic status, geographic background, religion, political ideology, language, or culture, we expect all members of this class to contribute to a respectful, welcoming, and inclusive environment for every other member of our class. If aspects of this course result in barriers to your inclusion, engagement, accurate assessment, or achievement, please notify me as soon as possible.

**Name and Pronoun Use**

If your name does not match the name on my class roster, please let me know as soon as possible. My pronouns are *[she/her; he/him; they/them]*. I welcome your pronouns if you would like to share them with me. For more information about pronouns, see this page: <https://www.mypronouns.org/what-and-why>.

**Community Agreement/Classroom Conduct Policy**

* Be present by turning off cell phones and removing yourself from other distractions.
* Be respectful of the learning space and community. For example, no side conversations or unnecessary disruptions.
* Use preferred names and gender pronouns.
* Assume goodwill in all interactions, even in disagreement.
* Facilitate dialogue and value the free and safe exchange of ideas.
* Try not to make assumptions, have an open mind, seek to understand, and not judge.
* Approach discussion, challenges, and different perspectives as an opportunity to “think out loud,” learn something new, and understand the concepts or experiences that guide other people’s thinking.
* Debate the concepts, not the person.
* Be gracious and open to change when your ideas, arguments, or positions do not work or are proven wrong.
* Be willing to work together and share helpful study strategies.
* Be mindful of one another’s privacy, and do not invite outsiders into our classroom.

### Content Notices and Trigger Warnings

Our classroom provides an open space for a critical and civil exchange of ideas, inclusive of a variety of perspectives and positions. Some readings and other content may expose you to ideas, subjects, or views that may challenge you, cause you discomfort, or recall past negative experiences or traumas. I intend to discuss all subjects with dignity and humanity, as well as with rigor and respect for scholarly inquiry. If you would like me to be aware of a specific topic of concern, please email or visit my Student Drop-In Hours.

### VII. RESOURCES: Academic Success, Wellness, and Safety

We all need the help and the support of our UIC community. Please visit my **drop-in hours** for course consultation and other academic or research topics. For additional assistance, please contact your assigned college advisor and visit the support services available to all UIC students.

**Academic Success**

* UIC [Tutoring Resources](https://tutoring.uic.edu/)
* College of Engineering [tutoring program](file:///Users/miirikotche/Library/Application%20Support/Box/Box%20Edit/Documents/1262649564537/●%09https:/engineeringequity.uic.edu/services/resources)
* [Equity and Inclusion in Engineering Program](https://engineeringequity.uic.edu/)
* [UIC Library](http://library.uic.edu/) and [UIC Library Research Guides](http://researchguides.uic.edu/).
* [Offices](https://ossb.uic.edu/offices/) supporting the UIC Undergraduate Experience and Academic Programs.
* [Student Guide for Information Technology](https://uofi.app.box.com/s/0nyho51r24yo0pivafibb1nvqogjm401)
* [First-at-LAS](https://first-at-las.uic.edu/) Academic Success Program, focusing on LAS first-generation students.

**Wellness**

* **Counseling Services**: You may seek free and confidential services from the Counseling Center at <https://counseling.uic.edu/>.
* Access [U&I Care Program](https://dos.uic.edu/student-assistance/uicare/) for assistance with personal hardships.
* **Campus Advocacy Network**: Under Title IX, you have the right to an education that is free from any form of gender-based violence or discrimination. To make a report, email [TitleIX@uic.edu](mailto:TitleIX@uic.edu). For more information or confidential victim services and advocacy, visit UIC’s Campus Advocacy Network at <http://can.uic.edu/>.

**Safety**

* [UIC Safe App](https://ready.uic.edu/toolkit/uic-safe-app/)—PLEASE DOWNLOAD FOR YOUR SAFETY!
* [UIC Safety Tips and Resources](https://ready.uic.edu/toolkit/be-safe-and-prepared/other-safety-resources/)
* [Night Ride](https://transportation.uic.edu/night-ride/)
* [Emergency Communications](https://emergency.uic.edu/): By dialing 5-5555 from a campus phone, you can summon the Police or Fire for any on-campus emergency. You may also set up the complete number, (312) 355-5555, on speed dial on your cell phone.