# Lecture 1

ECS 289C: Seminar in Programming Languages

# Note

Today is the last “normal” lecture day

Discussions starting next week

# Original plan

What is a programming language, anyway?

Areas of PL

Paper assignments starting next week

# New plan

~~What is a programming language, anyway?~~

~~Areas of PL~~

(Happy to talk about these sometime!)

General advice on how to think about research papers

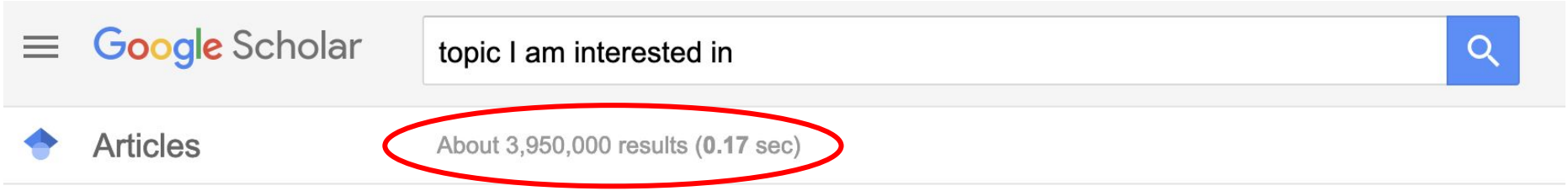
- With this advice, you can honestly figure out the areas on your own
- I think it will help with your presentations and summaries

If we have time (or bleeds into next time):

**2 Activities**

Paper assignments soon after

# Motivation 1: Reading literature is overwhelming



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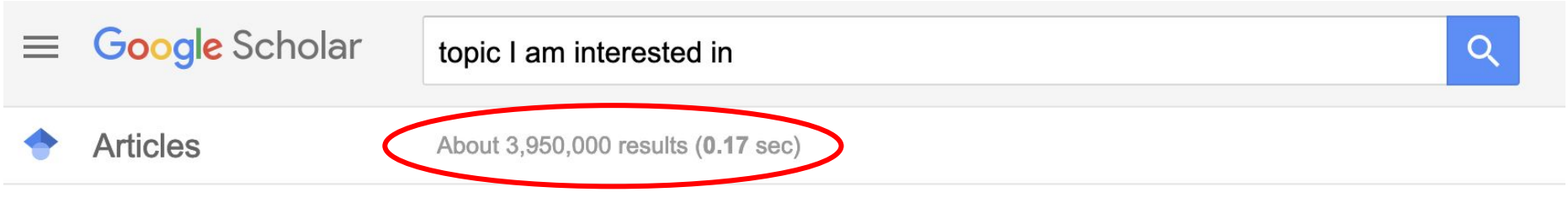


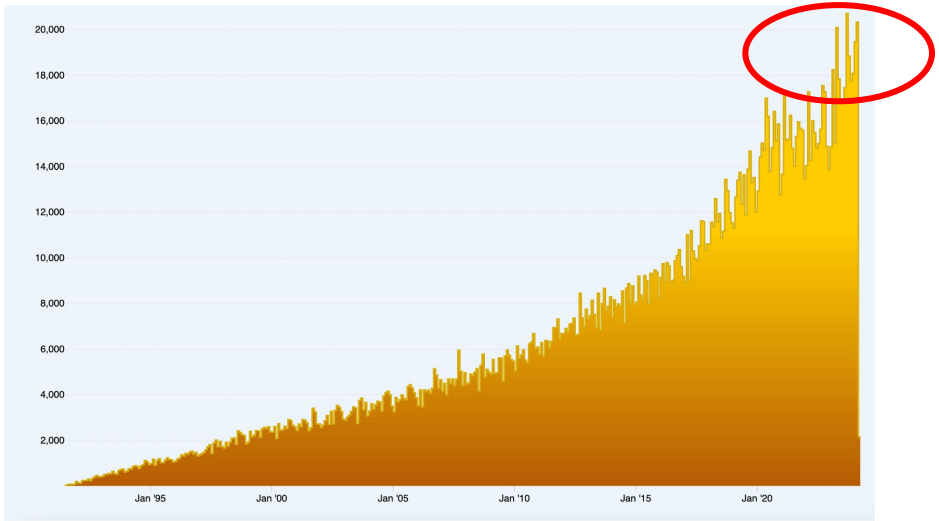


About **20,000** papers posted to arXiv every month

… or over **600/day**

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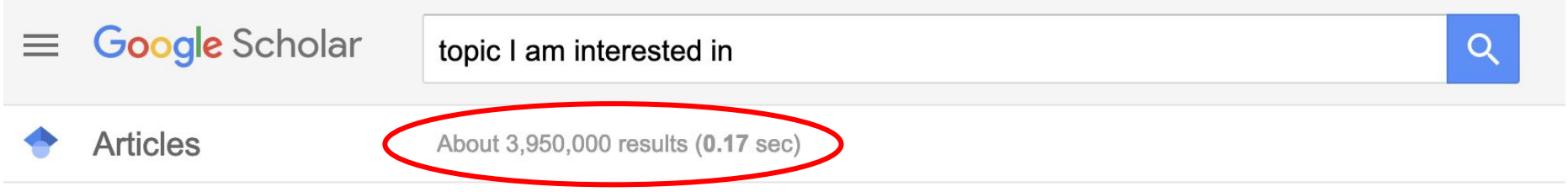


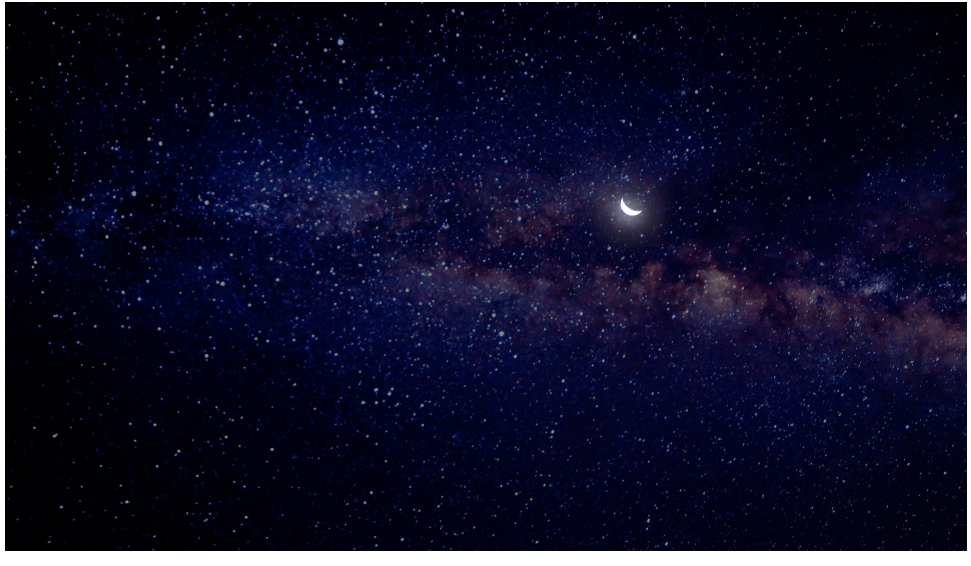

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**Too-easy conclusion:** why does what I **(you)** do/think make any difference?

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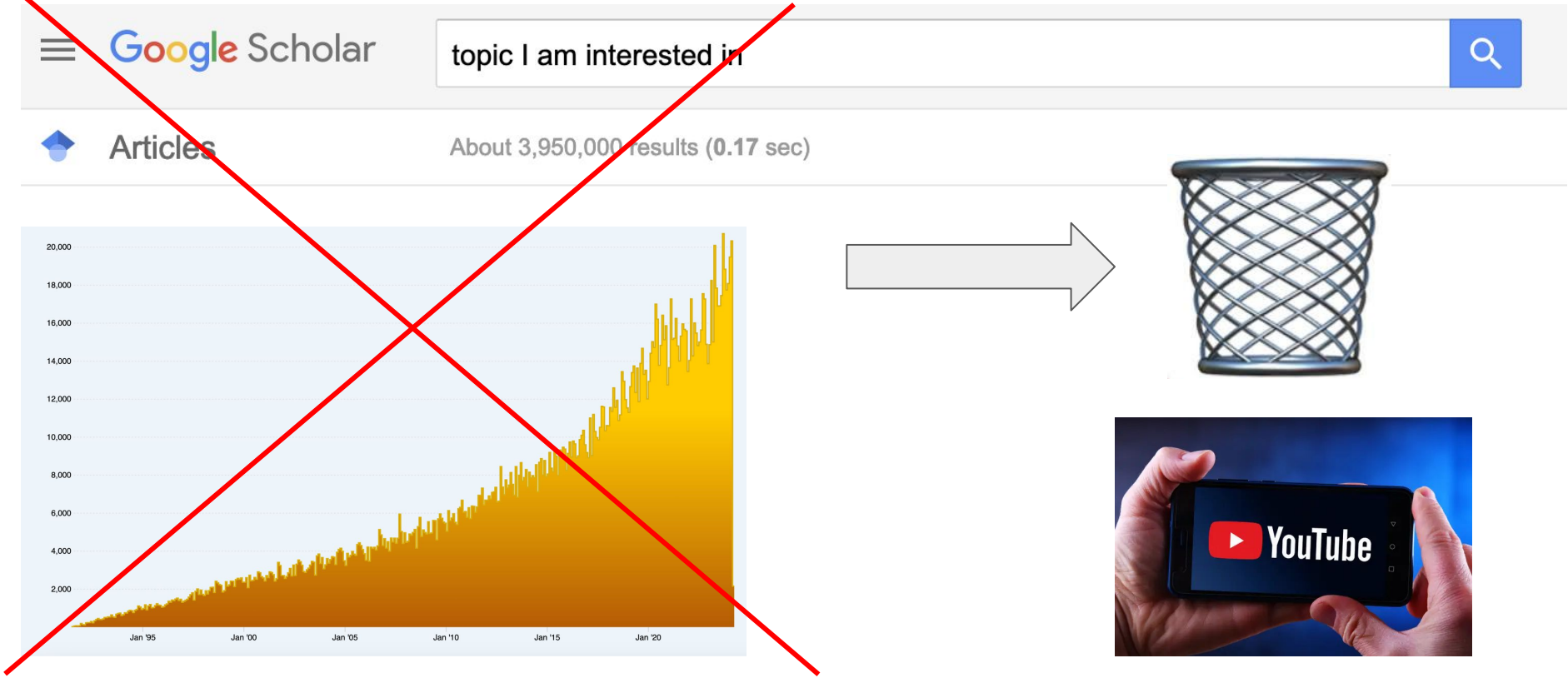
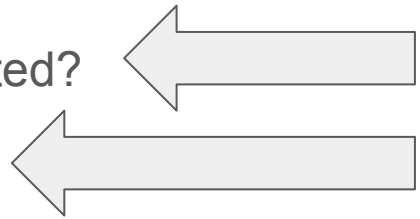


# Motivation 2: knowing **why** is critical

Why are you reading this paper?

2 parts:

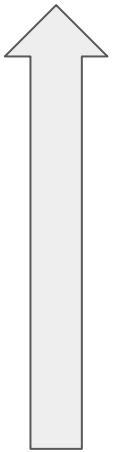
1. Why are you interested?
2. Why is it important?



**research area**

**contribution**

# The way I've come to think about this
# Or: Caleb's tree model of research



Applies to both reading literature + coming up with new research problems!)

Not really mine – this has been expressed in many ways before. But I hope it will help us address some of the motivations earlier

(Work in progress)

# Caleb’s tree model of research

Research literature is like a tree

# Level 0: Trunk

Computer science

~100,000 active computer science researchers

(ref: 100K ACM members)
(ref: 28.5K PIs on csrankings)

# Level 1: Limb

Major area
(Flagship conference)

~10,000 researchers
per major area

(ref: 27 areas acc. to csrankings,
but not all of them major)
(ref: 2743 SIGPLAN members)

# Level 2: Branch

Subarea
(Conference session)

~1,000 researchers
per subarea

# Level 3: Twig

Research topic

~100 researchers
per research topic

# Level 4: Leaf

Research problem

~10 researchers
thinking about a specific
research problem

# Level 5: Bud

Potential solution

~1 researcher investigating
a specific solution

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Fig. A: graduate student

# My hypothesis:

Any research idea can be completely identified by a list of nodes

**5 levels deep**

In the tree. (No more levels are needed!)

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# Corollaries

If you want to understand a paper…

- You **don’t** have to understand the whole tree

According to this model, the tree of computer science has 10,000 active research problems and 100,000 potential solutions.

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If you want to understand a paper…

- You **don’t** have to understand the whole tree

- You **do** have to understand how to “climb” the tree **5 levels** to get to the point you are interested in

According to this model, the tree of computer science has 10,000 active research problems and 100,000 potential solutions.

# Corollaries

If you want to make a new research contribution...

- You **don’t** have to convince the whole tree

- You **do** have to convince the **10 researchers** in your leaf that your idea is useful
  - and maybe one or two in the same twig

# Corollaries

If you want to give a talk at a conference...

- You **don’t** have to address the whole tree

- You **do** have to explain to the **1000 researchers** in your branch what your twig/leaf/bud is up to

# Corollaries

If a paper does this successfully…

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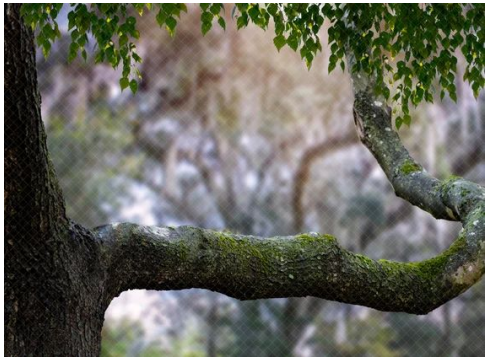

(if you happen to get really, really lucky)

# Why is this relevant to reading research papers?

1. Every peer-reviewed research paper successfully went through this process

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2. If you know which 5 levels **you** care about, you know which papers to read carefully – and which to **skim/ignore**

3. “Foundational” papers are ones that generated a new branch!

# Questions when reading a research paper

1. What **area** is it in?

   (This is the **5 levels deep** part)

2. What **contribution** does it make?

   (This is the **“convince the surrounding neighbors”** part)

# Activity 1

Pick a paper that catches your eye:

PLDI Research Papers - PLDI 2023

Answer the 2 questions

- What are the 5 levels?

- How does it convince the reader that it succeeded?