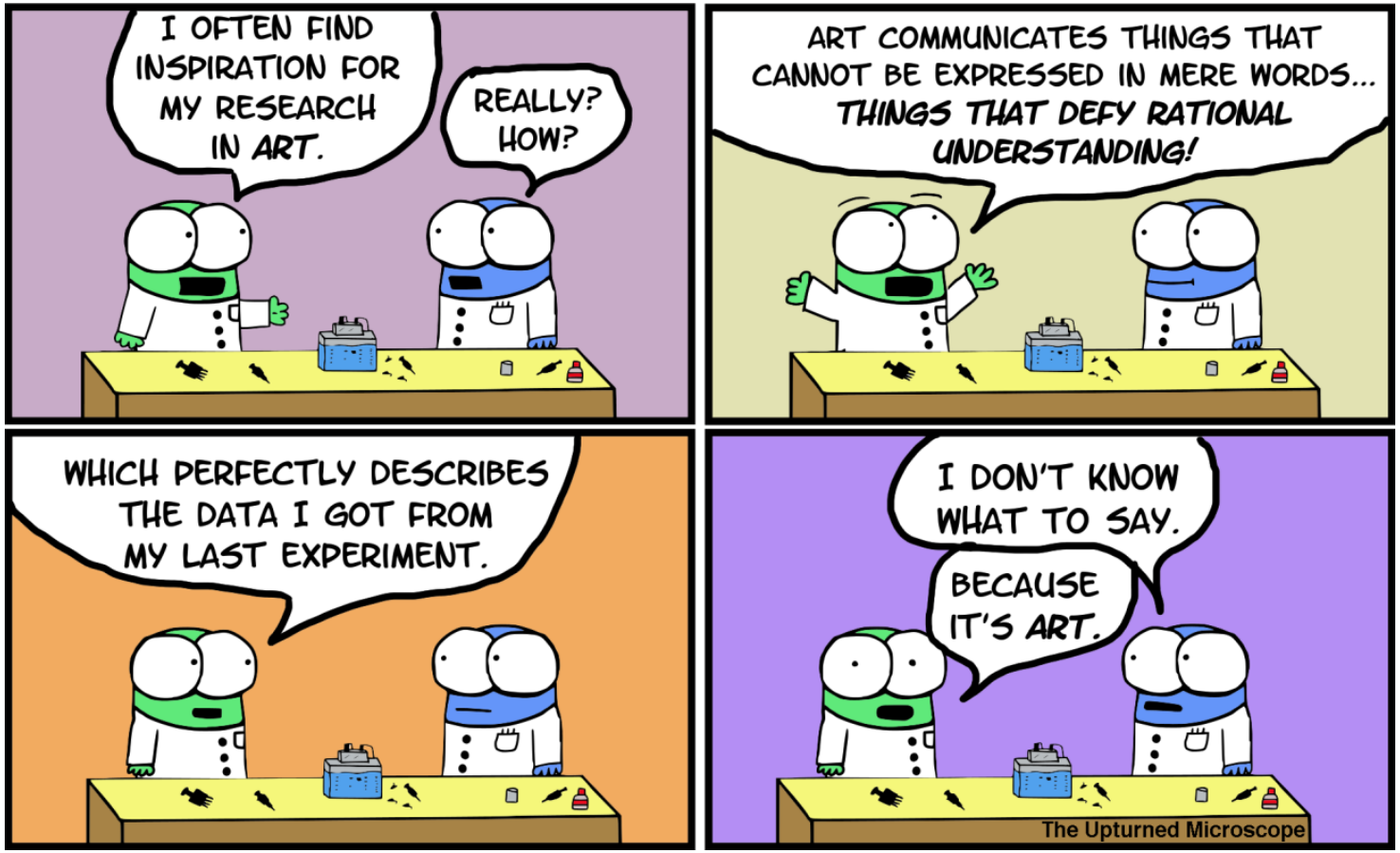
M1D7: Complete data analysis using statistical methods

1. Library
   - Howard Silver
2. Prelab
   1. Statistics
   2. Mod 1 Review
3. Complete stats analysis on data
4. Work on Data Summary



Mod 1 Due Dates

- Data summary (15%)
  - completed in teams and submitted via **Stellar**
  - draft due 10/4, final revision due 10/14

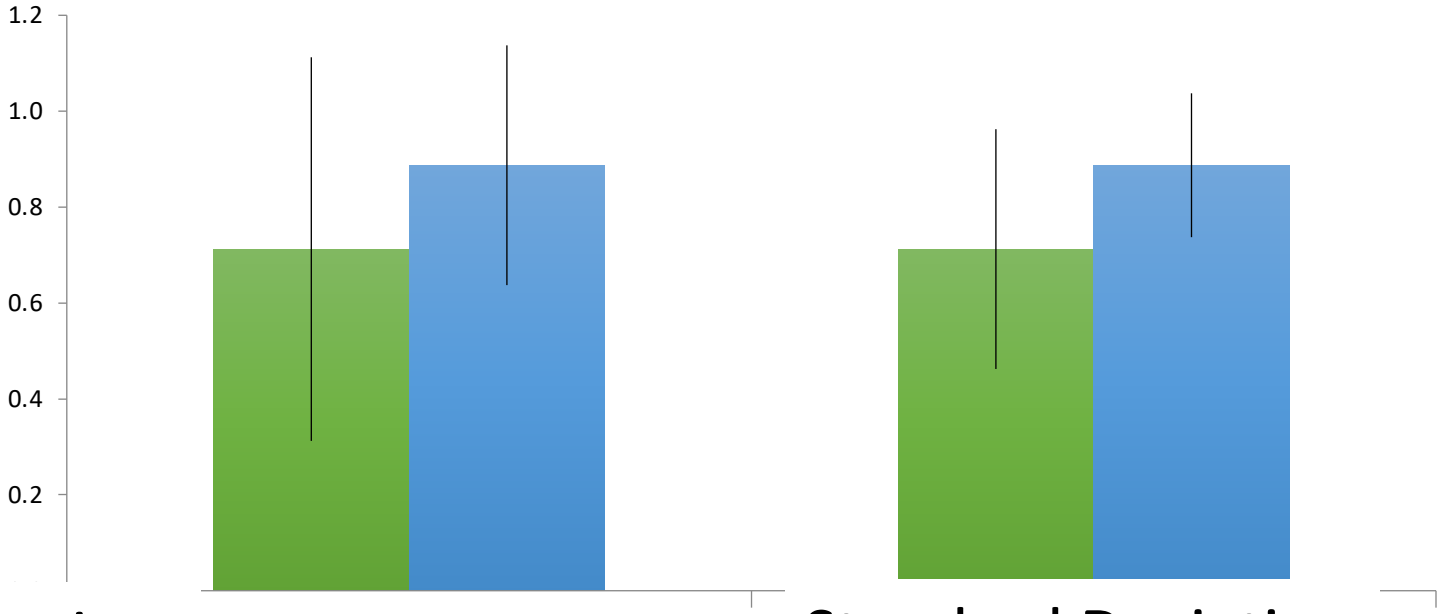
- Mini-presentation (5%)
  - completed individually and submitted **via Gmail**: bioeng20.109@gmail.com
  - due 10/11

- Notebook (collectively 5%) Rubric on Wiki
  - **Email pdf of M1D4** entry to Aimee at (amoise@mit.edu) by 10pm Friday

- Blog (part of 5% Participation)
  - due 10/5 via Blogspot

Confidence intervals show the variance in the data set

- At 95% confidence interval, there is a 95% chance that the true mean is within the defined range



Error bars depict: 95% CI Standard Deviation

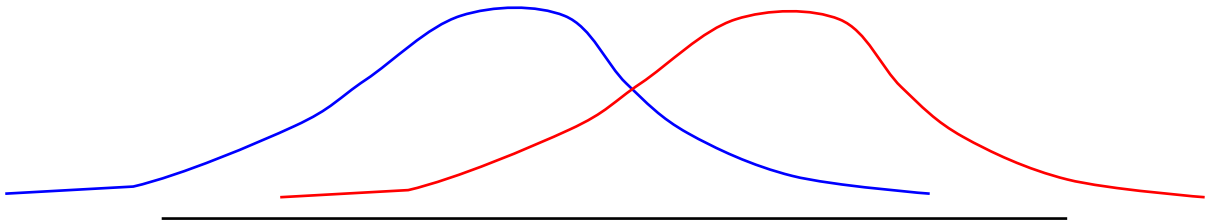
Calculating Confidence interval in excel

= CONFIDENCE(confidence level, standard dev., size)

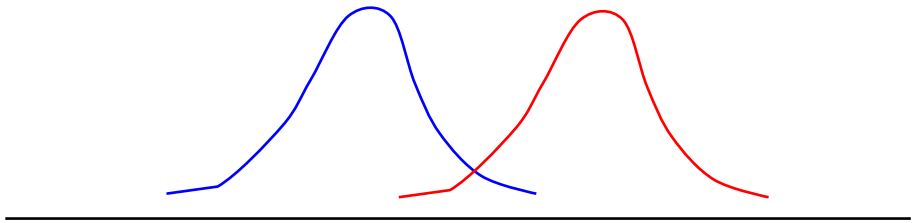
Once you have calculated the confidence interval you will enter this value as your “custom” error bar in excel

Student's *t*-test used to determine if populations are significantly different

- Assume data follows *t*-distribution
- At $p < 0.05$, there is less than a 5% chance that populations are the same (95% chance that populations are different)
- Examines signal (means):noise (variance) ratio



high noise

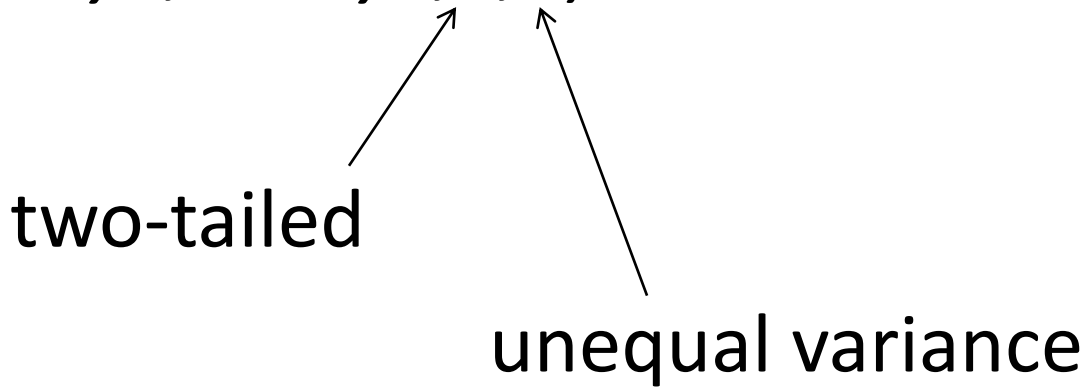


low noise

Calculating Student's *t* in Excel

p = TTEST (array1, array2,2,3)

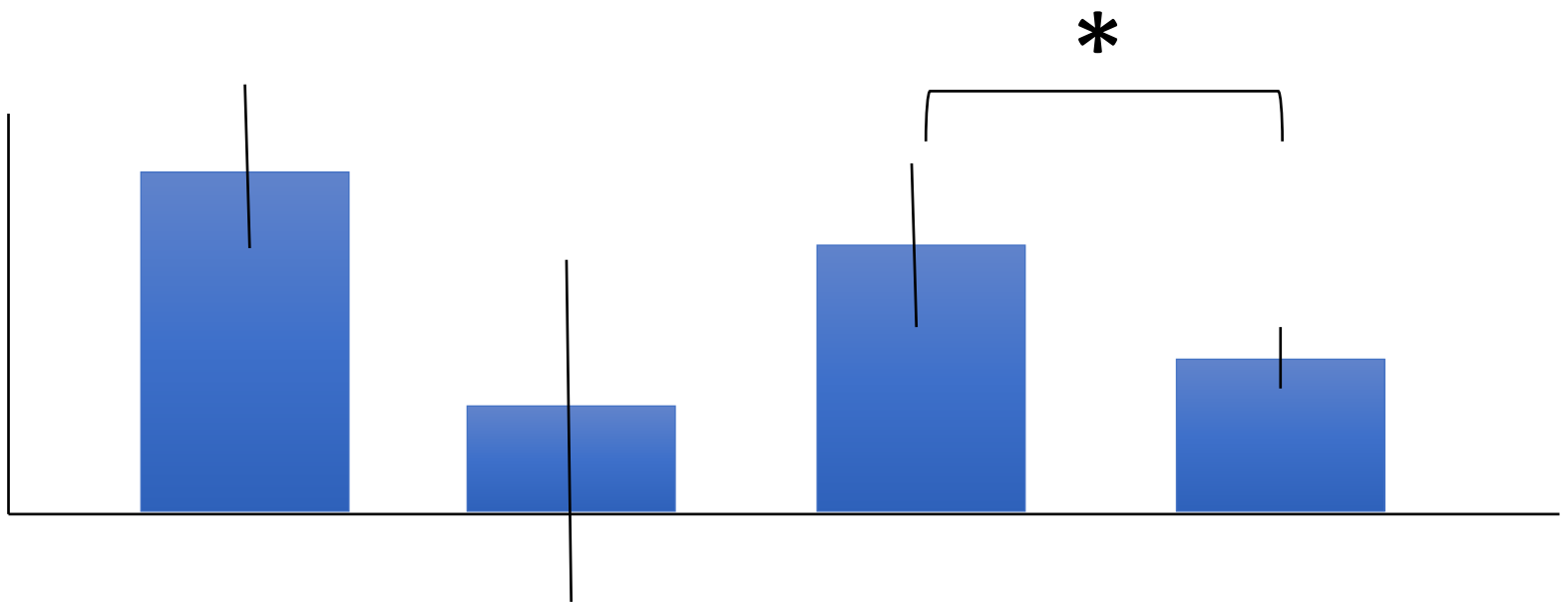
Use the fewest assumptions:



Can only compare two data sets at a time

*Make sure it is clear on your plots/writing which conditions are being compared

How will you use statistics in your data analysis?



What if the data are not statistically significant?

p = 0.055

Review Mod 1 project goals

What is our overall goal/question in this project:

What are the conditions we are using to address this:

Review Mod1 experiments

γH2AX

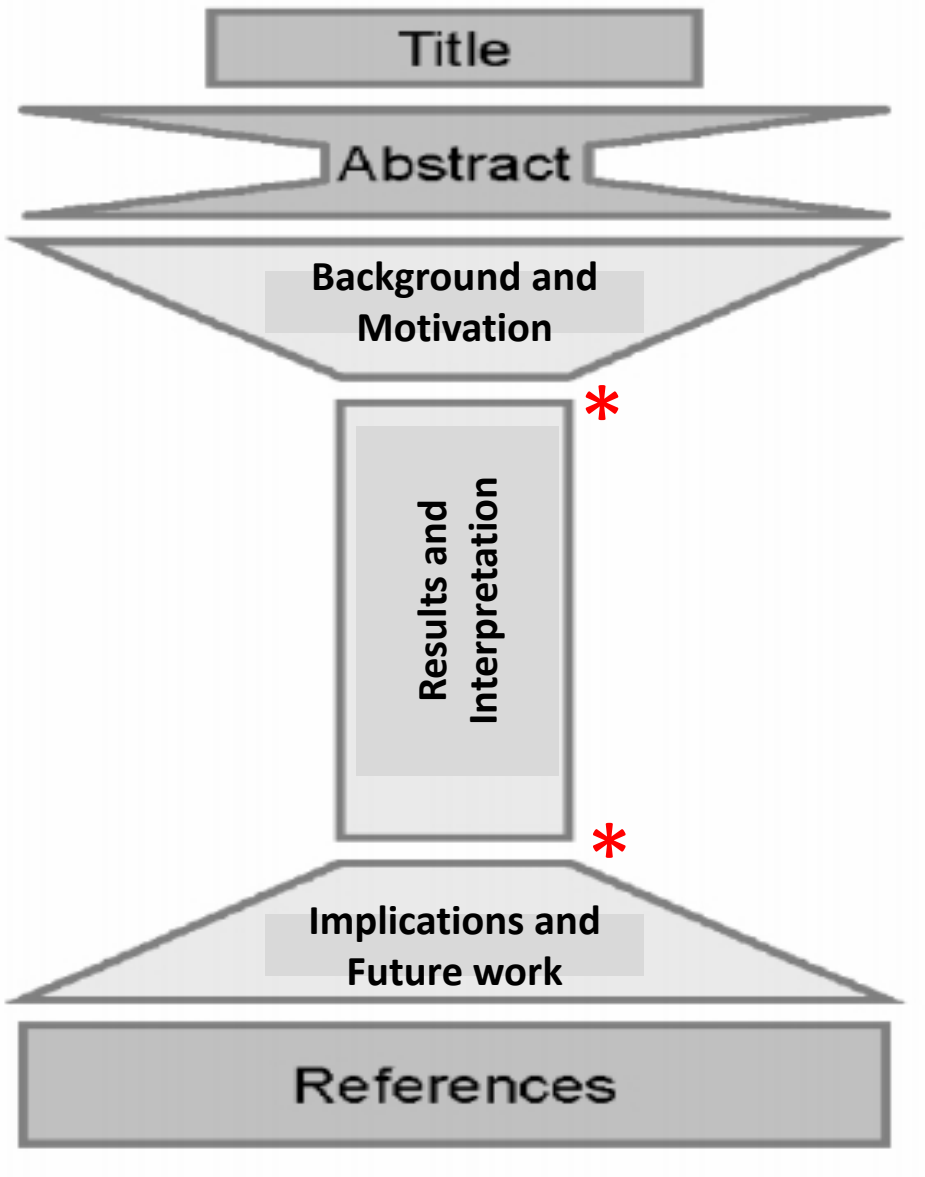
- How do we see DNA damage?
- Type of DNA breaks:
- Pros:
- Cons:

CometChip

- How do we see DNA damage?
- Type of DNA breaks:
- Pros:
- Cons:

M1 Data Summary

Format: Portrait 8.5x11” .ppt slides
See wiki for more details



Title: take-away message

Abstract: the only section ***not*** in bullet points

ALL bullet points:

-background and motivation (include references)

-Results and interpretation

Implications and future work (include references)

References (*see wiki for format suggestions*)

Background & Motivation

- Impact statement
  - General background
  - Describe previous work in the field

- Specific background (e.g. BER, H_2O_2, Arsenic, CometChip, H2AX)
  - Introduce topics, pathways and specific technologies necessary to understand the experimental approach
  - Include BER pathway figure
  - Reference schematic figure
  - Narrow focus to the specific question addressed in your study

- Knowledge gap/statement of problem
  - What is unknown, therefore motivating your study

- Hypothesis
  - What do you propose will be the outcome of your study?

- A brief preview of your findings
  - Here we show…
  - End with broad implications of the study

Results & Interpretation

- Figures and captions
  - ***Decide on the figures first***
  - Use figure subpanels (label with letters)
  - Text: limited on figure, explicit in caption
  - reasonable size
  - descriptive title
  - Intro/purpose at beginning of in caption
  - caption descriptive of image, very light on methods

- Results and Interpretation (each page needs subtitle below figure caption)
  - **Goal** / intent / purpose of experiment = intro topic bullet
  - What you did: experiments and expectations, describe controls
  - What you found: quantitatively describe your result, referring to the figure (”Figure 1a shows…”
  - What does this indicate: interpret your result, what does it mean?
  - What does this motivate you to do next: **transition** to next experiment

Implications & Future Work

- Start with a very similar paragraph to the last paragraph in your Background/Motivation (restate major results and broad implications)

- Follow same order as in Figures/Results
  - Describe your conclusions from your data
    - If necessary, describe caveats of experiment and suggest improvements
  - Identify unknowns and speculate (within reason)
    - Don’t make huge generalizations or overreach

- Propose future experiments, identify new questions that arise

- Come back to the big picture/impact statement topic introduced in background

Notes on Mini-presentation

- Bullet / outline format

- Follow time and content guidelines:
  - Introduce yourself and your research project
  - Clearly state hypothesis to identify main question
  - Be quantitative when stating results (NOT “this was more/less than...”)

- Logistics:
  - Submission should not be edited / spliced
  - Ensure that you can be clearly heard in the recording
  - Be mindful of background distractions

Please submit your completed Mini-presentation **due by Sun, Oct 11 at 10 pm** to bioeng20.109@gmail.com, with filename **Name_LabSection_MP.extension** (for example, ImaStudent_TR_MP.mov).

Grading rubric for Mini-presentation

Category	Elements of a strong presentation	Weight
Introduction	• Introduce yourself and the research • Summarize the background information necessary to understand the research • Provide a clear and concise description of the central question / hypothesis	25%
Methods & Data	• Provide ONLY the method information necessary to understand the results • Give complete and concise explanations of the results • Relate the results to the central question	25%
Summary & Conclusions	• Highlight the key finding(s) relevant to the central question / hypothesis	25%
Organization	• Give a logical, easy-to-follow narrative • Include transition statements	15%
Delivery	• Show confidence / enthusiasm and speak clearly • Use appropriate language (technical or informal, as appropriate) • Be mindful of the time limit (3 minutes +/- 15 seconds!)	10%

The mini-presentation will be graded by Dr. Noreen Lyell with input from Dr. Leslie McClain, and Dr. Becky Meyer.

For Today

- Complete statistics for **γ**H2AX and CometChip experiments
- Work on Data Summary

For M2D1

- Mini presentation Outline
- Read Intro for Mod 2