Papers We Love Raleigh-Durham

Speaker: Jean-Marcel Belmont

Topic: Learn to Read an Academic Paper

Paper to Review: api design

White Paper vs Academic/Research Paper?

- A research paper, otherwise called a paper, is something you use to publish research in a journal
  - It gets peer-reviewed and either accepted or rejected
  - It usually costs money to publish, because journals
- "White paper" is largely a nonsense business term, referring to a long document used for sales and marketing. It also means a government policy document.
  - A white paper is common in government and is not really important.
- Quora Discussion:

  https://www.quora.com/What-is-a-research-paper-vs-a-white-paper

How to read an academic article

- First pass to an academic article
- The art of the skim
  - Read the Abstract (if provided)
  - Read the introduction.
  - Read the conclusion.
  - Skim the middle, looking at section titles, tables, figures
    - Get a feel for the style and flow of the article.

How to read an academic article continued

- Second pass to an academic article
  - Go back and read the whole thing quickly, skipping equations, most figures and tables.
- Third pass to an academic article
  - Go back and read the whole thing carefully, focusing on the sections or areas that seem most important.

How to read an academic article continued

- After completing a third pass try to critique it
- What is the basic argument of the academic article?
- Was it well supported by argument or evidence?
- Compare article to others possibly read introduction and conclusion of other articles.
- Use something like Google Scholar to try to see if any other works cite the article
  - https://scholar.google.com/
  - https://scholar.google.com/citations?view_op=new_profile&hl=en
  - https://scholar.google.com/citations?view_op=new_articles&hl=en&imq=author:%22Donald+Knuth%22
  - Some references are behind a pay wall meaning you would be able to freely view them.
  - Some libraries have access to thousands of articles and professional journals
- Original Article
  - http://organizationsandmarkets.com/2010/08/31/how-to-read-an-academic-article/

Advice on Reading Academic Papers

- Start by reading the introduction and conclusion
  - This is the fastest way to determine the problem statement and the approach taken to the problem by the authors of the paper
- Scan the paper and determine the Purpose, Structure, and Direction before reading for a detailed understanding
  - This article does not go in depth about what a scan is but to recap
    - Skim the middle, looking at section titles, tables, figures
    - Get a feel for the style and flow of the article.

Advice on Reading Academic Papers Continued

- Do not read every single word!
  - There are bound to be words or phrases that trip you up as you read.
  - If you take the time to continually re-read a word, phrase, or paragraph until you completely understand it
    - then you will end up wasting quite a bit of time
  - Often a term/word is explained in detail later in the paper
  - If after reading through the paper it is still unclear
    - Then look at citations if there are any for the terms
  - If this still doesn't work then look online for more resources about this word
  - The main point I believe that the article is addressing is not to get stuck on a word and lose the forest for the tree so to speak.

Advice on Reading Academic Papers Continued

- After scanning the paper and then reading the paper in detail
  - Try not to ponder too much about the implications of the paper as you are reading
  - Try to first identify the main point of the article, its strengths and weaknesses
  - This way your own opinions don't cloud the main point of the article and instead you get the main that the author is trying to present.

How to read and understand a scientific paper: a guide for non-scientists

- Before trying to form opinions about a given field you need to become familiar with current research in the field
- There are 2 types of Research Articles
  - **Primary Research Article**.
    - Peer-reviewed report of new research on a specific question (or questions).
  - **Review articles**
    - Peer-reviewed reviewed but do not present new information instead summarize multiple primary research articles to give some consensus, debates, and unanswered questions within a given field.
    - Depending on some fields the older the information they present there can exist inaccuracies.
    - For example a research on genomics done in 1999 compared to 2015 as one example

How to read and understand a scientific paper: a guide for non-scientists

continued

- Reading a scientific/academic paper is not like reading a blog post or newspaper
- Try to take notes about the paper
- Read it multiple times and try to incorporate skimming at first
- Some journals have additional files (called Supplementary Online Information) which contain important details of the research, but are published online instead of in the article itself
- Beware of questionable journals
- Here I would advise looking at links provided from Papers We Love as they have been reviewed by the community

How to read and understand a scientific paper: a guide for non-scientists

continued

- Suggestion in article is to write down each word that you don't understand
  - I would counter that you only write down the word if it is not clearly stated later in the paper
  - Key point I am trying to make is not to get bogged down in details on first 2 passes
- Author advises to read abstract last
  - I would counter this and say read the abstract, introduction and conclusion
  - Interestingly the previous 2 articles say the opposite of this advice as I spoke about earlier

How to read and understand a scientific paper: a guide for non-scientists continued

- Author advises to identify the "Big Question" or main idea
  - What problem is this field trying to solve?
- Try to answer the Big Question
  - You need to be able to explain why this research has been done in order to understand the paper
- Try to take notes
- One advice not given in any of the articles that is particularly relevant for software developers is trying to implement ideas given in the research article using code
- We will definitely be implementing some ideas with code in the meetup
- If reading charts and diagrams is difficult try to look at some resources to learn
  - http://bobhall.tamu.edu/FiniteMath/Module8/Introduction.html
  - Some charts that lack confidence intervals or error bars might be a red flag in statistical inference
- Try to read the cited section to get background information
- http://violentmetaphors.com/2013/08/25/how-to-read-and-understand-a-scientific-paper-2/

Should I read Papers?

- Interesting point author makes by saying we don't have to eat healthy food either but all things point to the fact that a healthy diet promotes good health
- Tips from the author
  - Skim the works cited
  - Google the author's names and see what they're all about
  - Get a grasp of the domain involved from the abstract
- One point that the author does not explicitly state that I think is important is to involve other people when you read a scientific article
- Much like having a rubber duck helps to debug issues in code. Discussing papers with other people helps solidify understanding
- http://michaelrbernste.in/2014/10/21/should-i-read-papers.html

Watch this video

- https://www.youtube.com/watch?v=8eRx5W03xYA
- Highlights from video:
  - As other articles mentioned read paper in 3 passes
  - Summarize paper in 1 to 2 sentences
  - After reading the paper try to implement
    - Presenter says he usually implements while he is reading to get better understanding of the paper
  - Use a familiar tool meaning if the paper uses Java but you are more familiar with Ruby then use Ruby
  - Assumptions in paper can affect how you implement in code just be aware of this (Memory management strategies in C++ but you are implementing in Ruby as one example)
  - When you read pseudocode in people do not get too caught up with individual steps but instead focus on the semantics of what they are trying to present
  - When implementing you might throw away code multiple times as you understand more
  - Prepare to write and Rewrite Code that serves as implementation
  - Test early and test often
  - Interact with other people and see if what you understand matches what they understand
  - Possibly contact the author of the people as they maybe really happy to see interest in their work.