# Exploratory Data Analysis

## Visualization Goals

### Communicate (Explanatory)

* Present data and ideas
* Explain and inform
* Provide evidence and support
* Influence and persuade

### Analyze (Exploratory)

* Explore the data
* Assess a situation
* Determine how to proceed
* Decide what to do

## Effective Visualizations

* Have a graphical integrity
  + Your bar chart has to start at zero
  + If your graph is not zero-based, make it very clear in the graph with a comment, etc.
* Keep it simple
  + Maximize the data-ink ratio
  + Data-ink ratio = Data ink / Total ink used in graphic
  + 3d pie charts are bad
  + Avoid chartjunk
    - Extraneous visual elements that distract from the message
  + <http://extremepresentation.typepad.com/files/choosing-a-good-chart-09.pdf>
  + They are meant to offload the thinking so that you do not have to think very hard.
    - Look at wtf visualizations for bad examples.
* Use the right display
  + Bars vs. lines
    - Bar imply separate data
    - Lines imply continuous data
* Use color strategically
  + Whenever possible, don’t use color
  + Don’t use more then 5-8 colors
    - Don’t use the entire rainbow
  + If use color, use color brewer
* Tell a story with data
* Further reading
  + Edward tuft
  + Stephen few

# Storytelling and Effective Communication

## Two Fundamental Questions

### What is the goal?

### Who cares?

## IMAC

* I: Inferatial goal (scientific question of interest)
* M: Model (all models are wrong, some are useful)
* A: algorithms
* C: conclusions and checking

## Key principals

### Remember The Golden Rule

### Know your audience

### Tell a story

* You want to have a simple but memorable example
* Any story has a beginning, a middle, and an end.
  + Introduce interesting characters
  + Put them in a predicament
  + Resolve the predicament
  + But leave room for sequels! (limitations and future work)

### Choose and use notation carefully

### Read great writers

### Create good sense of direction (with the help of signposts), with clear flow of logic

## Tell a Story with Data

* If you give a talk, use some visuals

## Stories

* Stories are the most powerful delivery tool for information, more powerful and enduring than any other art form.

## Key Considerations

### Who is your audience?

* What do they know about your topic?
* What motivates them? What do they desire?
* What experiences do you share? What are common goals?
* What insights can you give them? What tools and ‘magical gifts’?
* Don’t make them think!
  + Your audience does not want to spend cognitiave effort on things you know and can just show them
  + Lead them through the major steps of your story
  + Point out interesting key facts and insights using captions and annotations

### What questions are you answering?

### Why should the audience care?

### What are your major insights and surprises?

### What change to you want to effect?

## Messaging

### Framing – Why should I care?

* Tell the audience: ‘Here is the right way to think about the problem I was trying to solve.’
* Catch the audience’s attention and frame the story using captions and annotations
* If done well, your insights will seem obvious given this framing.

## Visual Story Design

* Beginning is at the upper left
* The middle is at the right
* The end is at the bottom

## Further reading

* The functional art
* Presentationzen
* Made to stick
* resonate

# Effective Presentations

## Clarity

### Clarity of message

* Where do you want the message to be?
  + The big idea
* Where are they now?
* What is the best route to get them from here to there?

#### Telling a Story

* Problem – Pathway – Solution
* Problem – Solution – Reasoning
* The Hero’s Journey
* What is vs. What could be
* Professor’s Way of telling a story
  + Memorable opening
  + Technical nugget 1
    - 1. More detail / 2. More detail / 3. More detail
  + Technical nugget 2
    - 1. More detail / 2. More detail / 3. More detail
  + Technical nugget 3
    - 1. More detail / 2. More detail / 3. More detail
  + Memorable Closing

### Clarity of slides

* Avoid
  + Spelling errors
  + Colors that are hard to see
  + Fonts that are hard to read or see
  + Low quality fuzzy images
  + Clipart
  + Misaligned images

### Clarity of delivery

* Try to get a connection with the audience
* A talk is successful if you can make people’s eyes shine