Project Group 6: Neuronal Regeneration
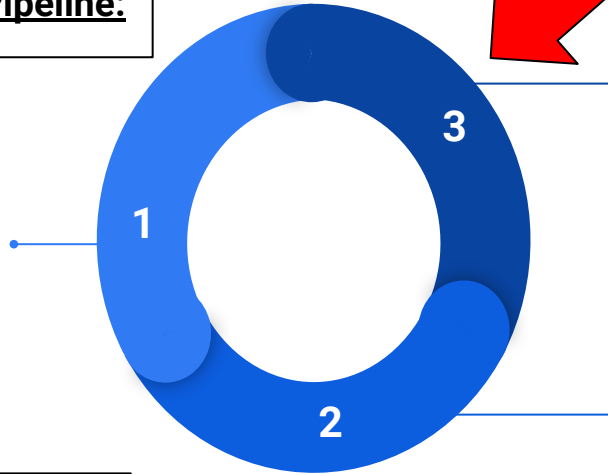
Members: Harris Lussenhop, Ajay Rao, and Augustus Lee

DS 4200 Fall 2020 - Prof. Cody Dunne, Northeastern University

Introduction

OUR FOCUS

Traditional Biological Research Pipeline:

3

Report + Share Findings

1

Conduct Experiment

2

Collect Results

Goal: Find a way to improve transmission of experimental findings to other scientists

Research Paper

Novel DLK-independent neuronal regeneration in *Caenorhabditis elegans* shares links with activity-dependent ectopic outgrowth

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Quick Summary:
- Normal neuronal regeneration in *C. elegans* regularly requires DLK-1 gene
- BUT, paper findings reveal a new DLK-1-independent form of regeneration
  - Regeneration requires stimulation
  - Cutting neuron axon and/or neuron dendrite are regenerative stimuli

Partner/Paper Author

- Samuel Chung, Ph.D
  - Assistant Professor of Bioengineering
- Northeastern University NeuroLab
  - Lab goal is to to identify/understand the mechanisms underlying lesion conditioning
- Authored a paper examining DLK-1-independent regeneration in *C. elegans* models where our data is sourced

Project Goal: effectively communicate the novel neuronal regeneration data to other researchers and to elucidate key data trends found across the various experimental conditions/groups

Data Properties

| length	regen_type	age	re_image_time	cut_type	genetics	re_image_time_class	col_name	none	not_to_ring	to_ring	along_ring	full_length
14.205	3	L2	12hr	axon	wild-type	12hr	wt axon	0.19047619	0.285714286	0.19047619	0.238095238	0.095238095
4.508	1	L2	12hr	axon	wild-type	12hr	wt a+d	0	0	0.076923077	0.461538462	0.461538462
17.799	2	L2	12hr	axon	wild-type	12hr	dlk-1 a+d	0.933333333	0.066666667	0	0	0
16.506	2	L2	12hr	axon	wild-type	24hr	wt axon	0	0	0.083333333	0.666666667	0.25
21.462	3	L2	12hr	axon	wild-type	24hr	wt a+d	0	0	0	0	1

- **Mix of quantitative and categorical data**
  - <u>Quantitative</u>: axon length regeneration measurements + regeneration type percentage
  - <u>Categorical</u>: regeneration type
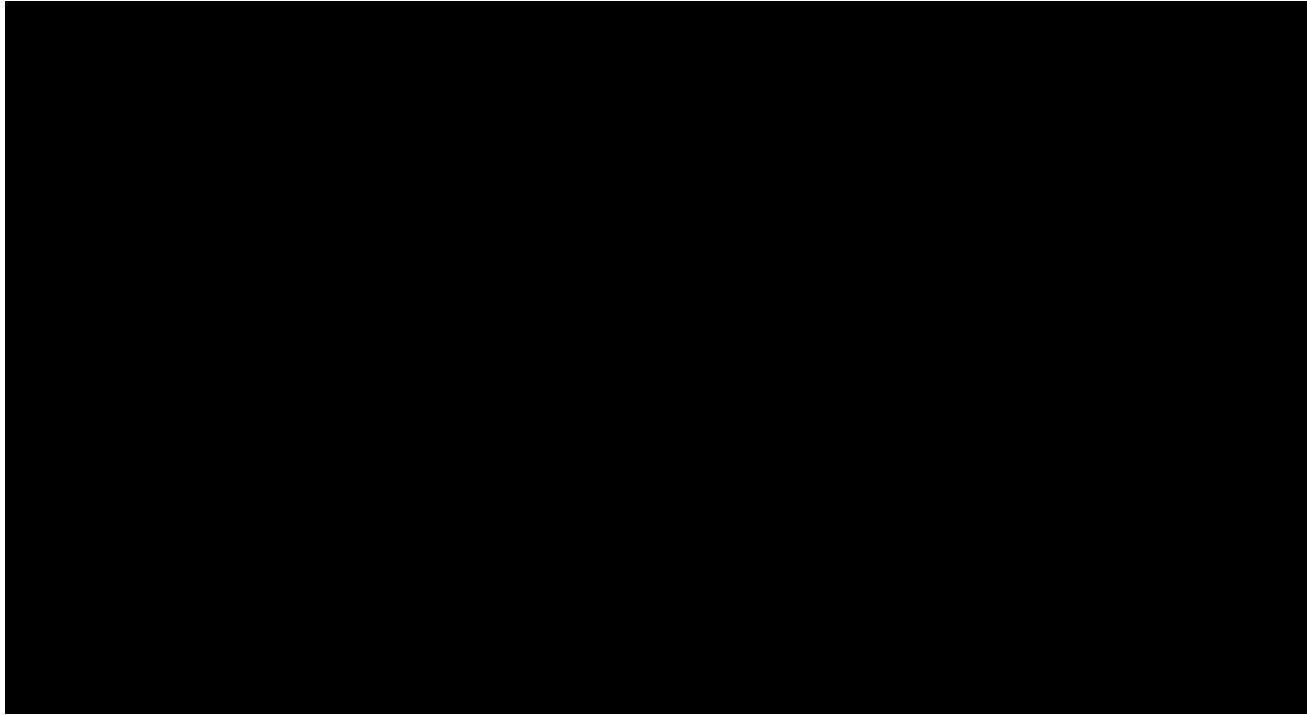   - i.e. "along ring", "not to ring", … (neuroscience lingo)

- **Statistical Data**
  - Relative P values for significant differences in regeneration between experimental conditions/groups were reported
  - Mean and SD for each experimental group was calculated

Visualization Design

Dendrite Cuts on Axon Regeneration in Wild Type (wt) and DLK-1 Mutants
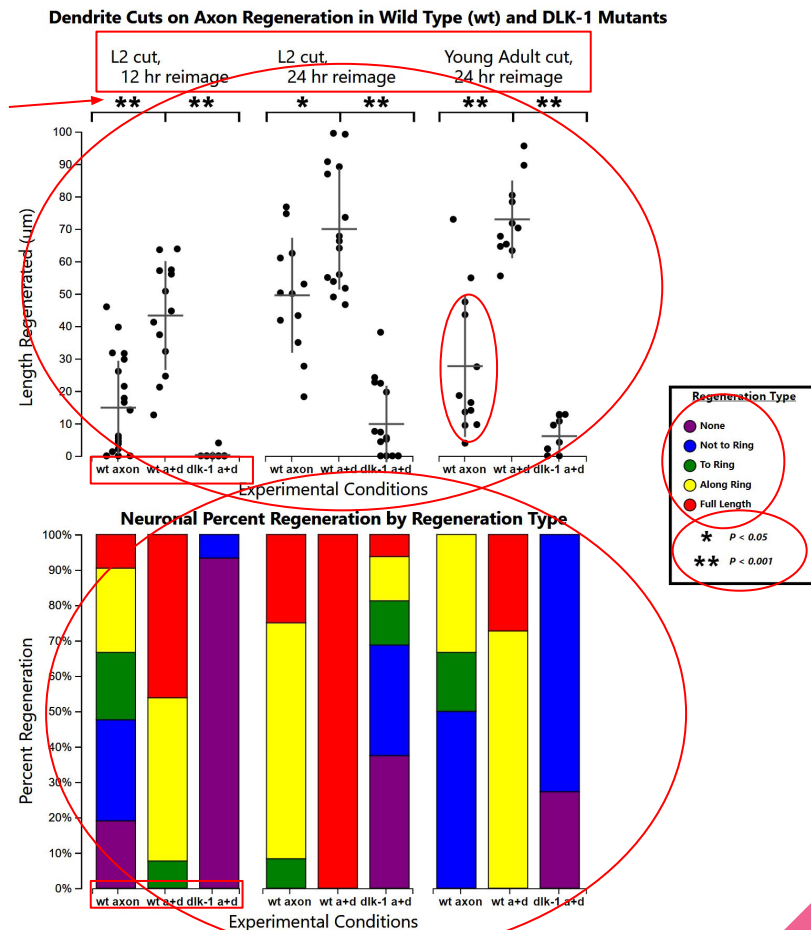
Live Demo

Conclusion

- Visualized novel DLK-1-independent neuronal regeneration data
- Interactive and dynamic features increase data understandability and reduce visual clutter
- Overall, visualization improves clarity of data and highlights the key experimental findings in the paper for its scientist users

<u>Special Thanks to</u>:

- Professor Samuel Chung
- Professor Cody Dunne
- David Saffo
- Noa Grooms