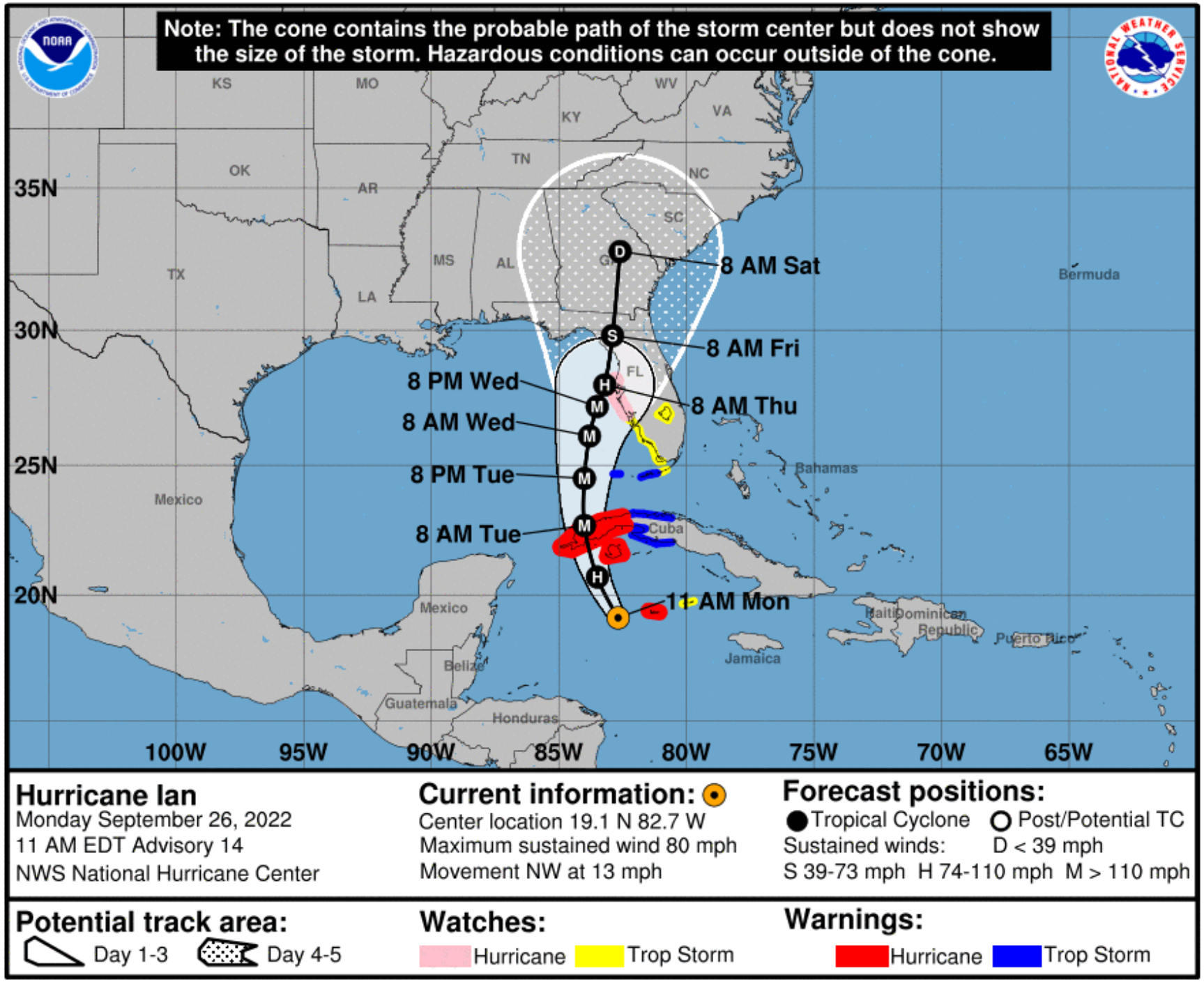
Jessica Witt, Ph.D.
Professor of Psychology

Graphical Displays of Information

Motivation

- Understand how vision works
- Vision ←→ data visualization
- Issues in Data Communication
  - Example: Hurricane forecasts



Hurricane Ian
Monday September 26, 2022
11 AM EDT Advisory 14
NWS National Hurricane Center

Current information:
Center location 19.1 N 82.7 W
Maximum sustained wind 80 mph
Movement NW at 13 mph

Forecast positions:
Tropical Cyclone Post/Potential TC
Sustained winds: D < 39 mph
S 39-73 mph H 74-110 mph M > 110 mph

Potential track area:
Day 1-3 Day 4-5

Watches:
Hurricane Trop Storm

Warnings:
Hurricane Trop Storm

Tampa Bay Times

LOCAL WEATHER / **HURRICANE**

Ian turned, Southwest Florida scrambled. Was there enough time to leave?

Some residents said evacuation orders came too late. Gov. Ron DeSantis said forecasts left few options.

THE HILL

Hurricane Ian made clear: Misinterpreting risks jeopardizes lives

BY JEFF HUFFMAN, OPINION CONTRIBUTOR - 10/06/22 4:00 PM ET
THE VIEWS EXPRESSED BY CONTRIBUTORS ARE THEIR OWN AND NOT THE VIEW OF THE HILL

SHARE TWEET

The Washington Post
Democracy Dies in Darkness

CAPITAL WEATHER GANG

Cone of confusion: Why some say iconic hurricane map misled Floridians

By Scott Dance and Amudalat Ajasa
October 4, 2022 at 5:30 p.m. EDT

KSAT.com

The forecast cone and why it's often misunderstood

Delayed evacuations in Lee County during Hurricane Ian bring the issue front and center

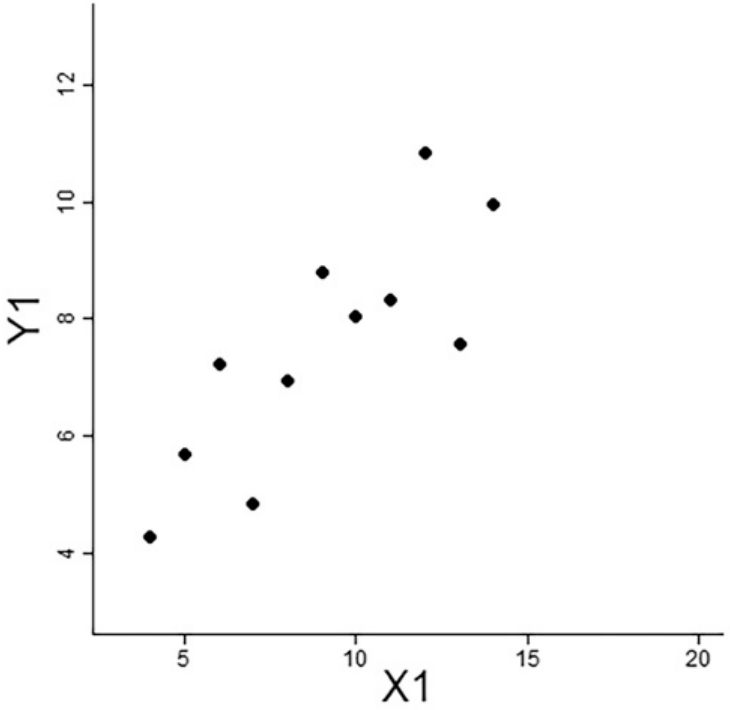
Time to end cone confusion?

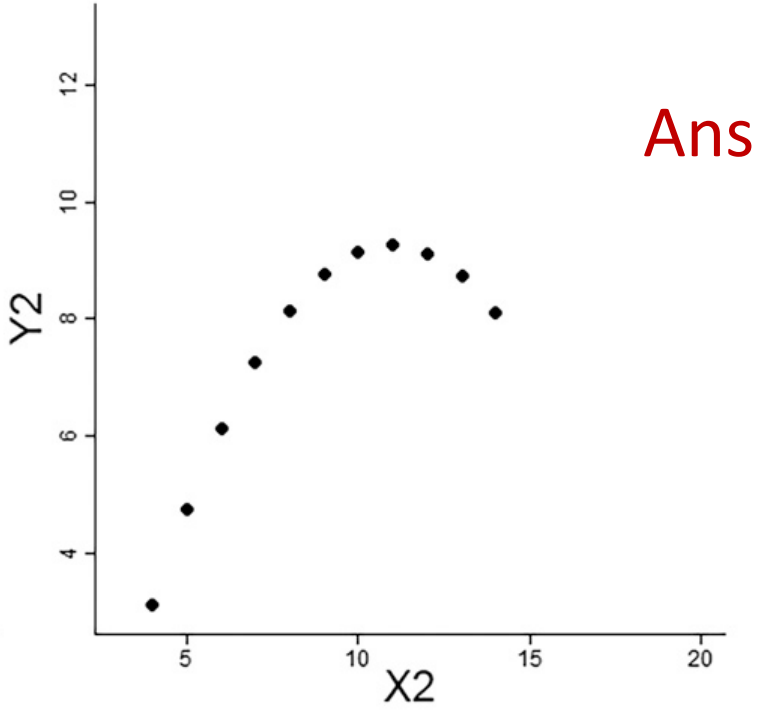
Former Chief, Hurricane Specialist Unit, National Hurricane Center, NOAA/NWS (retired)

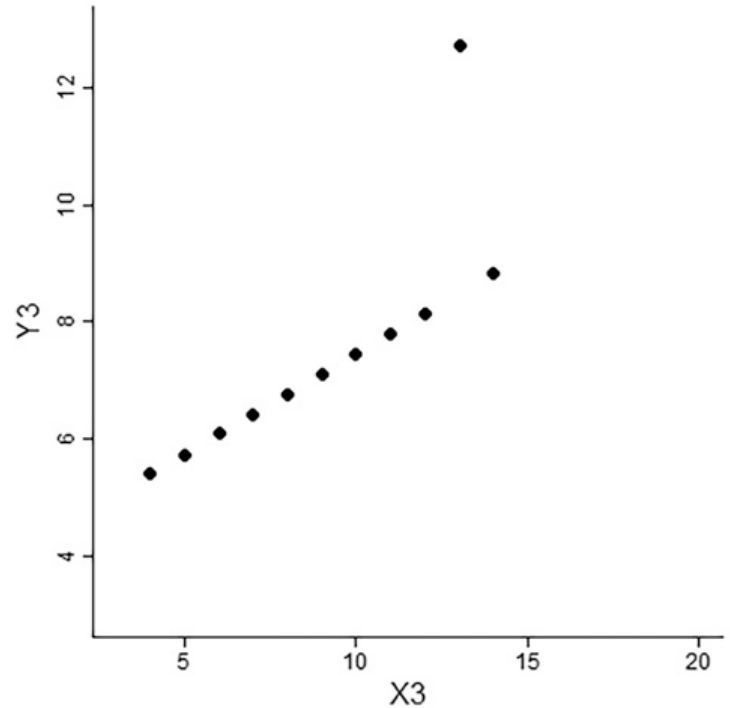
Motivation

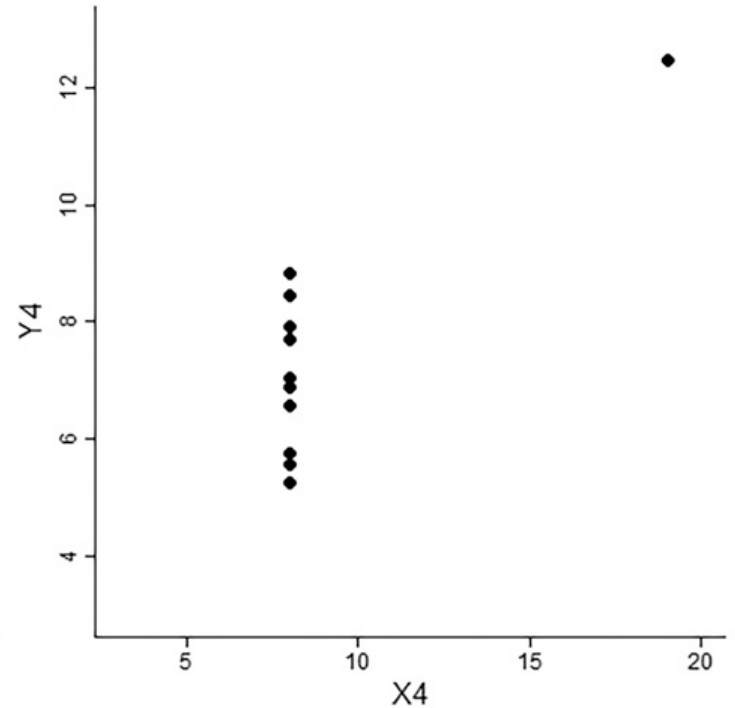
- New way to visualize forecasts that leverage visual abilities
- Visual system is good at seeing groups of objects (ensembles)
- Cone: summary statistics
- New visualization: ensembles

Anscombe's Quartet









Mean of x = 9

Mean of y = 7.5

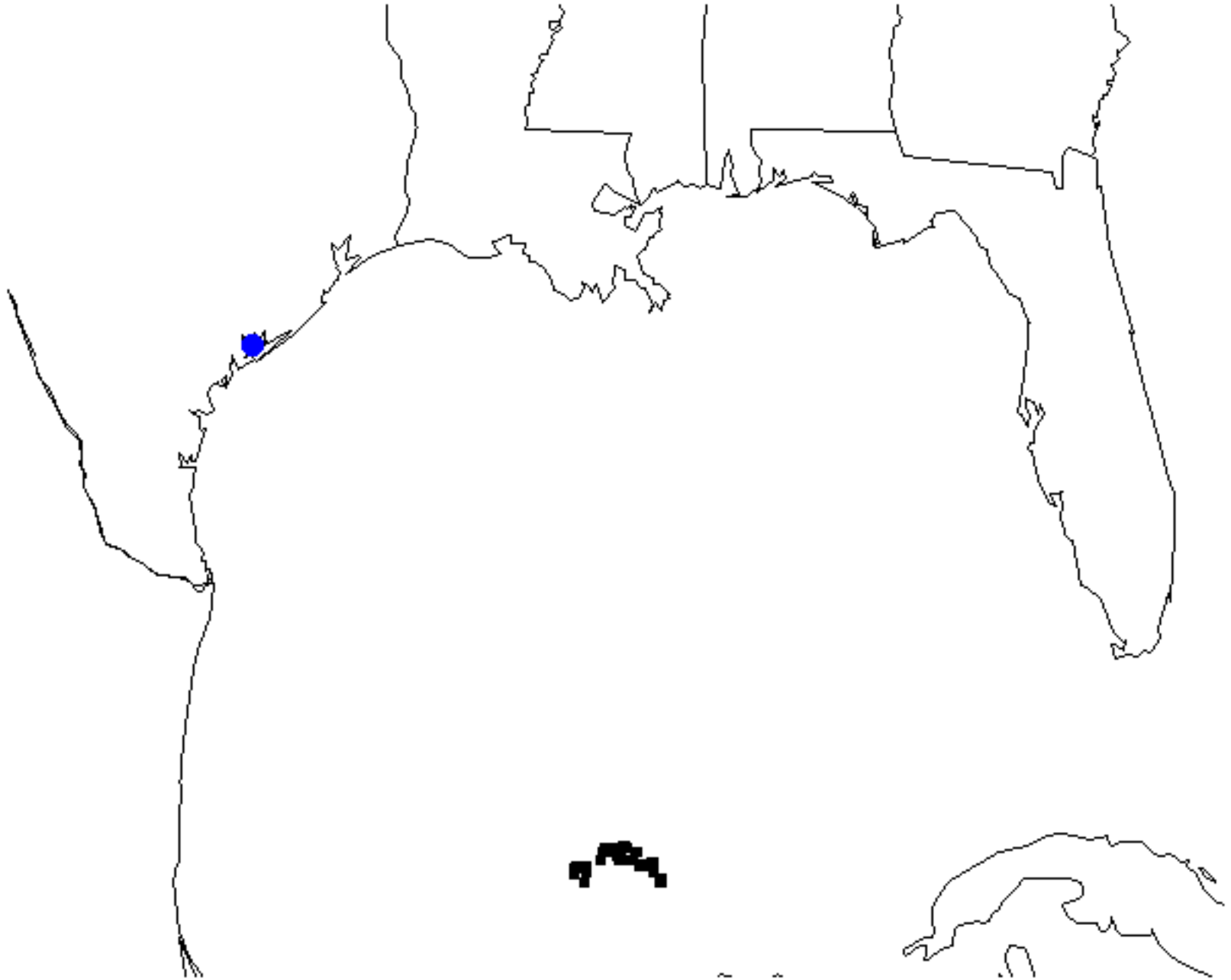
variance of x = 11

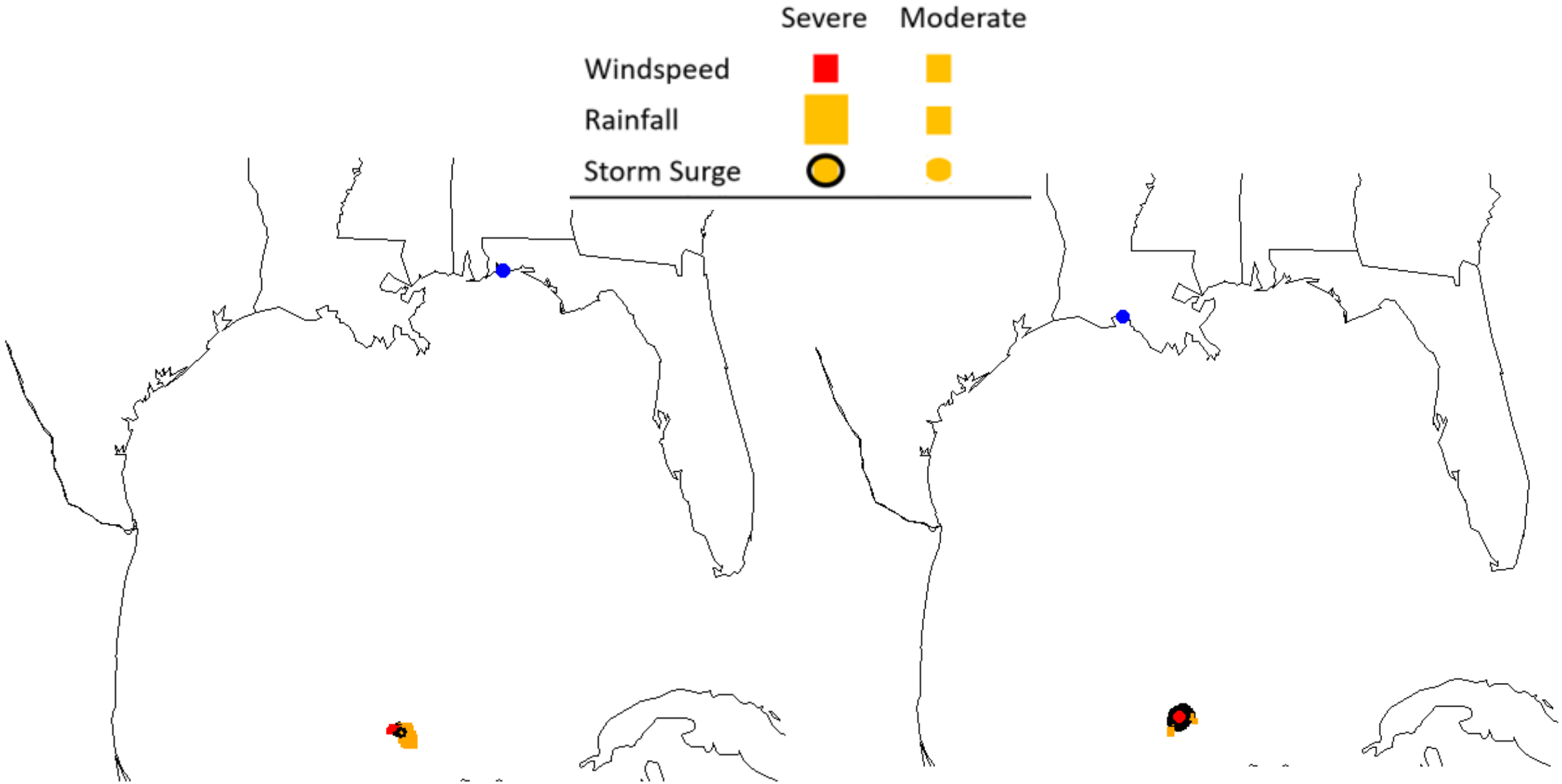
variance of y = 4.1

Correlation = .82

R squared = .67

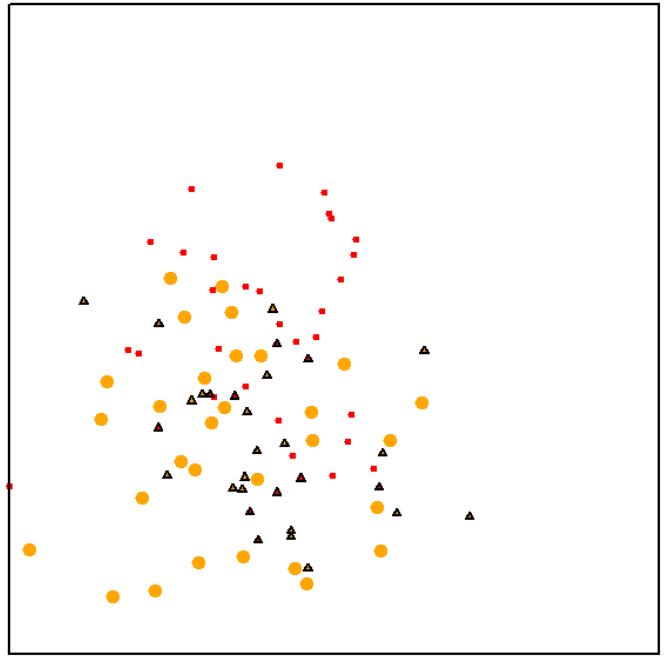
y = 3.00 + 0.500x




Severe
Moderate
Windspeed
Rainfall
Storm Surge

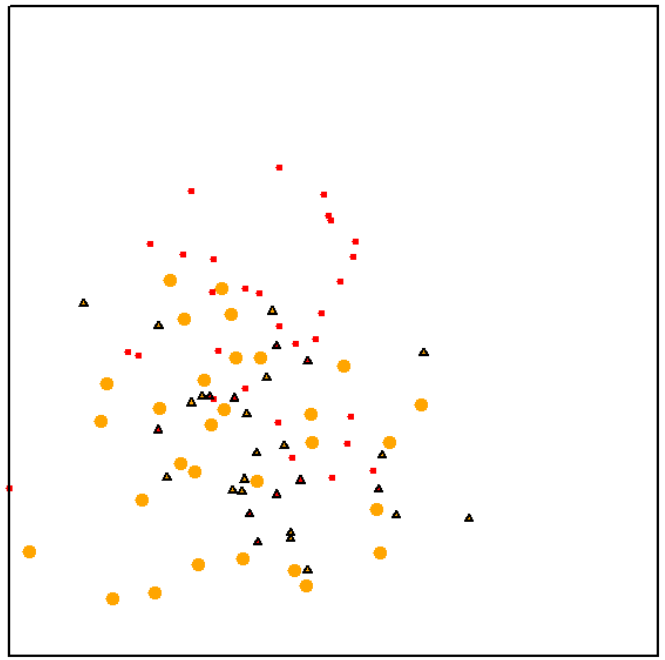
Research Question

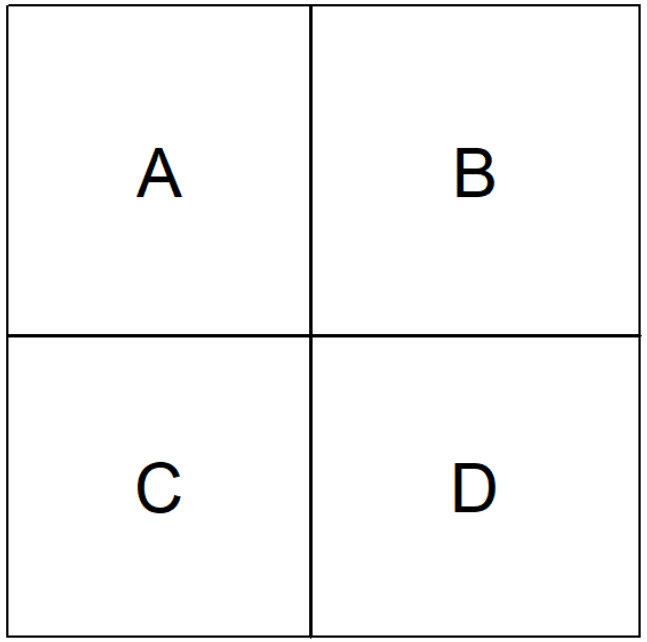
- Can people process all the dots in this display?



Research Task: Centroid Decision

- The centroid task is a purely vision task
- View a group of objects (dots) and estimate the mean location
  - Estimation of the quadrant of the centroid due to program limitations

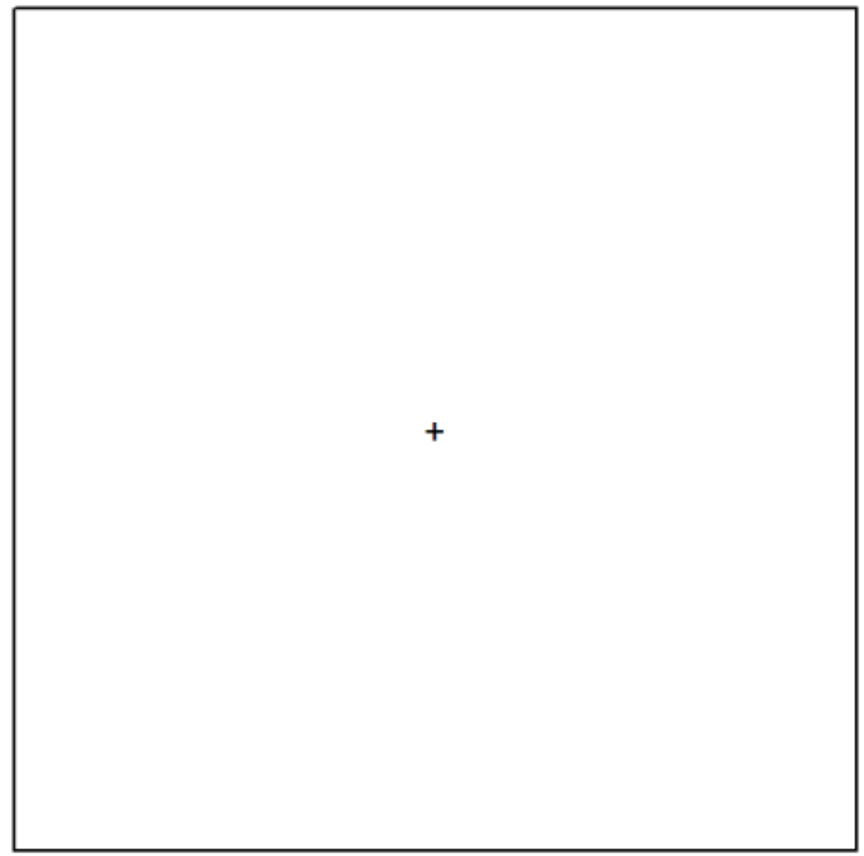


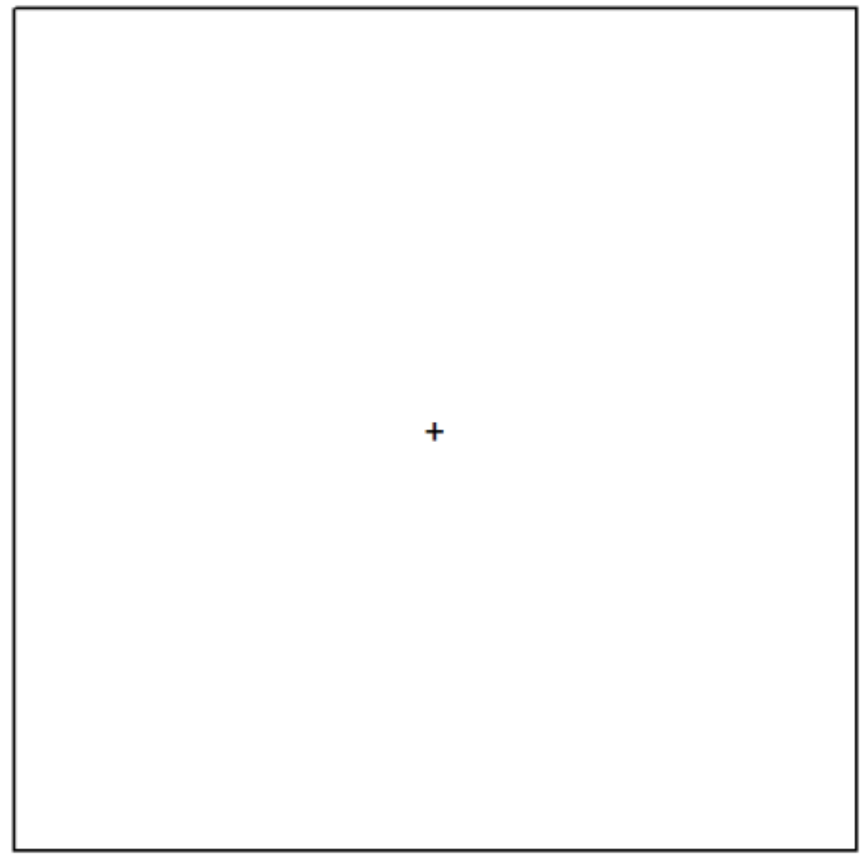


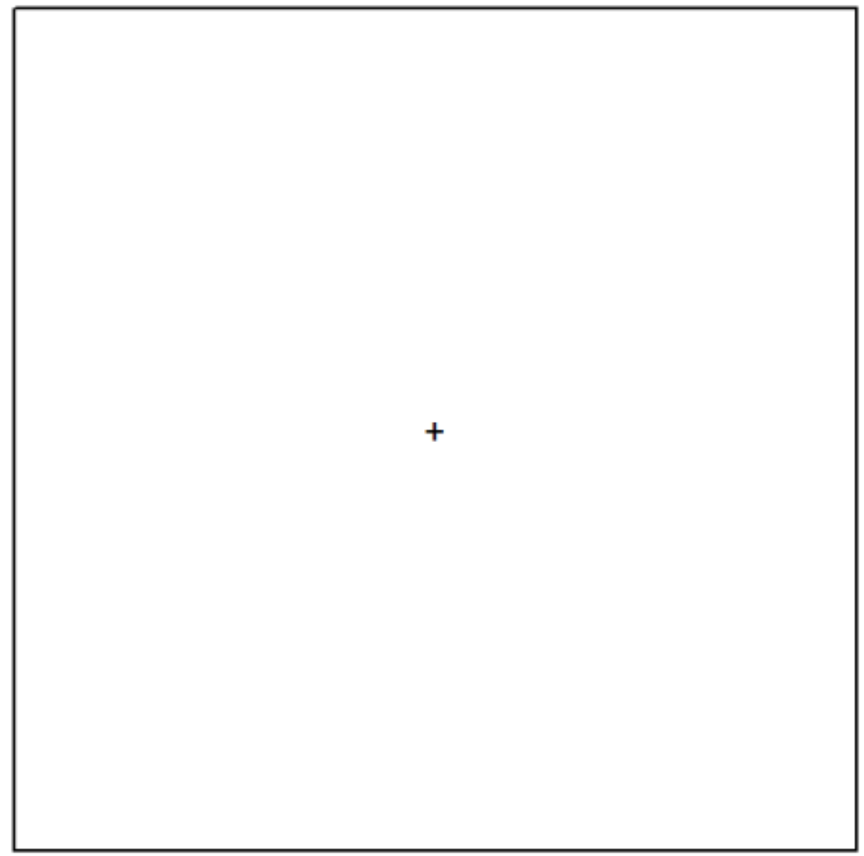
In this study, you will see a group of dots. They will flash up then disappear. You will then see a grid of 4 quadrants (A, B, C, D).

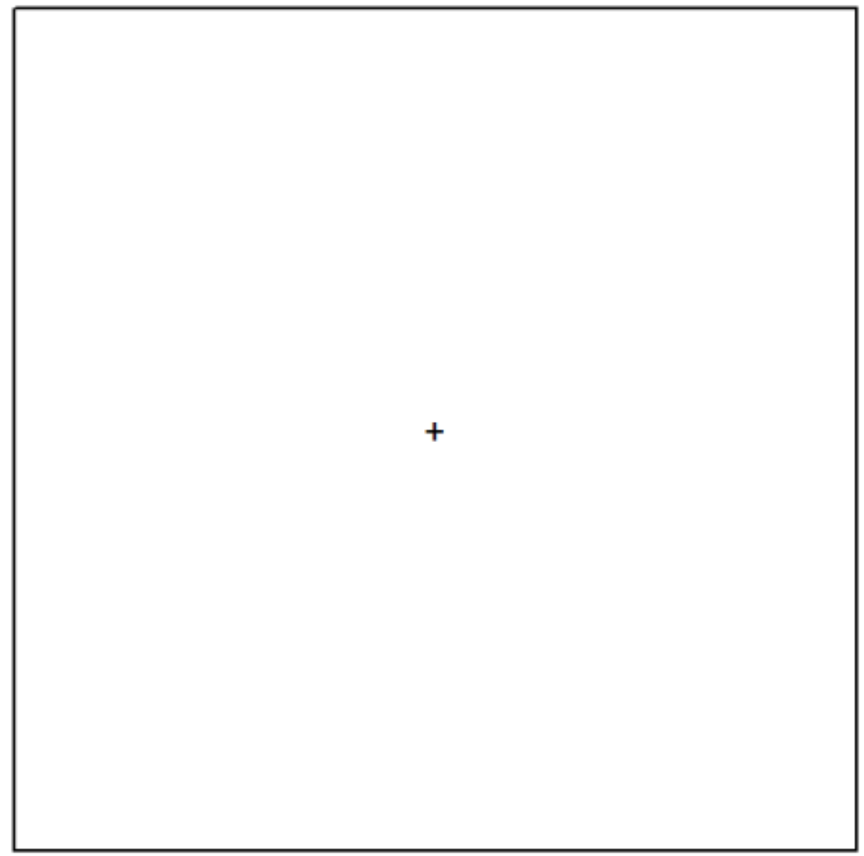
Your task is to determine the center location of all the dots.
Pick the quadrant of the center location of the dots and click the corresponding button.

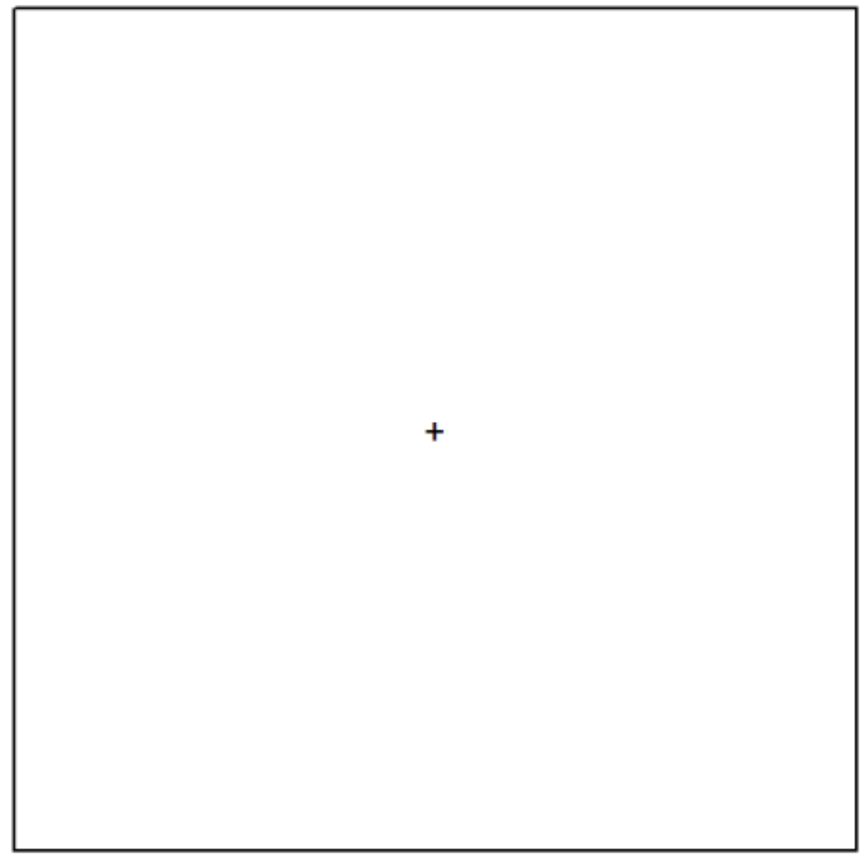
→

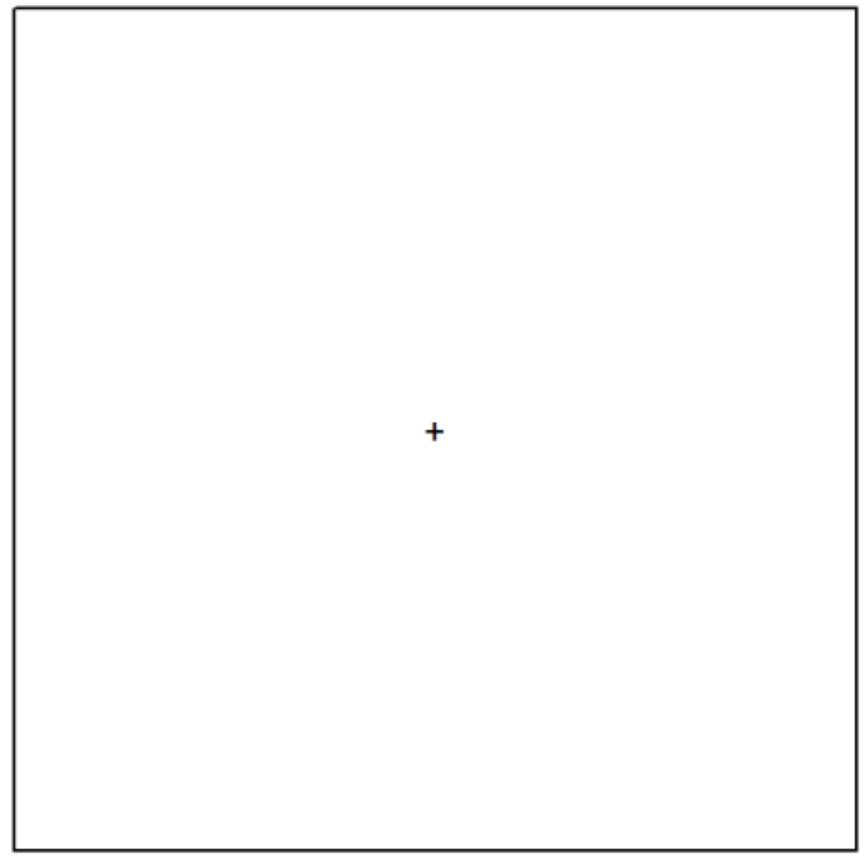


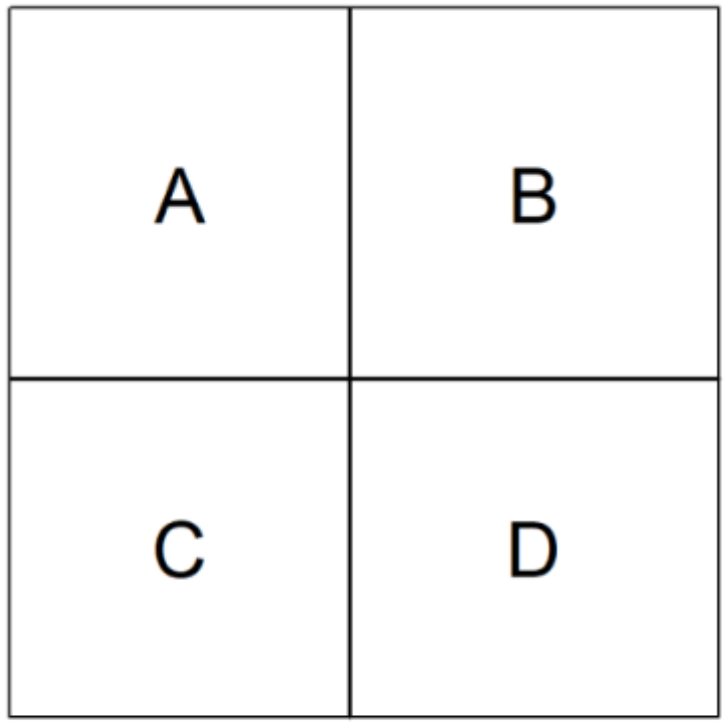












A	B	C	D
○	○	○	○

Data File

- 52 human participants (“subj”)
- 400 unique displays (“currImg”)
- Each participant completed 200 trials
  - 200 displays were randomly selected of the 400 options
- Each row in the data corresponds to one participant seeing one display (we call this a trial)
- For each trial (row), the data has:
  - The participant’s response on that trial
  - The quadrant of the mean location (“corrQuad”)
  - The distance of the mean location to the middle of the display (“distToMiddle”)
  - The standard deviation of the dots (“meanSD”)
  - Whether the mean of each type of dot is the same mean as all the dots
    - “isColSame” “isSizeSame” “isPulseSame”
    - 1 means that feature is same as group mean
    - So if “isColSame” is 1, that means the mean of the red dots is in the same quandrant as the mean of all the dots

Motivation

- Data need to be communicated
- Visual system can process large quantities of information
- Data should be communicated via graphs

- Research Question: Can people process multiple bits of information
  - Follow-ups: When do they succeed? When is performance worse?

“Client” Wishes

- Can people do this task?

- If I were to use this task and these images in a follow-up experiment, are there any images I should use (or should not use)?
  - If some images lead to terrible performance, I would not want to use them

Jessica Witt, Ph.D.
Professor of Psychology

Graphical Displays of Information

Vision ← → Data visualization