Week 12: Scientific Viz & Infographics

Fall 2017
Matthew Turk
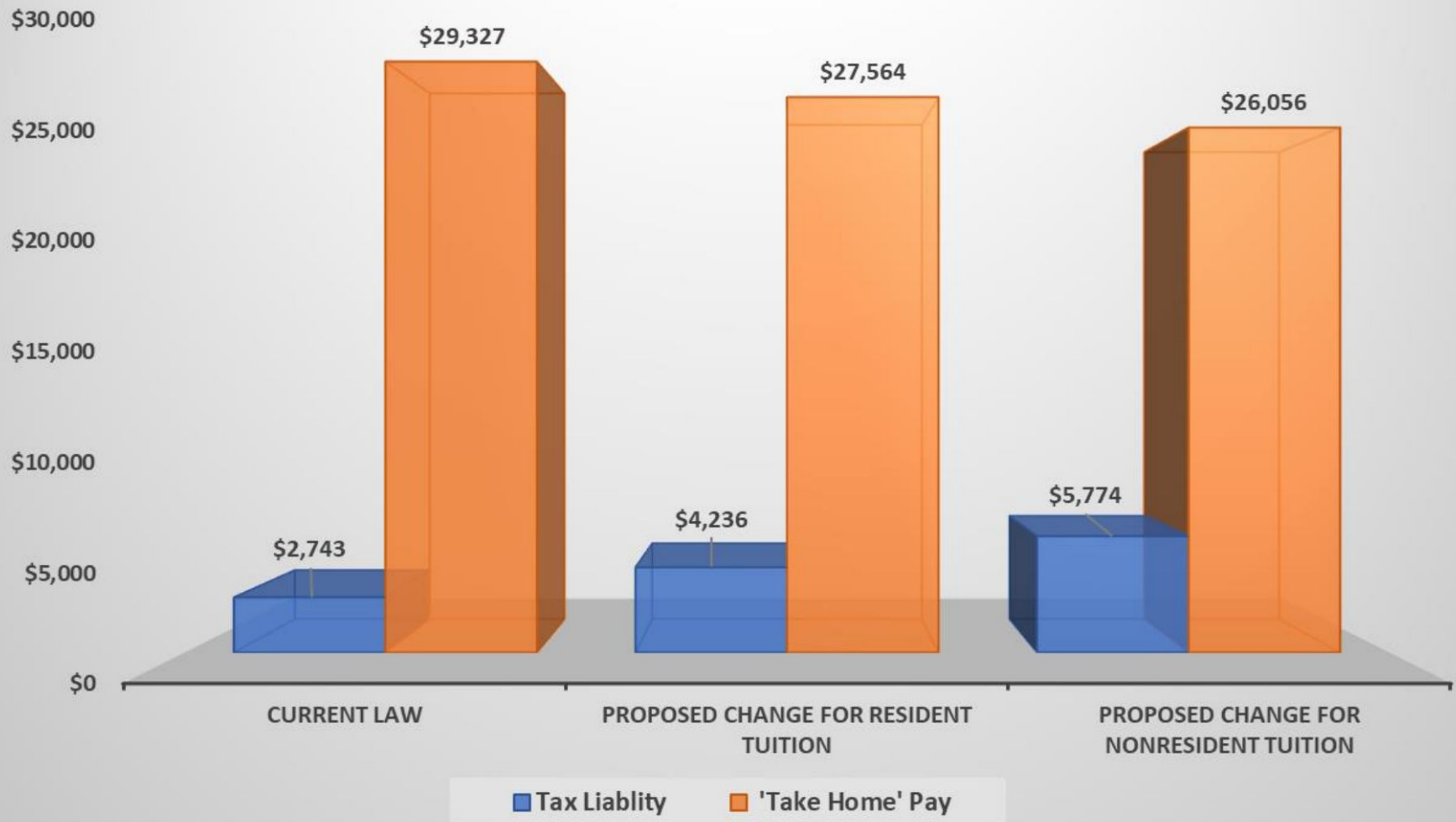
Broadcasting

go.ischool.illinois.edu/meet2

Warm-Up Activity

1. What is the visualization trying to show?
2. What are its methods?
3. What are the strengths / weaknesses?
4. (Bonus) How was the data collected?

**Impact on Typical Graduate Student of Taxing Tuition Waivers**

Example: A single (unmarried) graduate student at the University of Washington, who is a research or teaching assistant for 12 months out of the year, at a monthly 'salary' of $2,650 for an annual income of $31,800, and receives tuition waivers for three quarters, equal in value to $15,500.
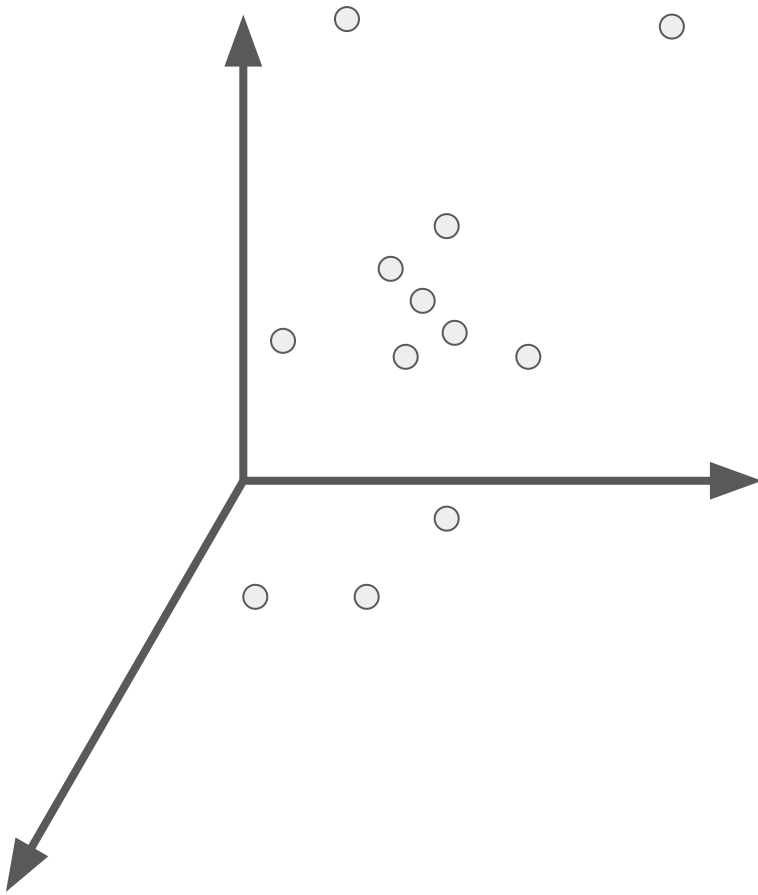
Scientific Viz

- Spatial organization
- Dimensionality reduction
- Multiple quantities

Data Representations
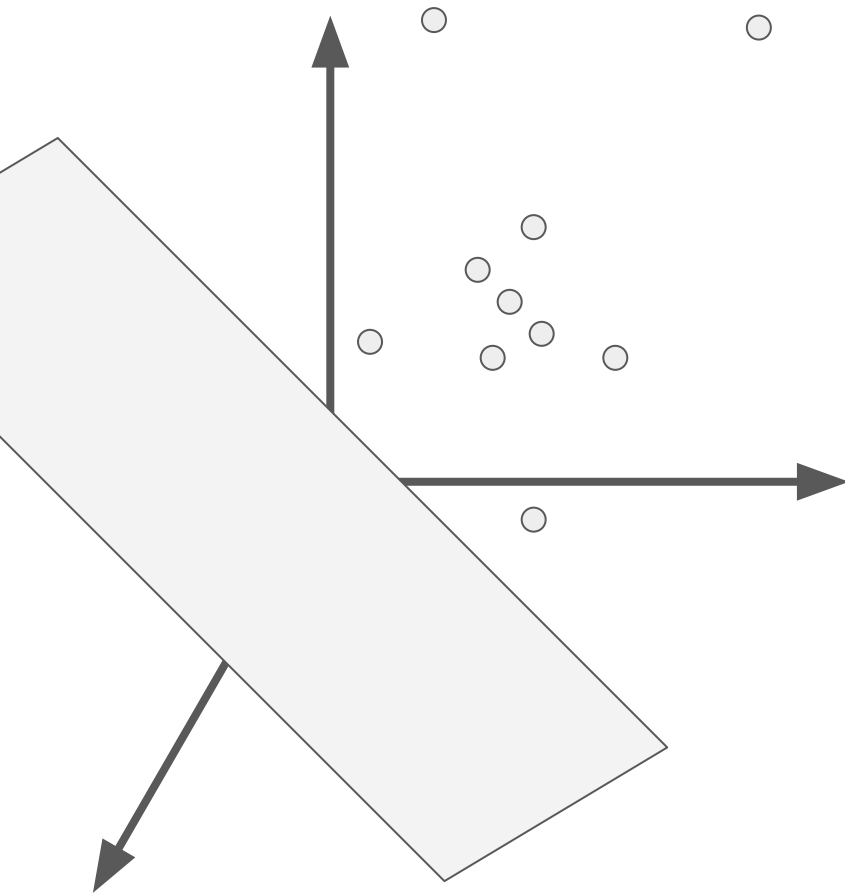
- Discrete
- Volume-filling
- Mesh
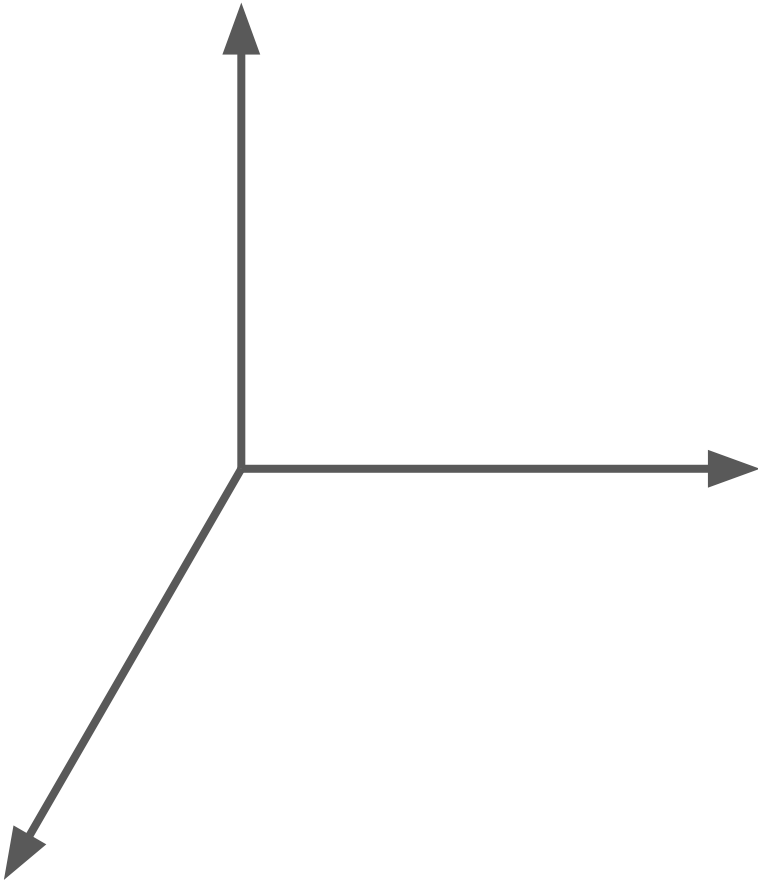
Discrete Points: Data

- Associated field values
- *May* have extent
- Values:
  - Locally defined
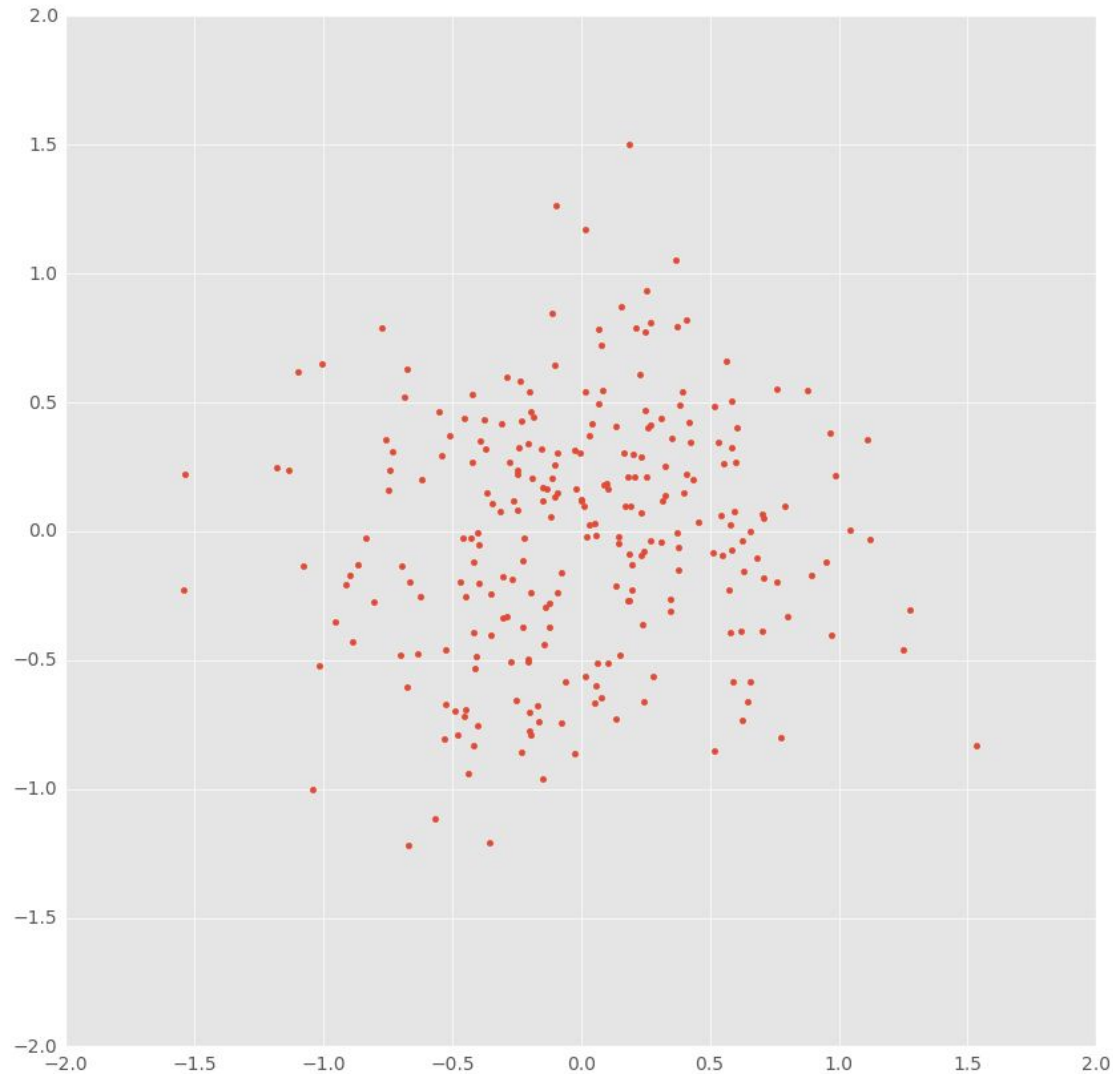 - Integral over neighbors

potree.org

Discrete Points: Techniques

- Projecting onto a plane
  - Gaussian "Splat"
  - Points / circles / patches
- Density estimates
  - Local estimates
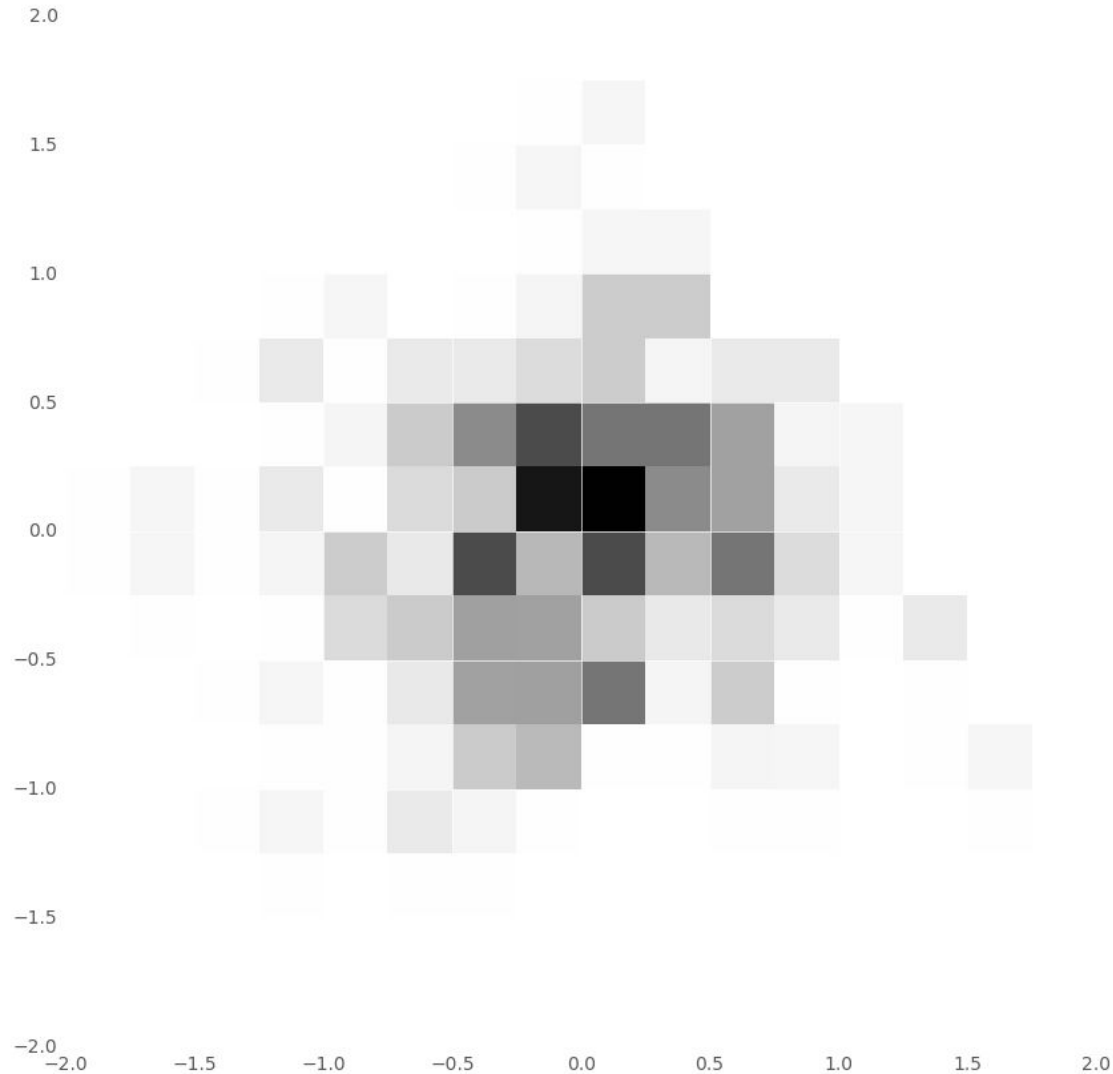 - Adaptive estimates
- Non-Spatial visualization

Discrete Points: Density Estimates
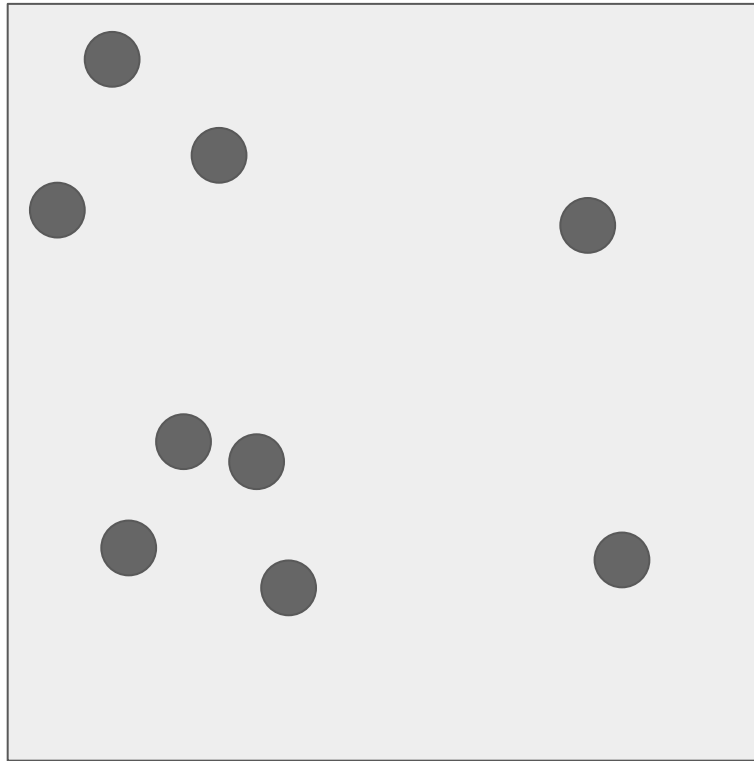
Regular
Quadtree/Octree
kD-tree

Discrete Points: Regular
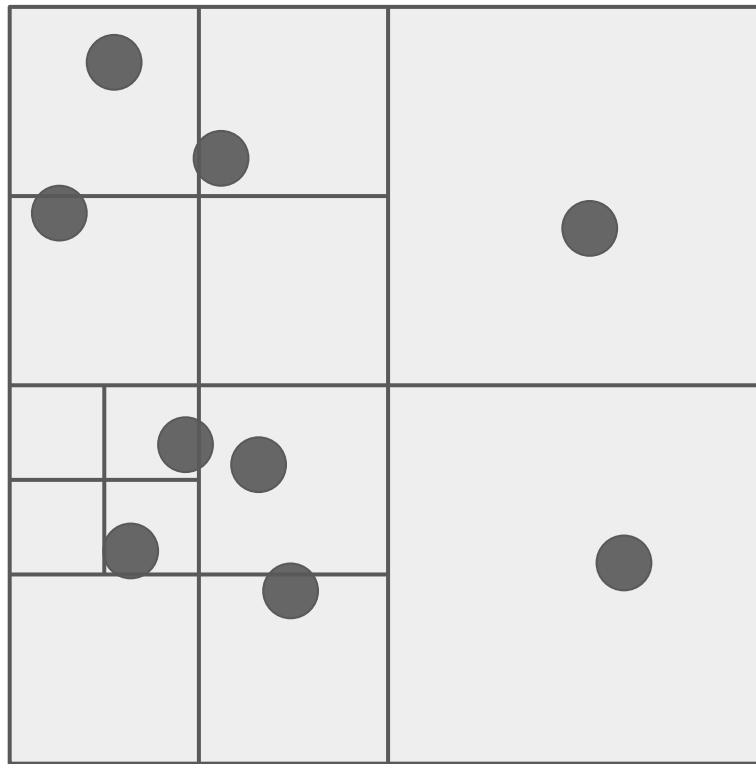
Regular
Quadtree/Octree
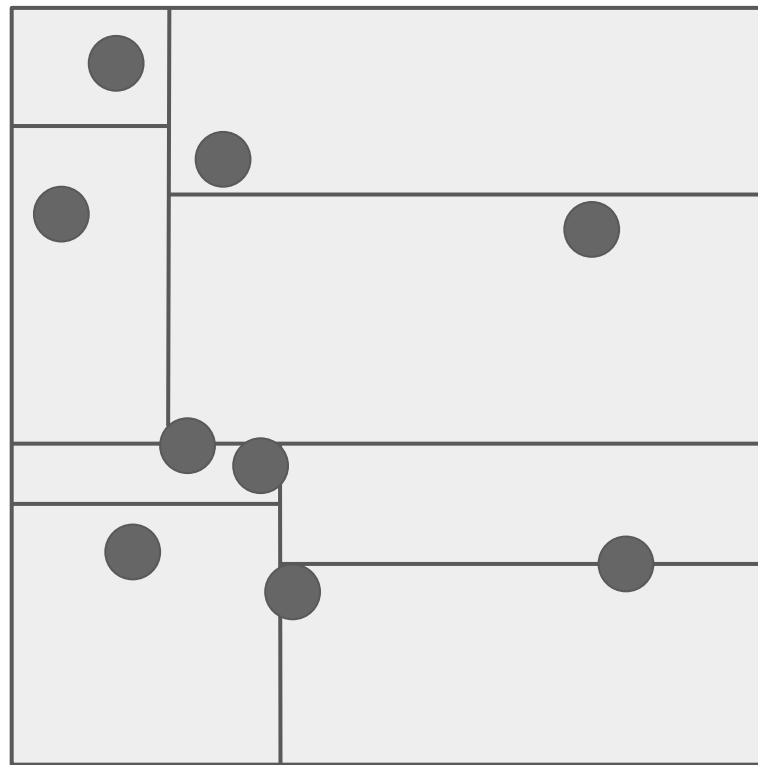kD-tree

Discrete Points: Quad Tree

Discrete Points: Quad Tree

- Simultaneous cuts in x, y
- Not necessarily bisection

Discrete Points: kD-Tree

- Bisection
- Cycle through dimensions
- Median or mean

Volume Filling: Data
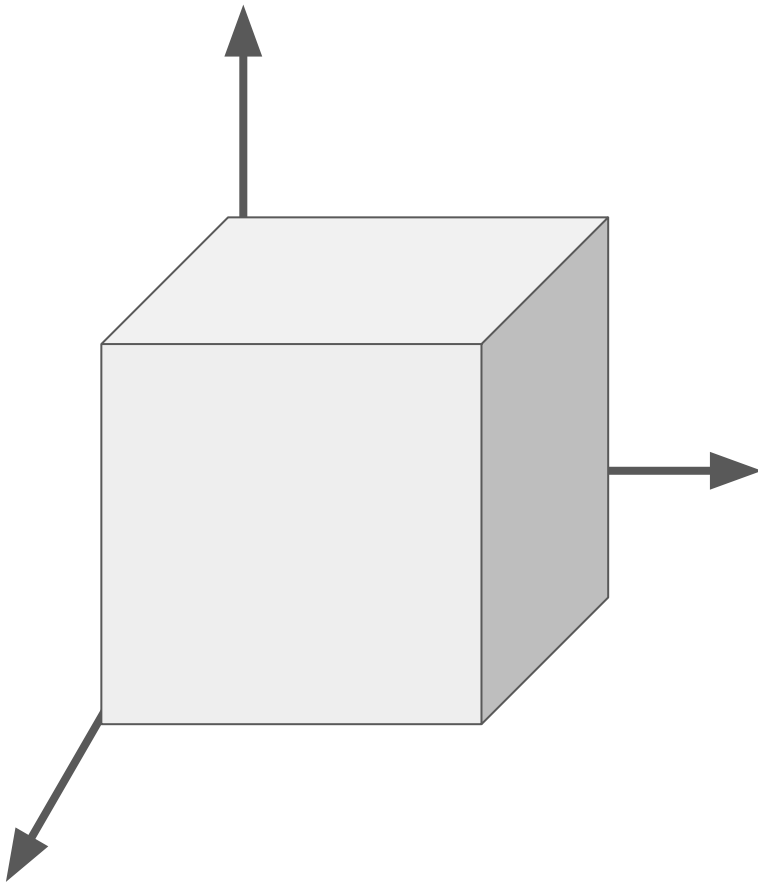
- One or several "values"
- Predictable intervals
- May have multiple in the same domain
- Values:
  - Locally defined
  - Stencil definition (gradient, etc)

Volume Filling: Techniques
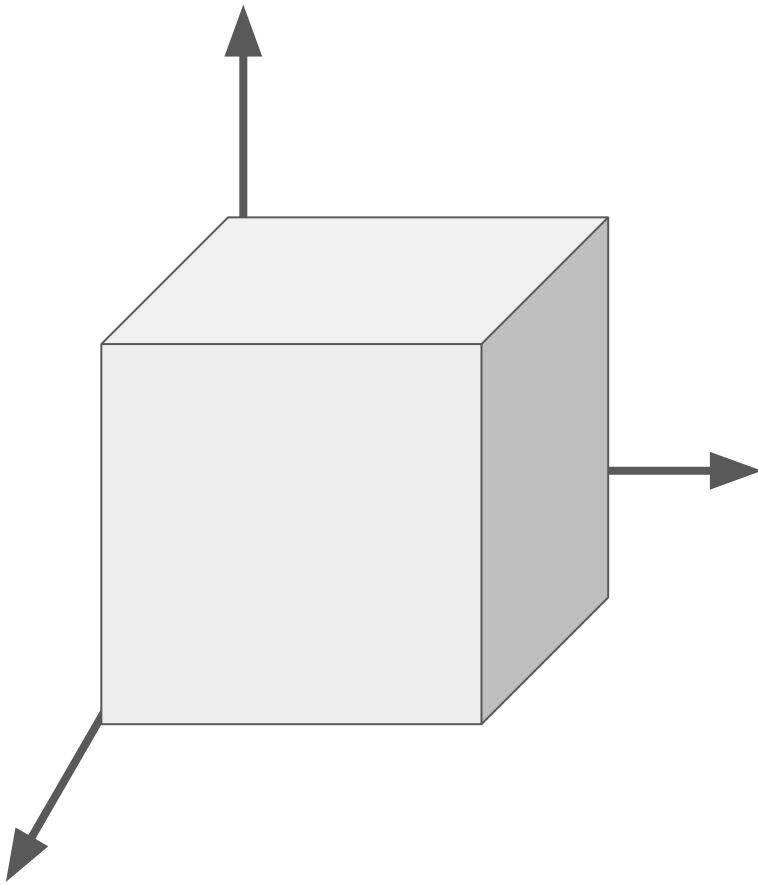
- Dimensionality reduction
  - Min / Max / Integral / Sum / Mean
  - Slice
  - Axially-aligned
  - Non-aligned
- Volume rendering
- Segmentation
- Non-spatial visualization

Mesh: Data
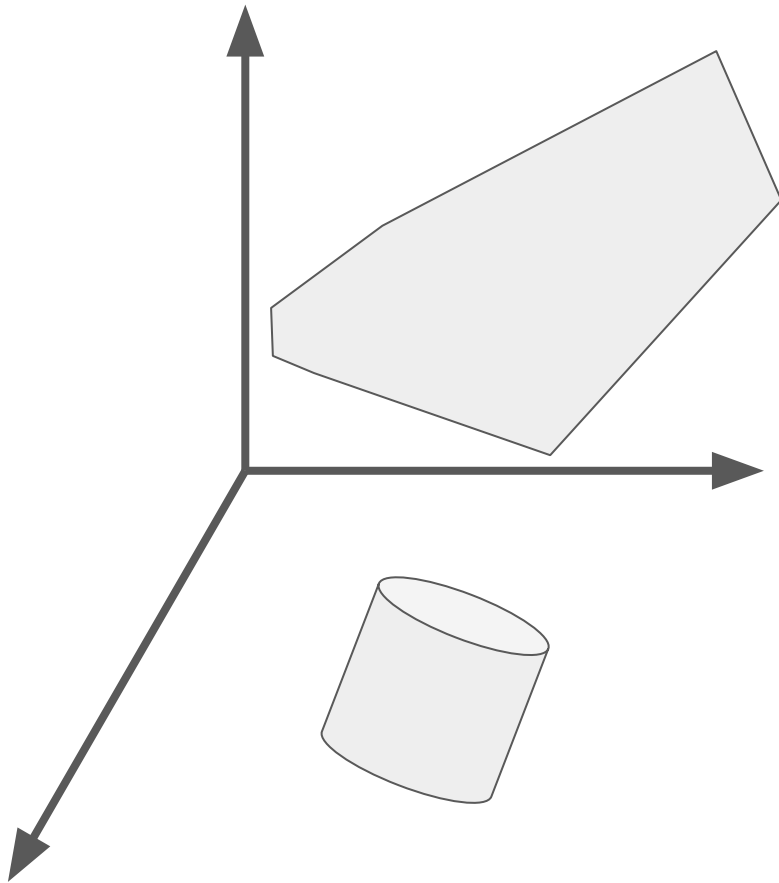
- Components
  - Vertices (can be shared)
  - Faces
  - Edges
- Regular structures
  - Hexahedra
  - Tetrahedra
  - Wedges
- Irregular structures
  - Voronoi tesselations
  - Isosurfaces
  - Point cloud reconstructions

sketchfab.com/jnaiman
sketchfab.com/matthewturk

Mesh: Techniques
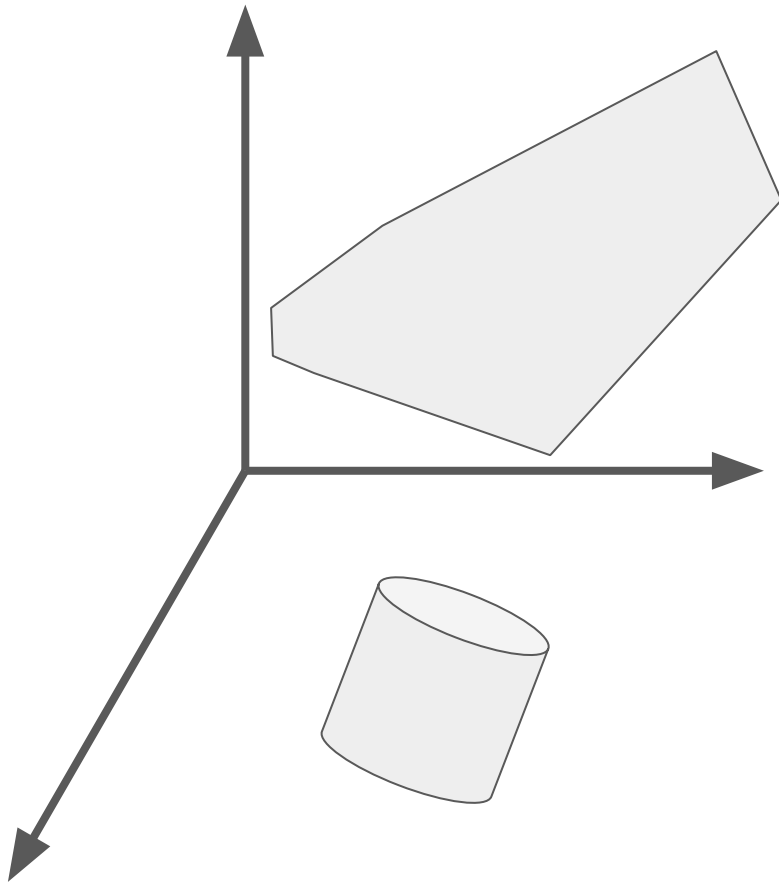
- Volume rendering
- Slices
- Projections
  - First intersection
  - Accumulation
- Intra-element evaluation

Project: Component 3

- Interactive UFO database explorer
  - State-by-state map, colored by aggregate fields
  - Aggregated sightings by year, state, shape, etc
  - Show over-time sightings
  - Select time period
- Involve a second dataset of your own identification for normalization.
  - Cite the dataset (do not check it into your repository)
  - Include all code for reading and cleaning the data

Infographics

- Easy to gather information
- Presented simply
- Hack the brain

Infographics

- Infographics are a *design* task
- Start with quantitative representation, supplement as qualitative

Evaluating Infographics

- What information is this telling me?
- What information is it hiding from me?
- How do the shapes, colors, and text convey the story?
- What is the progression of the information?
  - Is there a connection, explicit or implicit between the charts?
  - Is that connection logical or natural?
- Is the narrative text necessary, supplemental, or irrelevant?

See online slides for example infographics.

Online Creators

- infogr.am
- venngage.com
- canva.com
- piktochart.com

Project: Part 3

- You should write a *function*
- This function will receive a pandas dataframe object and a filename
  - names
  - dates
  - latitude
  - longitude
  - categorical
  - quant1
  - quant2
  - quant3
- Save a PNG file to the supplied filename. The dates column will be in seconds since the epoch.

Project: Component 4

- "Infographic" based on component one or component three.
- Tell a story about the data
- You will be graded on:
  - Aesthetics
  - Representation of information
  - Overall presentation
  - Breakdown of information
- Examples:
  - http://www.numfocus.org/annual-reports.html
  - https://www.nytimes.com/interactive/2016/12/28/us/year-in-interactive-graphics.html
- Submission in PDF or website