# Visualization & Visual Analytics 1

Angus Forbes

creativecoding.evl.uic.edu/courses/cs424

# Project 3

- Solving a real-world visualization problem

- Working with domain experts to meet their needs

- Main dataset is assigned in advance, will be opportunities to incorporate additional data

# Option 1

***Interactive visualization of dynamic rule networks***

Harvard Medical School – Fontana Lab – Systems Biology – Probabilistic Programming – Dynamic Network Layout

# Option 1

## *Challenge 1*

Create an interactive web visualization that automatically creates "site graphs" from a JSON file. The graph should be editable so that a user can add, edit, or remove information from the site graph using your interface, and will update the underlying data representation as required. The layout must effectively manage highly complex site graphs so that visual clutter (e.g., link crossings, color choices) is mitigated as much as possible.

# Option 1

## *Challenge 2*

Create a “dynamic influence map” that illustrates how the influence of particular rules describing a biochemical system changes over time. Your web visualization should make it clear how the “influence” updates over time and additionally should support the comparison of how similar influence maps, but with different values, diverge from each other. The influence map should be editable and visual clutter should be mitigated as far as possible (edge crossing, text labeling, etc).

# Option 1

## *Websites*

http://www.kappalanguage.org/visualization/

http://dev.executableknowledge.org/

http://dev.executableknowledge.org/try/index.html?&plot_period=.1&time_limit=90&model=https%3A%2F%2Fraw.githubusercontent.com%2FKappa-Dev%2FKaSim%2Fmaster%2Fmodels%2Fabc-pert.ka

## *Contact*

**Pierre Boutillier**
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# Option 2

***Extend the "brat" text annotation system to include hypergraphs***

University of Arizona – CLU Lab – Computational Linguistics – Network Layout – Text Annotation

# Option 2

## *Challenge 1*

The *brat* annotation system currently does not support the possibility for an edge to point to another edge (that is, all edges must point to nodes). For instance, imagine you have an edge *alpha* connecting two nodes, A and B, and want another edge *beta* connecting node C to *alpha*. Create an interactive web tool that can overlay text with complex annotations and that supports this functionality (hypergraphs). Users should be able to edit, add, delete annotations as desired, which would update the underlying data representation as required. Users should be able to save the annotations as high-resolution images or PDFs on demand.

# Option 2

## *Challenge 2*

Although the main representation of the text annotation should have the annotation integrated with the text itself. However, an alternative visualization could emphasize the structure of the annotations themselves, and provide information about how often certain annotation patterns appear throughout a single text or a collection of texts. Create an alternative representation that is annotation-focused (rather than text-focused), and make it possible to switch between these two visual representations.

# Option 2

## *Challenge 3*

Any text could be annotated using different rules. For example, any sentence could be annotated in terms of parts-of-speech (Nouns, Verbs, Noun-phrases, etc), but at the same time a sentence describing a biological process could be annotated in terms of how certain words match particular biological functions. Make it possible to show multiple annotations simultaneously, but also give users the option of toggling on or off particular annotations on demand.

# Option 2

## *Websites*

https://github.com/clulab,

http://brat.nlplab.org/examples.html,

http://www.aclweb.org/anthology/E12-2021.pdf,

http://agathon.sista.arizona.edu:8080/odinweb/open/submit

## *Contact*

Gustave Hahn-Powell,
hahnpowell@email.arizona.edu

# Option 3

## Create an interactive geospatial interface for historical aerial photographs of the City of Chicago

University of Illinois at Chicago – UIC
Special Collections – Geotemporal Data

# Option 3

## *Challenge 1*

Create a interactive interface that lets users explore a historical archive of aerial photographs, showing the evolution of the city over the last 5 decades.

## *Challenge 2*

Extend your interface so that it also includes additional historical datasets (not necessarily image datasets) from the UIC special collections, especially (but not exclusively) ones that can be linked geographically to the aerial photographs.

# Option 3

## *Websites*

https://uofi.app.box.com/files/0/f/9156817677/CAPS_Project_Copies,

http://library.uic.edu/collections/special-collections-university-archives,

http://library.uic.edu/collections/digital-images,

http://explore.chicagocollections.org/

## *Contact*

Ian Collins,

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# Option 4

## Investigating fluvial geomorphology, using visualization to understand how rivers evolve

University of California at Santa Barbara – Earth Research Institute – Environmental / Geological Data

# Option 4

## *Challenge 1*

Create a visualization tool that makes it possible to enable objective detection and characterization of riffles & pools from real river data

- locations of absolute minima and maxima?
- locations & lengths of rising vs. falling slopes?
- lengths of riffles vs pools?
- amplitude & wavelength of riffles?
- comparing multiple river profiles?

# Option 4

## *Challenge 2*

Enhance the visualization so that it's possible to quantify and visualize the asymmetry of riffles and pools from real river data

- a simple equation for asymmetry exists, but may need to interactively fit a curve to better match the data

# Option 4

## *Slides + Code*

Will put slides and code examples online

## *Contact*

Erin Bray,

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# Option 5

## Develop new visualization methods to represent RF data

Keysight Technologies, Inc. – Electronic Measurements Dept.

# Option 5

## *Challenge 1*

Create visualizations that show the intensity of particular RF data at different locations in real-time.

## *Challenge 2*

Create an interactive visualization to compare different locations at the same time, or averaged across a time period.

## *Challenge 3*

Create an immersive visualization (AR?/VR?) that shows RF data at different parts of the city, e.g., along a CTA line, or at the Riverwalk downtown, etc.

# Option 5

## *Websites*

http://www.architectureofradio.com/

http://www.elasticspace.com/2013/09/the-immaterials-project

http://maps.generalradio.org/

http://creativecoding.evl.uic.edu/pdfs/Balogh_SpectralLandscapes_CGA_2016.pdf

## *Contact*

Brett Balogh, brett.balogh@gmail.com

Jonathan Helfman, jonathan_helfman@keysight.com

# Option 6

## Investigating travel patterns in an urban environment by animating origin-destination matrices

Transportation Research Board – AirSage, Inc – Urban/Geographical Data

# Option 6

## *Challenge 1*

Create an interactive that visualizes hourly origin-destination matrices by trip purpose and traveler type

- 30 consecutive days for a large metropolitan region in the US is available (Orlando)

- Shapefiles for city + neighborhoods are available

- The visualization should provide insights into travel trends in the city.

# Option 6

## *Challenge 2*

Include a range of analysis tools so that your visualization can provide information about:

- Spatial patterns of different kinds of travelers
- Day-to-day variations in travel patterns
- Behaviors of different market segments (tourists, workers, work week, weekend)
- Integration of OD data with other data, e.g., (e.g. land use data, demographic data)

# Rules

- Each of the six project options must be assigned to at lest one team
- Teams assigned to the same project can share data / programming tools, etc, but should have develop their own unique ideas
- Teams can be made up of between 2 and 4 students, except...
- No more than 2 graduate students per team

# Option 6

Data will be available online

## *Websites*

Urban Flows: https://uclab.fh-potsdam.de/cf/

Shangai Metro Flow: http://tillnagel.com/2013/12/shanghai-metro-flow/

http://tillnagel.com/wp-content/uploads/2010/09/Nagel-ShanghaiMetroFlow-VISAP2014.pdf

## *Contact*

Sybil Derrible, derrible@uic.edu

# Deliverables

Week 1:

- Choose you project and make sure you understand the data.

- Create sketches of the possible interface and investigate the necessary technology to work with the data.

Week 2:

- Present a Project Plan outlining the innovation of your project and the work necessary to complete it.

- Contact domain experts to verify relevance of visualization tasks.

# Deliverables

Week 3:

- Present a first draft of your project to domain experts and report on their feedback.

- Critiques by instructors and guest reviewers.

Week 4:

- Final Project 3 presentations in class (12/1)

Week 5:

- Turn in final version of Project 3 and Project Report (12/9)

# Presentations?

Dec 1st, Thursday, 3:30-5:30pm

OR

Dec 9th, Friday 1:00-3:00 pm