Publishing Your Research

Margaret Martonosi, Princeton
Lydia Tapia, University of New Mexico

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Margaret Martonosi Intro #1: The Technical Me…

Cornell BS EE '86 -> Stanford PhD, 1994

Princeton 1994-now: Assist., Assoc., Full…

Research: Computer architecture and mobile systems. Power efficient systems. Memory model verification.

Sabbaticals: IBM (2005) & US State Dept (2015-6)

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Margaret Martonosi Intro #2: Non-Technical Me

- Married 16 years to Kevin Burkman
- Met when we were both hike leaders for the Appalachian Mountain Club
- Other fun: Running, swimming, travel

About Lydia

- Ph.D. 2009, Texas A&M U.
- Postdoc 2009-2011, U. Texas Austin
- Assistant Professor 2011-2017, U. of New Mexico
- Associate Professor 2017-present, U. of New Mexico

- Interdisciplinary research in high-dimensional robotics
  - Robotics work with ECE and ME
    - Robotics venues
    - Control venues
  - Computational biology work with UNM Medical School, Biology, and Chemical Engineering
    - CS computational biology venues
    - Biology venues

- About my publication record
  - Pre- PhD 10 papers (2 papers/year)
  - Pre-tenure Faculty 34 papers (5.6 papers/year for 6 years)

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Publishing Your Research

Part 1- The Publishing Process

Part 2- The Writing Process

Thanks to Holly Rushmeier for some of the material in these slides, which she, in turn, had adapted from previous Grad Cohort presentations and a Grace Hopper presentation by Jaime Treevan

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The Publishing Process

The "Writing Bug"

Why?

It feels good:

- to share what you've done
- others to be interested
- to say how you've advanced state of the art!

So keep doing it -- as much as you can?

- **Quality!** Quantity varies by area
- Citations matter as career progresses
- Venue matters

It's addictive!

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Avenues for Publication

Examples from Robotics

IEEE Transactions on Robotics Journal

IEEE International Conference in Robotics and Automation

3rd Workshop on Machine Learning in Planning and Control

Workshop on the Algorithmic Foundations of Robotics

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prestige

field recognition

visibility

feedback

feedback

Additional

Workshop Abstracts

Doctoral Consortium Abstracts/Posters

Conference/Workshop Posters

Other Outlets

Thesis

Software, patents, books, data repositories

Social media: blogs, Twitter, YouTube

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IEEE Publication Cycle

General idea holds in other fields

Peer-Reviewed

Workshop

Conference

Journal

Authors are NOT tied to this pipeline!

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Workshop Process

Submission date usually after conference rejections
May have formal program committee
Usually high acceptance rate

Drawbacks:
-A lot of work (mini paper) for not a lot of prestige
-Acceptance is commitment to attend workshop
-Papers may or may not be archived!

Advantages:
-Early feedback on your work

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Focus*: Conferences

Conference status is different in CS

- Primary outlet for CS (selective)
- Place to meet for other disciplines (not selective)

Not all conferences are equivalent

- Know top-tier conferences in your research area
- Acceptance rates/citations
- Sponsoring organizations

Acceptance is requirement for an author to attend

Visibility can be very high from giving a talk or meeting with other researchers

*Be sure to understand what is primary in your area of CS (especially if doing interdisciplinary research)

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Conference Process

Uniform Submission Date

- Typically once/year
- May have separate abstract deadline

Program Committee

- May be hierarchical, may have non-committee reviewers

Decisions

- Single decision or rebuttal

Details vary by area and year

- Read the CFP carefully!!!
- Talk to Grad Cohort speakers from your area

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Journal Process

- No fixed deadlines
- More space and time
- No travel or registration expenses (publication fee?)
- Can be hard to finish without a deadline
- Review cycle often much slower-- even over a year!

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Journal Process

Outcomes

Accept

rare on first submisison

Minor Revision

possibly accept

Major Revision

be attentive to suggestions; may have just one iteration to address them

Reject

review may specify “resubmit as new” vs. “hopeless”

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Peer Review Process

- Reviewer selection
  - Drawn from citations, contacts, lit search
  - Uses keywords or categories (beware of choosing too broadly)
  - Experts in the field
  - No conflicts of interest

- Single-blind- author does not know reviewers
- Double-blind- reviewers do not know author, author does not know reviewers

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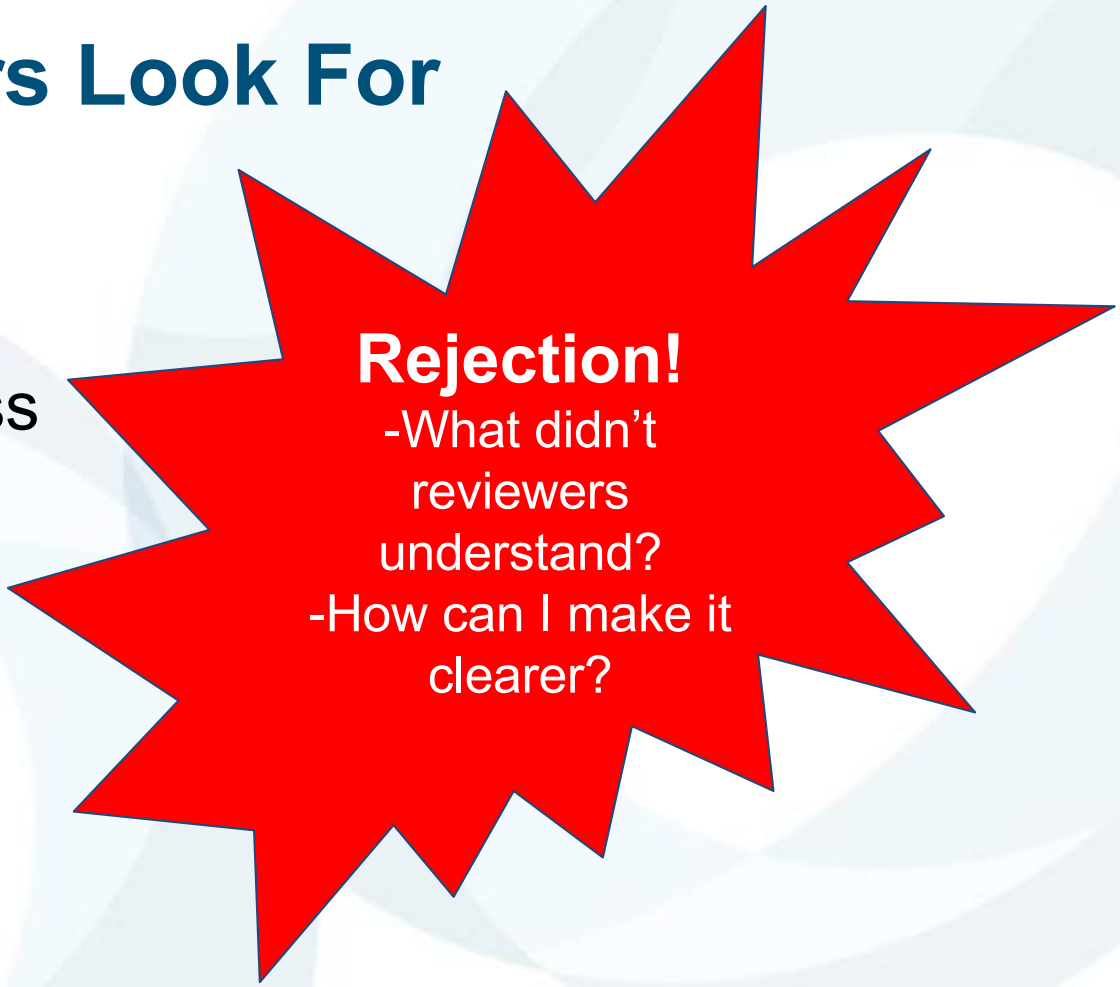
What Reviewers Look For

Clear contribution

Technical soundness

Solid evidence



Good writing will never make a paper. But, it helps to make contribution, technical soundness, and strong evidence clear!

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The Writing Process

Writing Effectively

- Empathy for reader:
  - Get out of your head and into yours.
  - They haven't been "riding along with you" during your work; they just got here. Avoid "kidnapping them". Tell them where you are going and why it matters
- Short sentences
  - Humans stop and process information at the period (.) Give them more places to pause and process.
- Outline, clear sequencing, and topic sentences
  - Write out an outlined bullet list of sections and clearly sequenced key points.
  - Turn each key point as the topic sentence of a paragraph.

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The Intro

- What is the problem?
- Why is it important?
- What have others done about it?
- What are you doing about it? (What is novel/different from others?)
- What are the takeaways? should the world learn from your work?

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Scenario: Let's improve this abstract!

Graph analytics form the basis for many important computational applications including machine learning, social network analysis. Graph analytics performance is an important metric, and both hardware and software acceleration can be applied. This work studies hardware and software methods that together improves runtime by 12% across a set of graph analytics benchmarks running on large-scale graphs. Our framework takes the vertex programming model as input for compatibility, but applies compiler optimizations and offers hardware support through a CAM-based edge access scratchpad memory.

-> What writing changes do you suggest?

Note: some might be simple rewrites of the info that is there, and other might require asking me to provide more info

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Graphicionado Approach

Graphicionado: A high-performance, energy-efficient graph analytics HW accelerator which addresses challenges in graph analytics computing

- **Vertex Programming Abstraction based HW Pipeline**
  - **Programmers:** specify computations for a graph algorithm
  - **Graphicionado:** efficiently supplies data for specified computations
  - Can handle multiple different algorithms with minimal reconfiguration
- **Domain-Specific Pipeline and Memory System**
  - **~3x speedup and 50x-100x** energy efficiency over 32-core CPU
  - **1.5-4.5 Billion edges/s** on 78 GB/s memory system

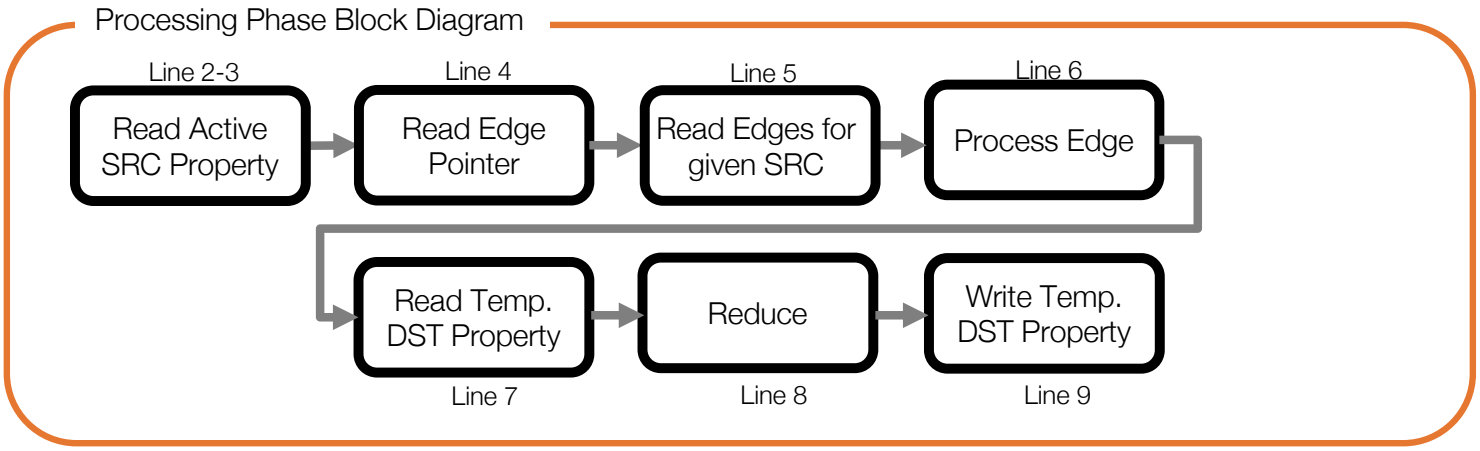
From abstraction to HW

```
1  for (i=0; i<ActiveVertex.size(); i++) {
2    vid = ActiveVertexID[i];
3    vprop = ActiveVertexProp[i];
4    eptr = PtrToEdgeList[vid];
5    for (e = Edges[eptr]; e.src == vid; e = Edges[++eptr]) {
6      res = Process_Edge(e.weight, vprop);
7      temp = TempVertexProp[e.dst];
8      temp = Reduce(temp, res);
9      TempVertexProp[e.dst] = temp;
10   }
11 } // Apply Phase updates ActiveVertexProp with TempVertexProp
```

Read the active (SRC) vertex

Traversing edges of the given active vertex

Updating the destination vertex with the programmer supplied computation



From abstraction to HW

```
1  for (i=0; i<ActiveVertex.size(); i++) {
2    vid = ActiveVertexID[i];
3    vprop = ActiveVertexProp[i];
4    eptr = PtrToEdgeList[vid];
5    for (e = Edges[eptr]; e.src == vid; e = Edges[++eptr]) {
6      res = Process_Edge(e.weight, vprop);
7      temp = TempVertexProp[e.dst];
8      temp = Reduce(temp, res);
9      TempVertexProp[e.dst] = temp;
10   }
11 } // Apply Phase updates ActiveVertexProp with TempVertexProp
```

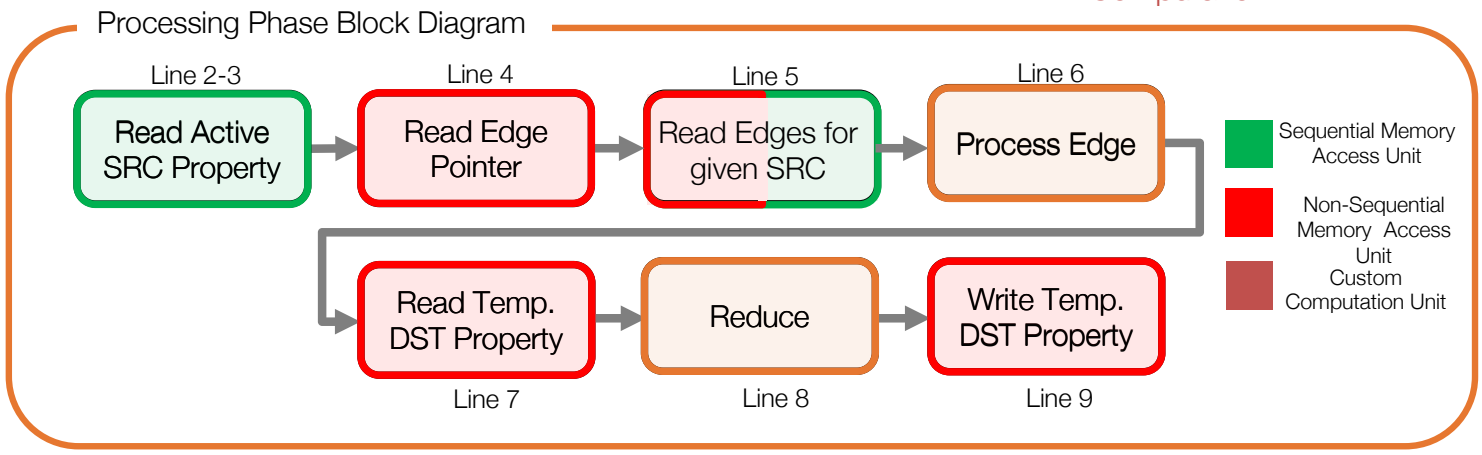
Sequential (vertex) Memory Access

Non-sequential (edge ptr) Memory Access

Non-sequential and then Sequential (edge) Memory Access

Non-sequential (vertex) Memory Access

Custom Computation



Scenario: Let's improve this abstract!

While others have studied graph analytics a lot, and there has been both software and hardware research, and some of it really improved performance, our work also studies graph analytics. Through the analysis our results show 12% improvement. Part of this comes from a CAM-based edge access scratchpad memory. We started from the vertex programming model but we adjusted it also so our work has both hardware and software aspects to it.

-> What writing changes do you suggest?

Note: some might be simple rewrites of the info that is there, and other might require asking me to provide more info where it is missing.

Resources

- Strongly Suggest: “The Science of Scientific Writing” by Gopen & Swan
- https://cseweb.ucsd.edu/~swanson/papers/science-of-writing.pdf
- Very short – just a few pages, but gives great strategies to work on.

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