Visualization & Visual Analytics 1
Angus Forbes

creativecoding.evl.uic.edu/courses/cs424
Grades

- grading rewards bravery, originality, curiosity, creativity, difficulty
- grading of assignments is purposefully harsh... not to crush your spirit, but to give you a sense of how I think others would judge
- goal is to get better during the class, it would be absurd to expect to already be an expert – if that was so, then you wouldn’t need to take this class
- will provide a list of requirements for grades for the complete project
- seemed to be a lack of awareness about how hard it was to make sense of your sketches
Visual communication

- Humans are very good at picking up on even subtle cues about... pretty much anything that we can take in with our senses. We are instinctively aware of what is appropriate in what contexts.

- Any image can be interpreted in multiple ways. In addition to overt, intended meaning of a representation, there are hidden meanings, the “subtext” of an image, accidental unintended meanings. As producers and consumers of images – we should be aware of these meanings.
Visual communication

This ability to interpret images is partly innate (how our brains have evolved to process the world), partly personal (due to our experiences and attachments to particular forms and colors, etc), and partly cultural (our conscious or unconscious awareness of what forms are appropriate, interesting, current, etc).

While we can’t (yet) manipulate the structure of our brains, our awareness as individuals, and as a culture, changes over time...
Click here and you can listen to the greeting announcement.

Take a wistful gaze into my celestial coffee cup...

You're visiting my Dream

Enchanted
Welcome to Apple

Introducing CyberDrive

Register today for a free CD-ROM.

Preorder Mac OS 8
Now you can preorder Mac OS 8, described by Macworld as "the most comprehensive update to the Mac OS in years, sporting a bold new look, a speedier Finder, more"

Be the First to Know
Learn about new Macintosh software releases the moment they become available. Check Hot Mac Products to hear about programs like Speed Demon, ReBirth RB-338 and
Introducing Series 2.
Welcome to Thefacebook!

Thefacebook is an online directory that connects people through social networks at colleges.

We have opened up Thefacebook for popular consumption at Harvard University.

You can use Thefacebook to:
- Search for people at your school
- Find out who are in your classes
- Look up your friends' friends
- See a visualization of your social network

To get started, click below to register. If you have already registered, you can log in.
University of Illinois at Chicago

Electronic Visualization Laboratory
The Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago (UIC) is a graduate research laboratory specializing in virtual reality and real-time interactive computer graphics. A joint effort of UIC's College of Engineering and School of Art and Design, EVL represents the oldest formal collaboration between engineering and art in the country offering graduate degrees in electronic visualization (MFA, MS, PhD).

Electronic Visualization is the art and science of creating images on electronic screens and on virtual reality display devices. The primary goal of the Electronic Visualization graduate program is to further students' visual goals using the tools of advanced computer graphics, computer animation, interactive graphics, video, and virtual reality (VR).

Related research goals include scientific visualization, new methodologies for informal science and engineering education, paradigms for information display, distributed computing, sonification, human/computer interfaces, every-citizen interfaces, and abstract math visualization. EVL is also involved in evaluating virtual reality as an educational tool.
The Electronic Visualization Laboratory (EVL), is an interdisciplinary graduate research laboratory that combines art and computer science, specializing in virtual reality, visualization and high-speed networking. The laboratory is a joint effort of UIC's College of Engineering and The School of Art & Design, and represents the oldest formal collaboration between engineering and art in the country offering graduate degrees in visualization (MFA, MS, PhD). Funded research projects include; tele-immersion, collaborative software, the development of viable, scalable, deployable stereo displays and management of next-generation advanced networking initiatives.

In 1992, EVL invented the CAVE® virtual reality theater, followed by the ImmersaDesk® in 1995. These are now used globally for tele-immersive scientific discovery, art exhibition and industrial prototyping.

Having received recognition for developing the CAVE® and ImmersaDesk® virtual reality systems, EVL's current research focus is...
Gold Nanoparticle

Participants can explore the self-assembly of a ligated gold nanoparticle and proteins inside an ionic solution in the CAVE2™ Hybrid Reality Environment. Data and visualization provided by the Petr Kral Research Group at the Department of… Read more
Campus Organization

All departments with home pages are under Academic Programs. Other campus units, such as Human Resources, Business Affairs, or the Police are under Campus Units.

- Campus Phonebook

Students

- Undergraduate Catalog
- Graduate Catalog

Services
- Organizations
- Governance

Employment Opportunities:
- Academic
- Student

Academic Opportunities:
- Admissions and Records
This ability and compulsion to interpret applies to everything – fashion, personality advertisements, cell phones, cars, the way we speak, the phrases we use, how we socialize, how we think and organize, political beliefs, interactions with technology, research methodologies ... 

For the purpose of this class - I want everyone to think about communication that takes place on images and screens...
Even though it’s a relatively new field, our use of interactive data visualizations have become much more sophisticated in recent years.

A good visual designer is aware of:

- the history and context of different types of images and visualizations,
- the audiences they are presenting to and an expectation of how different audiences will respond,
- their own personality - interests, biases, etc.
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Interpretive Perspectives

Paul Martin Lester lists different perspectives you can have when producing or interpreting an image:

- Personal
- Historical
- Technical
- Ethical
- Cultural
- Critical
Dataset type / Data types

Tamara Munzner tries to present a comprehensive overview of what can be visualized, and what elements can be used to visualize them.

She further discusses the visual encodings that can be used to build, highlight, and emphasize elements in the datasets.

She also discusses various tasks that can be accomplished using visualization.
Dataset type / Data types

According to her, there are four basic (and three less common) "dataset types":

- **Tables** - [space defined by rows and columns, ordered in some way]
- **Networks** - [space defined by algorithms to minimize clutter]
- **Fields** - [mins and maxs]
- **Geometry** (i.e. 2D maps) - [real world positions]
- **Clusters, Sets, Lists** - [no intrinsic spatial position]
Furthermore, each of these "dataset types" is made up of "data types" that include:
- items, attributes, links, positions, and grids.

For each of these, the data type can be:
- categorical, ordinal, or quantitative.

Finally, this data can either be:
- static or dynamic.
Dataset type / Data types

**item** - an item is a discreet entity, separate from other entities

**attribute** - an item can have many (or zero) attributes, depending on what the item represents.

**link** - a link is a relationship between items

**grid** - a grid indicates the visualization strategy for sampling continuous data

**position** - a specific spatial location, i.e. lat/lng on a map.
Dataset type / Data types

- not every dataset necessarily requires making use of all of these data types...

Tables have *items* and *attributes*

Networks have *items*, *attributes*, and *links*

Fields have *grids* and *positions* within the grid

Geometry has *items* and *positions*

Clusters, Sets, Lists have *items*
Visualization Tasks

Tasks are made up of

- **Actions**
  things you can do with the data

- **Targets**
  results of what your action
Data Actions

Analyze

- Consume existing information
- Discover / Generate or Validate hypotheses
- Present / Communicate
- Enjoy / Inspire
- Produce new information
- Annotate
- Record
- Derive / Transform
Data Actions

Search
- Lookup
- Browse
- Locate
- Explore

Query
- Identify
- Compare
- Summarize
Data Targets

- Trends
- Outliers
- Features
- Distribution
- Extremes (maxima/minima)
- Dependencies / Relationships
- Correlation / Causality
- Similarity
- Topology
- Paths
- Shapes
Exercise

Convene in groups of 2 or 3, contrive a dataset consisting of your family members and/or close friends and information about them. [items, categorical or ordered or quantitative attributes, relationships, etc]

- Sketch up 4 different visualizations for each of the dataset types (table, network/tree, field, geometry) – Sketch up a 5th one which merges two of the dataset types...

- Show how your visualization could facilitate analysis, search, and/or query tasks and what a “target” output might look like
Exercise

“Don’t just draw what you’re given; decide what the right thing to show is, create it with a series of transformations from the original dataset, and draw that!” – Munzner
What is Vis, and Why do it?

In other words – there is lots of room for innovation in visualization:

- layout algorithms
- interaction techniques
- analysis techniques
- application to particular datasets & assisting “domain experts” with their tasks
For next week

For Tuesday, read Munzner, Chapter 3 and 5 (you can skip Chapter 4 for now)

Quiz on Tuesday – D3.js and Munzner chapters 1, 2, 3, and 5

Project 1 due on Thursday – I will post minimum requirements for C, B, A