

Information Visualization

Reading & Writing Visualization Papers

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Reading Visualization Papers

- To understand an area, need to see what has already been done
- Sometimes requires reading tens if not hundreds of papers
- **Cannot** remember all of the details!
- "By 'read' we mean extracting the essential, most important information from a (previously) published scientific conference or journal paper." [R. S. Laramée, 2009]
- Goal: Read research papers for a literature review
 - Can be used to write a survey paper

[R. S. Laramée, 2009]

Important Pieces to Extract from a Vis Paper

- Concept: what is the main goal/idea?
- Implementation: how is this realized?
- Related Work: what previous work does this build on or relate to?
- Data Characteristics: what is the type of data (items & attributes)?
- Visualization Techniques: what classes of techniques are used?
- Application Domain: where can this research be applied?

[R. S. Laramée, 2009]

Project Proposal

- Move deadline to next **Thursday**: September 16
- Write up your ideas as they currently stand
- Things can change, that's ok!
- Focus on motivation (why should we care?) and the core idea (how does your work improve on existing techniques?)

Technical Papers

- A document that describes scientific research
- Two general categories:
 - Survey: What has been done in a specific area
 - Research: a problem, related work, solution, and results
- Writing helps clarify your own thinking & communicate it to others [N. Feamster]
- "The purpose of research is to increase the store of human knowledge, and so even the very best work is useless if you cannot effectively communicate it to the rest of the world." — M. Ernst
- Research papers are primary sources, textbooks are secondary sources
- Most recent research is not in a textbook
- Technical Reports vs. Journal Articles/Conference Proceedings

Paper Structure

- Title & Author List
- Abstract
- Introduction
- [Background/Preliminaries]
- Contribution (Approach/Theory/Specification/Implementation)
- Evaluation (Experiments, case studies)
- [Discussion]
- Related Work (here or after introduction)
- Conclusion [& Future Work]
- [Appendices]

Paper Titles

- Something of an art
- Want to be informative and capture essence of the paper
- Sometimes catchy but should not be too "cute"
- Differs by domain:
 - "The histone lysine methyltransferase KMT2D sustains a gene expression program that represses B cell lymphoma development" [Nature Medicine]
 - "Time Curves: Folding Time to Visualize Patterns of Temporal Evolution in Data" [IEEE Vis]

Author List

THE AUTHOR LIST: GIVING CREDIT WHERE CREDIT IS DUE

The first author
Senior grad student on the project. Made the figures.

The third author
First year student who actually did the experiments, performed the analysis and wrote the whole paper. Thinks being third author is "fair".

The second-to-last author
Ambitious assistant professor or post-doc who instigated the paper.

Michaels, C., Lee, E. F., Sap, P. S., Nichols, S. T., Oliveira, L., Smith, B. S.

The second author
Grad student in the lab that has nothing to do with this project, but was included because he/she hung around the group meetings (usually for the food).

The middle authors
Author names nobody really reads. Reserved for undergrads and technical staff.

The last author
The head honcho. Hasn't even read the paper but, hey, he got the funding, and his famous name will get the paper accepted.

JORGE CHAM © 2005

www.phdcomics.com

[Piled Higher and Deeper, J. Cham, 3/13/2005]

Abstract

- Needs to summarize problem, approach, results, and conclusions
- Has the key contributions from the paper
- Should tell a reader whether they want to read further
- Vocabulary should describe work to a more general audience
- Does not attempt to cover everything in the paper but should highlight key points

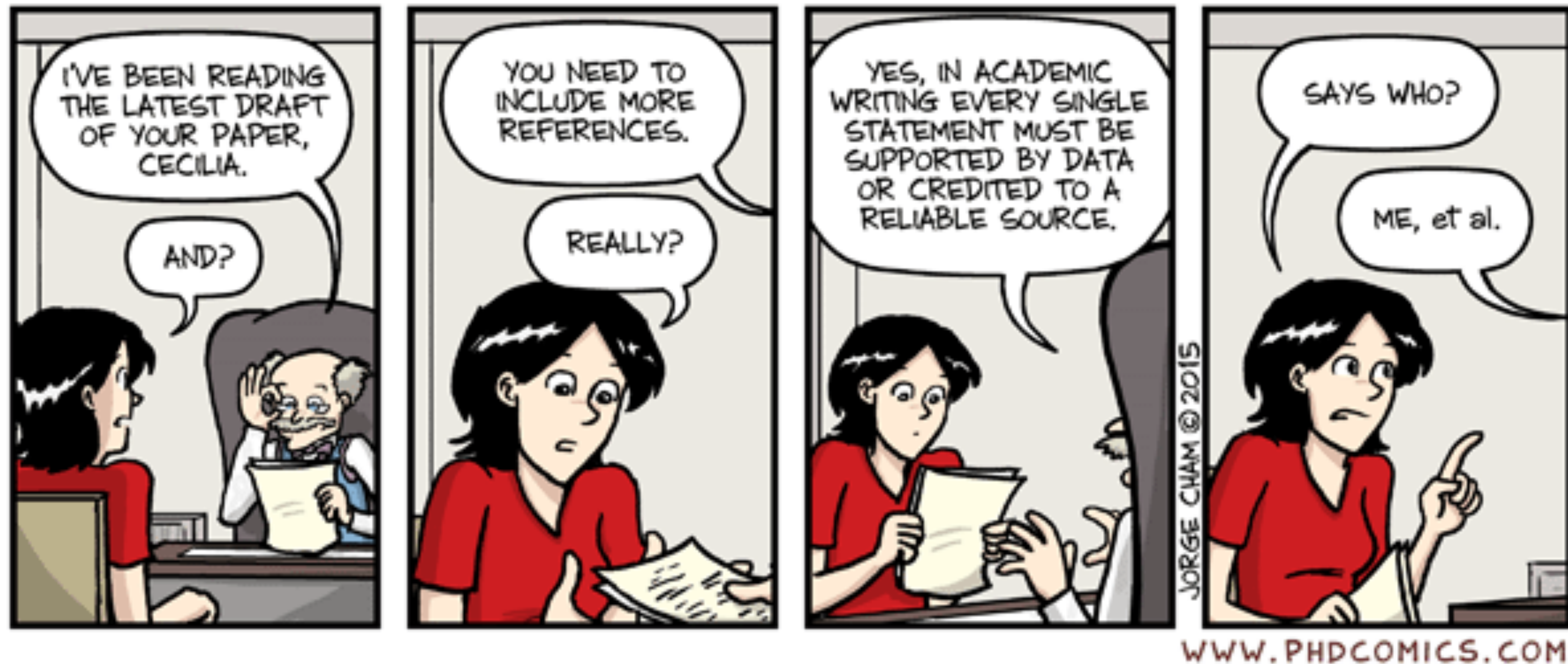
Introduction

- Defines the problem
- Motivation: Why do I care about this?
- What is this paper doing that is new/different from what already has been done?
- Outlines the approach and results

Background vs. Related Work

- Paper may need to review notation, information from another domain, the existing work
- Related work serves to define **areas of interest** to the reader and how they relate to this paper
- Sometimes at the beginning (Section 2) or the end (Section n-1) of the paper
- Citations should occur **throughout** the paper not just in Background and Related Work sections
- References are located at the end of the paper

References



[Piled Higher and Deeper, J. Cham, 9/11/2015]

Contribution

- Theoretical or experimental
- May be broken into multiple sections
- For computer science techniques, often broken into a framework/specification, and the implementation
 - Framework describes the main contribution at a conceptual level,
 - Implementation is secondary but gives readers an idea of the actual code (code can be made available on the Web)
 - Pseudocode is usually used for specific algorithms.
- Should provide details that allow other computer scientists to recreate the proofs or technique
- Not a daily journal—tell a story that argues for the importance of the results

Evaluation

- Need some way of judging whether the presented work matters
- Does it clearly support or refute a hypothesis (e.g. technique is faster, allows users to better understand data, etc.)?
- Comparisons to existing work are important
- What can be evaluated? [Widom]
 - Running time, parameter sensitivity, scalability, user perception
 - Absolute performance, relative performance (comparisons!)

Discussion

- What do the results suggest?
- Section to speculate
- Sometimes tied to related work

Conclusion & Future Work

- Summarize work more concretely
- Not just a rewrite of the abstract or introduction
- Gives a clue to others interested in the area about what else should be explored
- Sometimes stakes ground to show work is continuing

Citations and References

- Credit those who have done work already
- Always try to cite a paper or book to support a claim
- Any claim that someone may question or disagree with should be cited
- Cite refereed papers not blog posts!
- Citation formats:
 - ACM & IEEE
- Think of citation like a persistent web page link:
 - Allows readers to easily track down existing work
 - Makes it clear what the reference relates to
- Do not only put references at the end of a paper!

Peer-reviewed Papers

- Scientific papers are reviewed by other scientists before being published
 - Papers are submitted to journal/conference
 - Assigned to external reviewers who provided critical feedback
 - The primary reviewer or editor writes a summary review
 - The editor or program committee decides on acceptance or what necessary rewrites should be done
- The fact that other experts have read and provided feedback on the science is important
- Citing Web URLs or unreviewed papers is usually done sparingly

Example Papers

<http://faculty.cs.niu.edu/~dakoop/>

Reading Papers



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phd.stanford.edu

[Piled Higher and Deeper, J. Cham, 6/1/2001]

Questions when reading

- "How to Read and Evaluate Technical Papers", B. Griswold modified by G. Murphy
- Sometimes useful to read the paper "out of order"
- Five questions you should answer when reading a paper:
 1. What are the motivations for this work?
 - People problem
 - Technical problem
 2. What is the proposed solution?
 3. What is the evaluation of the proposed solution?
 4. What are the contributions?
 5. What are future directions for this research?

How to Read a Paper

- "How to Read a Paper", S. Keshav
- Make multiple passes over the paper
 - First pass: title, abstract, introduction, headings, conclusion, references
 - Second pass: read but ignore details, study figures
 - Third pass: virtually re-implement the paper

Missing Background

- You will get papers that do not explain all relevant background
 - May be outside the area you focus on
 - May involve an application you're not as familiar with
 - There isn't enough space to describe all details
- Strategies:
 - Search for key terms (e.g. Google Scholar)
 - Look at the referenced work and read/skim those papers
 - Check other work in the journal/venue
 - Read examples to clarify the proposed technique or goal

Important Pieces to Extract from a Vis Paper

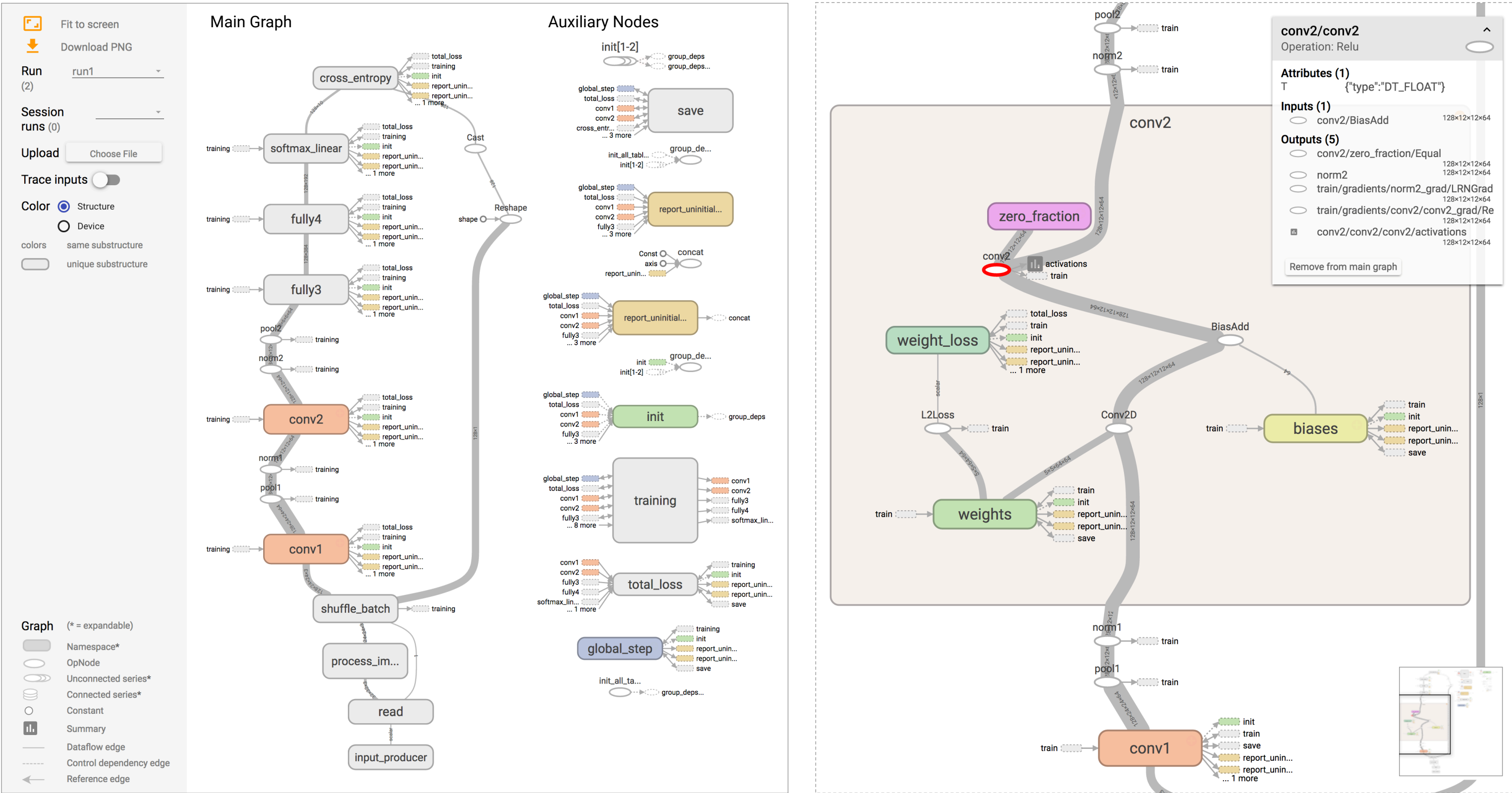
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[R. S. Laramée, 2009]

Example: TensorGraph Visualization

Visualizing Dataflow Graphs of Deep Learning Models in TensorFlow

Kanit Wongsuphasawat, Daniel Smilkov, James Wexler, Jimbo Wilson, Dandelion Mané, Doug Fritz, Dilip Krishnan, Fernanda B. Viégas, and Martin Wattenberg

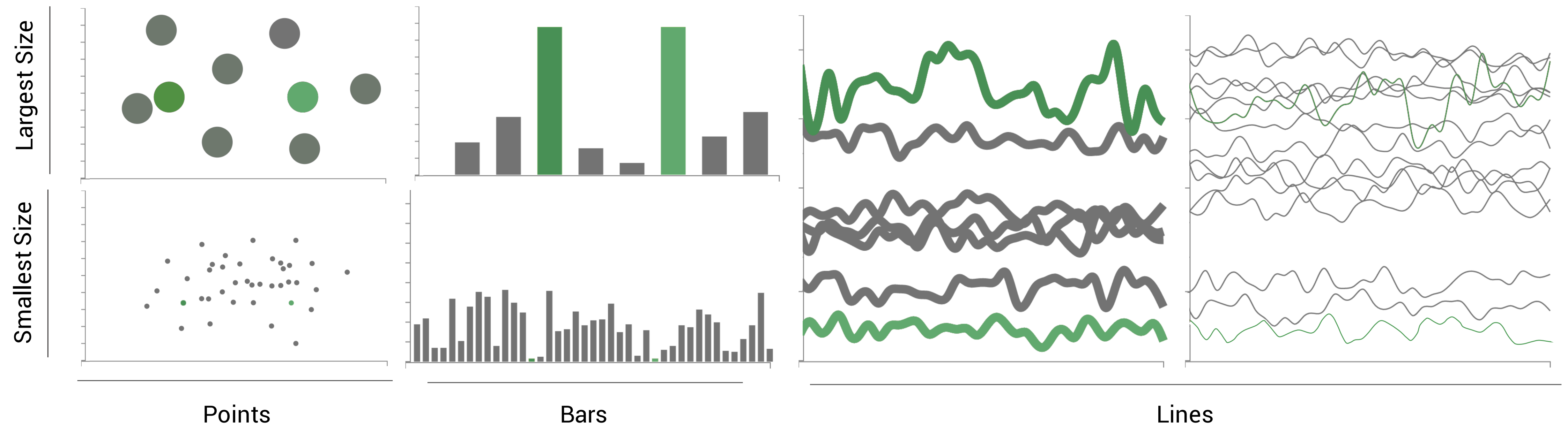


[Link]

Example: Color Difference

Modeling Color Difference for Visualization Design

Danielle Albers Szafir, *Member, IEEE*



[\[Link\]](#)