GUI REVIEW PREPARATION

CSE416 – Section 1

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Objectives

- Begin to design the structure of your Web GUI
- Consider the libraries needed to implement parts of your GUI
- Prepare for your GUI Review

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Reading

- Good post that explains the basics of non-linear regression
  https://statisticsbyjim.com/regression/curve-fitting-linear-nonlinear-regression/
- Ecological Inference
  https://gking.harvard.edu/files/eiintro.pdf

  https://github.com/mggg/ecological-inference/blob/main/paper/paper.pdf
- Ecological Inference (EI) Github available at
  https://github.com/mggg/ecological-inference/blob/main/pyei/intro_notebooks/Plotting_with_PyEI.ipynb

You will see use cases for ecological inference in the current draft of the use case list

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GUI Review

- 15-minute Zoom review (a few teams reviewed in class)
- Grade based on
  - Depth of requirements review (show you analyzed project)
  - Usability of the interface (user-based logic)
  - Quality of the interface (e.g., color choice, layout, readability, etc.)
  - Depth of implementation (e.g., real data, use of client APIs, etc.)
- Time slots will be published in class Web site
- Request a time slot with an email to me
- Provide alternate time slots

Graded GUI reviews begin the week of 3/2

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GUI Review Expectations

- Show an understanding of overall requirements of project
- Demonstrate knowledge of project background
- Show logical flow of GUI from a user's perspective
- Real data (e.g., EAVS data) not required for review
- Demonstrate basics of GUI design

Your GUI review should show a nearly complete skeleton of your final project

Most of your project GUI will be a Web Single-Page Application (SPA)

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Suggested GUI Items

You will need to select your client visualization tool

- Splash page with map of US showing all 48 continental states
- State selection
- Menu items consistent with use cases
- Transitions in response to use case menu selections
- Tabs to show separation of GUI functions
- Tables to display summary data (filled with dummy data)
- Graph placeholders (correct style of graph, but with dummy data)

Consider the JSONs of dummy data you will need to populate each GUI component

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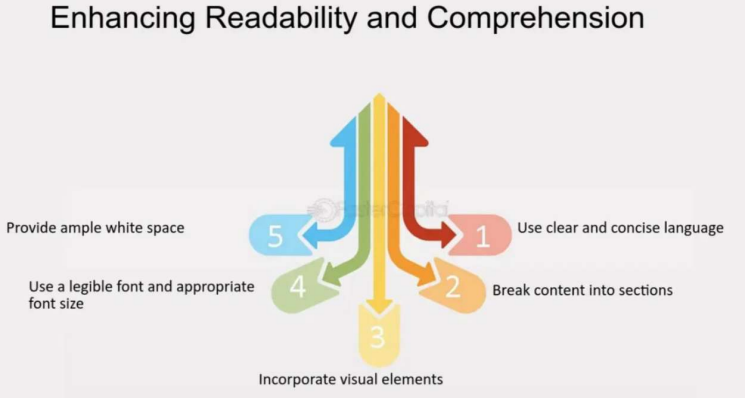
GUI Core Principles

- Consistency
- Clarity and simplicity
- Visual hierarchy
- User control and freedom
- Recognition over recall

Extensive human factors studies of readability have led to many of these recommendations



Qamarjafari

Core principles based on Google AI search

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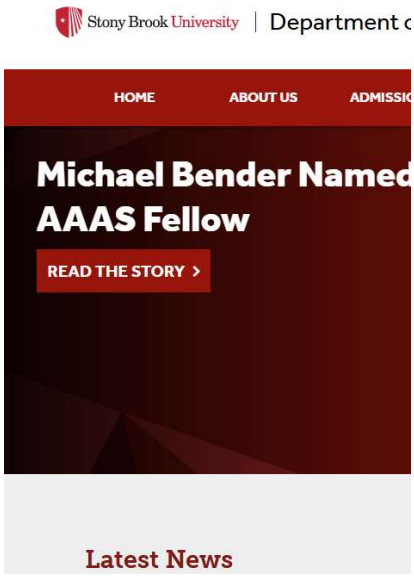
GUI Principles (Consistency)

- Maintain a uniform look and behavior across the entire interface
- Use the same colors, fonts, and icon styles
- Help users recognize patterns
  - For example, a button should behave the same way in every component

Variations in look & feel tell the use that something is different



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GUI Principles (Clarity and Simplicity)

- Avoid clutter
- Focus the user's attention on important tasks.
- A simple interface is easier for users to understand and navigate without a steep learning curve

Make navigation intuitive

Assume your typical user is accessing your system for the first time

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GUI Principles (Visual Hierarchy)

- Arrange and size elements to guide the user's eye and indicate importance
- GUI has an inherent hierarchy, for example,
  - Banner with name of the state is at top of hierarchy
  - Table heads higher than cell data
- Text size and style shows a hierarchy
  - Font size – larger font size for items higher in hierarchy
  - Bold text show higher in hierarchy compared with plain text
  - Placement indicates a hierarchy (lower in page connotes lower levels)

Do not use all-caps or underlines to show hierarchy

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GUI Principles (User Control and Freedom)

- Ease and logic of navigation
- Easy to undo or reverse actions.
- Offer clear "Cancel" or "Back" buttons
- Accessible exit paths

Ensure that navigation components (e.g., buttons) appear as such

Your use case list includes a reset

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GUI Principles (Recognition Over Recall)

- Reduce the cognitive load by making objects and actions visible
- Users should recognize options rather than having to recall them from memory

Tabs are helpful when the content has clear groupings and not enough screen space for everything

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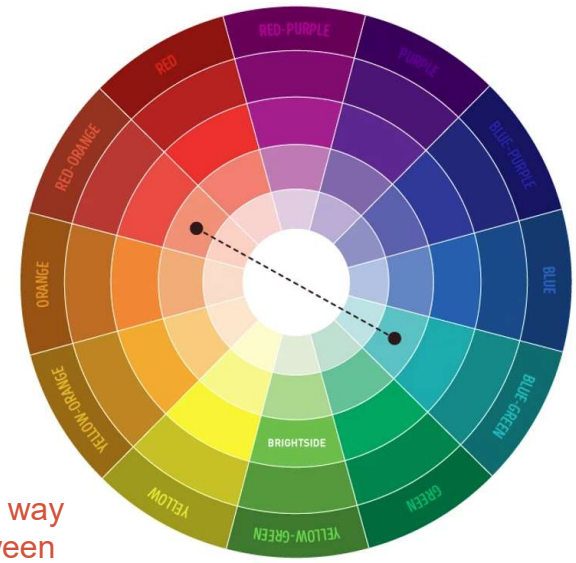
GUI Visual Elements

- Color palette
- Typography
- Layout and spacing
- Imagery
- Interactive elements



Viewing on CS2120 screen will require greater contrast than your laptop

A color wheel is a good way to ensure contrast between text and background

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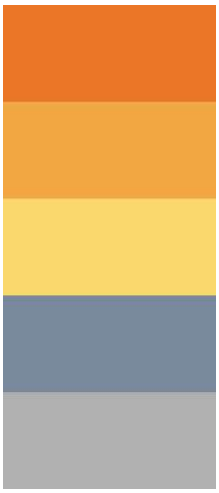
GUI Visual Elements (Color Palette)

- Consistent color scheme of 3–5 colors
- Reflects the brand's personality and evokes the desired emotional response.
- Ensure sufficient contrast for readability, especially between text and background



Consider colorbrewer2.org for color suggestions for choropleth maps

Don't use red or blue for anything other than chart indicators of Republicans and Democrats

Your GUI Builder app might have themes

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GUI Visual Elements (Typography)

- Use one or two fonts that are highly legible on all devices.
- Use font size, weight, and style consistently to create a clear visual hierarchy for headings and body text

Sans-serif fonts (e.g., verdana and calibri) are best for text

Serif Sans-Serif

Abc Abc

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GUI Visual Elements (Layout and Spacing)

- Use white space and grid-based layouts to create balance
- Properly sized margins and padding make content easier to read
- Left aligned text for readability
- Right aligned numbers for readability

Your GUI design should avoid scrolling

Be aware that you are required to display far more results than can fit on a screen

Alternate row shading works nicely in a table

Video standard	Resolution	Pixels	Aspect ratio
QQVGA	160 × 120	19k	4:3
HQVGA	240 × 160	38k	3:2
QVGA	320 × 240	76k	4:3
WQVGA	480 × 272	130k	16:9
VGA	640 × 480	307k	4:3

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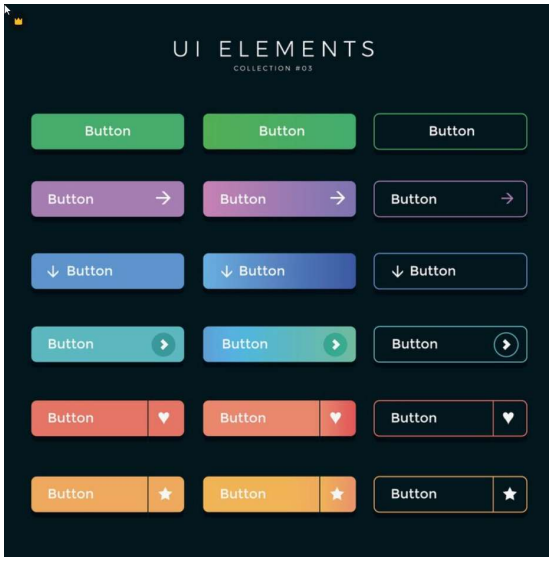
GUI Visual Elements (Interactive Elements)

- Create distinct and predictable styles for interactive elements like buttons, links, and forms
- Use hover effects or animations consistently to provide clear visual feedback

Make sure your buttons look like buttons (not headings)



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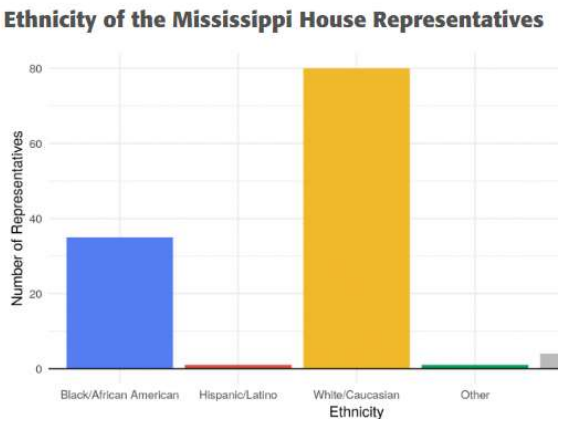
Charts

- Bar charts
- Map displays
- Choropleth maps
- Bubble charts
- Line graphs (e.g., non-linear regression)
- Probability curves

Start to think about the data structures that support your displays



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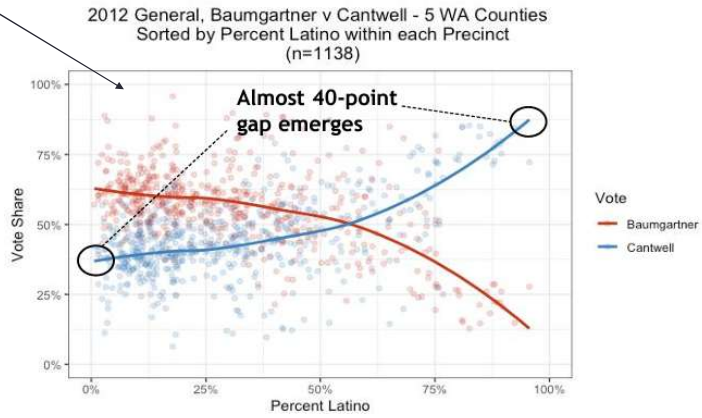
Charts

Sometimes referred to as a Gingles Chart

Your client visualization API should support non-linear curves

- Lots of good graph examples in https://senatedemocrats.wa.gov/wp-content/uploads/2021/10/Barreto-WA-Redistricting-Public-Version.pdf
- Calculate non-linear regression curve
- Possible linkage between your chart and table data (click one component and transition to the corresponding component)



You might use the SciPy library for non-linear regression

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Ecological Inference

Covered in more detail in a few weeks

- Definition – “the process of extracting clues about individual behavior from information reported at the group or aggregate level.”
- Used to estimate racial/ethnic voting patterns

No direct voting data associates a political data with their membership in a racial/ethnic/economic group

- Used frequently in VRA litigation
- A Python library will be the start (PyEI MGGG software referenced earlier in slide set)
- Lots of variations on EI analysis will be contained in the master use case list

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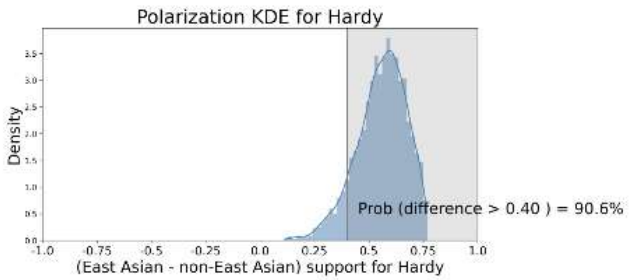
Ecological Inference – Sample Plot

- Plots show the probability of various results
- You can usually analyze the entire state or just a portion, but county level data will allow just state analysis



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Did You Satisfy the Objectives?

- Begin to design the structure of your Web GUI
- Consider the libraries needed to implement parts of your GUI
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