Tips for Giving Clear Talks

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My motivation

- I have found I give nearly the same feedback over and over to students making talks
  - It is not profound feedback, it is just application of a simple set of techniques and principles that are consistently useful when making talks

- I am hoping that:
  - These slides serve as a useful checklist that you can refer to vet your own talks before delivering them to others
  - I still make these mistakes all the time when creating first drafts of talks

Why give talks?

Two reasons to give talks

1. **Convey what you have learned in your research to your peers**

   (Don't tell the room what you did, tell the room the most important things they <u>should</u> know, but probably do not.)

2. **Get feedback from others to advance your own research goals**

   (Goal: put smart people in the best position to help you.)

Two BAD reasons to give talks

1. You believe it is a reward for:
   - Finishing a project
   - Getting a paper accepted
   - Being clever enough to get a good result

2. You were signed up to speak in lab meeting or in CS197
   (Presenting is an opportunity, not an obligation.)

Consider the costs of a bad (unclear) talk

- To the audience:
  - 1 hour x 50 people = 50 person-hours of work
  - General unhappiness

- To you:
  - Missed opportunity for feedback or quality discussion
  - Missed opportunity to identify new collaborations
  - Diminished impact of your work

Benefit TO YOU of a good (clear) talk

- Non-linear increase in the impact of your work
  - Others are more likely to remember and build upon your work
  - Others are more likely to adopt your ideas
  - Others are more likely to come up to you after the talk

- Clarity is highly prized in the world: the audience will remember clear communicators
  - “Hey, that was a great talk yesterday… are you looking for a job anytime soon?”
  - “Hey, that was a great talk, I’m working on something that you might find helpful.”

Roadmap

- The rest of this talk is structured as a list of principles and tips
  - It is not a comprehensive guide to making a talk

- So let's get started…

Who painted this painting?

Salvador Dali (age 22)

My point: learn the basic principles before you consciously choose to break them

Tip 1

Identify your audience

Strive for clarity for that audience

- You should aim for your target audience to understand <u>everything</u> you say in a talk (if they won't understand it, why are you saying it?)

- This means you have to put yourself in your audience's shoes
  - Even if you are targeting experts (e.g., your research advisor or peers), experts haven't been thinking about your problem 60 hours a week
  - The ability to analyze your own talk from the perspective of others is a skill ~~young researchers~~ all researchers (including professors) struggle with tremendously.

Tip: recite a sentence out loud to yourself. Do you really expect someone who has not been working with you everyday on the project to understand what you just said? *

* I find hearing myself say something makes it easier to parse it from an audience's perspective.

Tip 2

A good principle for any talk (or paper):
“Every sentence matters”

What are you trying to say?
What technical story are you trying to tell?
What is point you are trying to make?

Is what you just said making that point? (If not, remove it)

If you can’t justify how it will help the listener, take it out.
If it won’t be understood, take it out.

An example of applying “every sentence matters”:

The talk intro

Intros and background are often very poor

- Too many talks have introductions and related work that do not suggest much thought was put into them
  - Which is bad — those are critical parts of the talk!
  - Example of useless intro to a graphics audience: many people in computer graphics know that global illumination is important to realistic image synthesis. Don't have to say it.

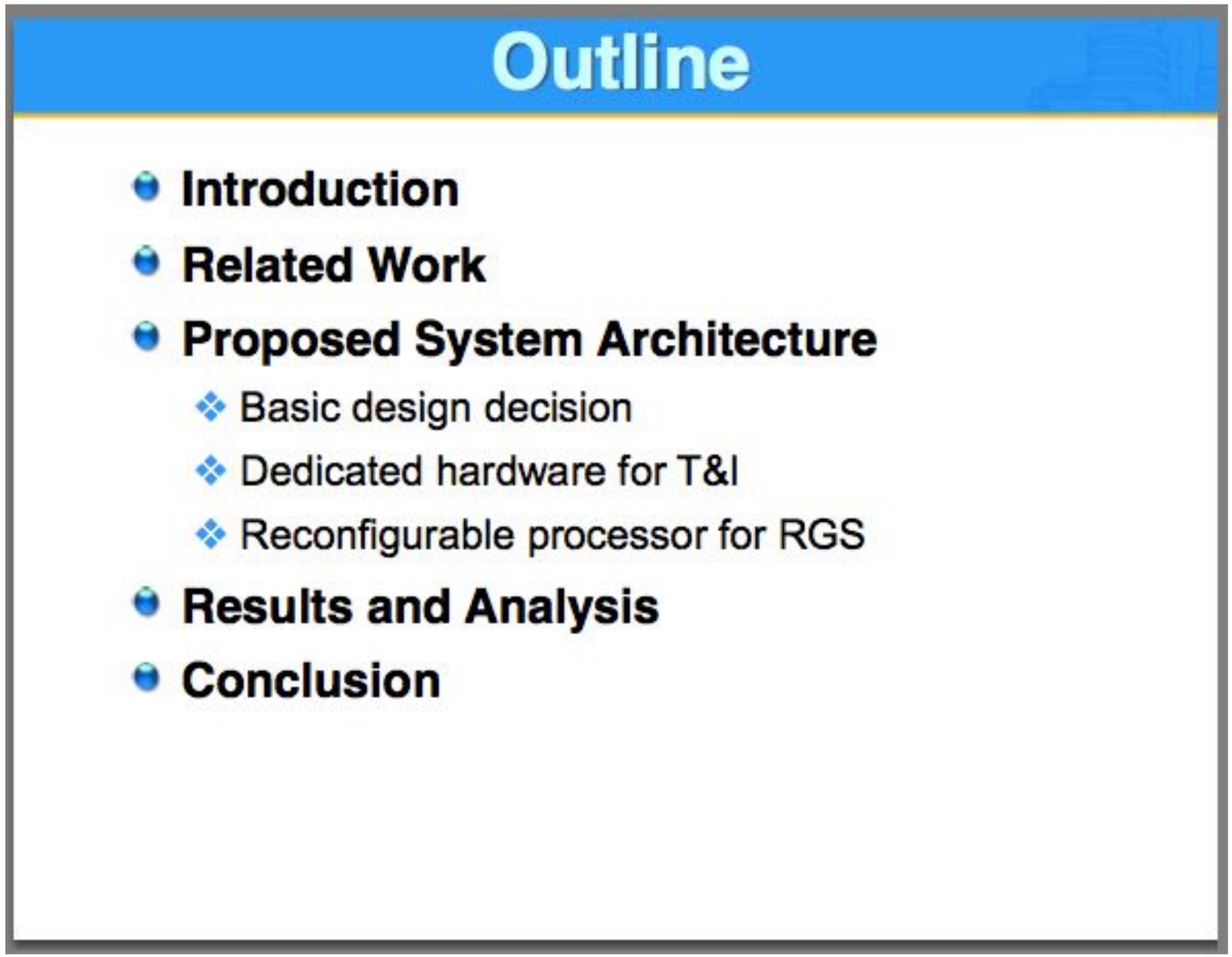
- Unlike a paper, related work in a talk does not exist for academic completeness
  - No one cares if citations are comprehensive (will address this later)

- They intro/related work in a talk exist to set the context for the technical components of the talk. Specifically...

The goal of the intro and background is to tell the listener: "In this talk, here is the way I want you to think about the problem I am trying to solve."

Bad example 1

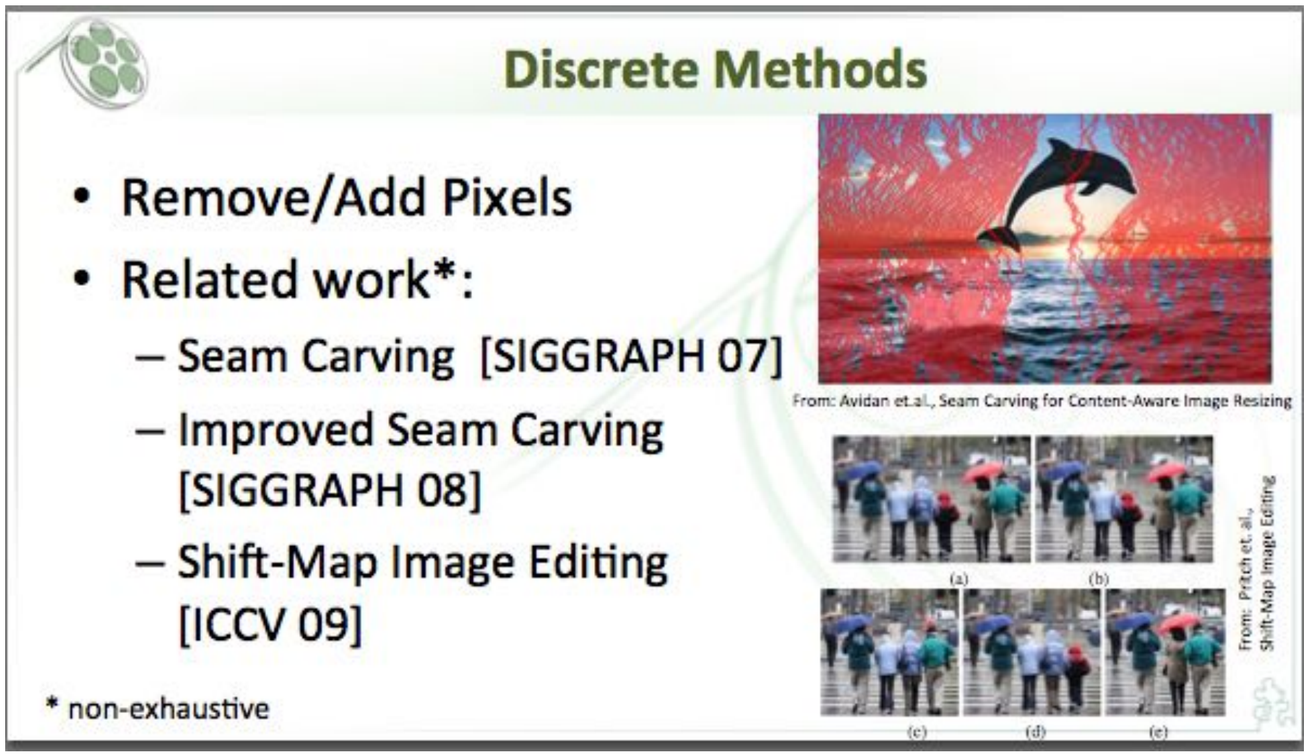
- Never ever, ever, ever do this!



This slide just told me this talk will have an introduction and a conclusion. :-(

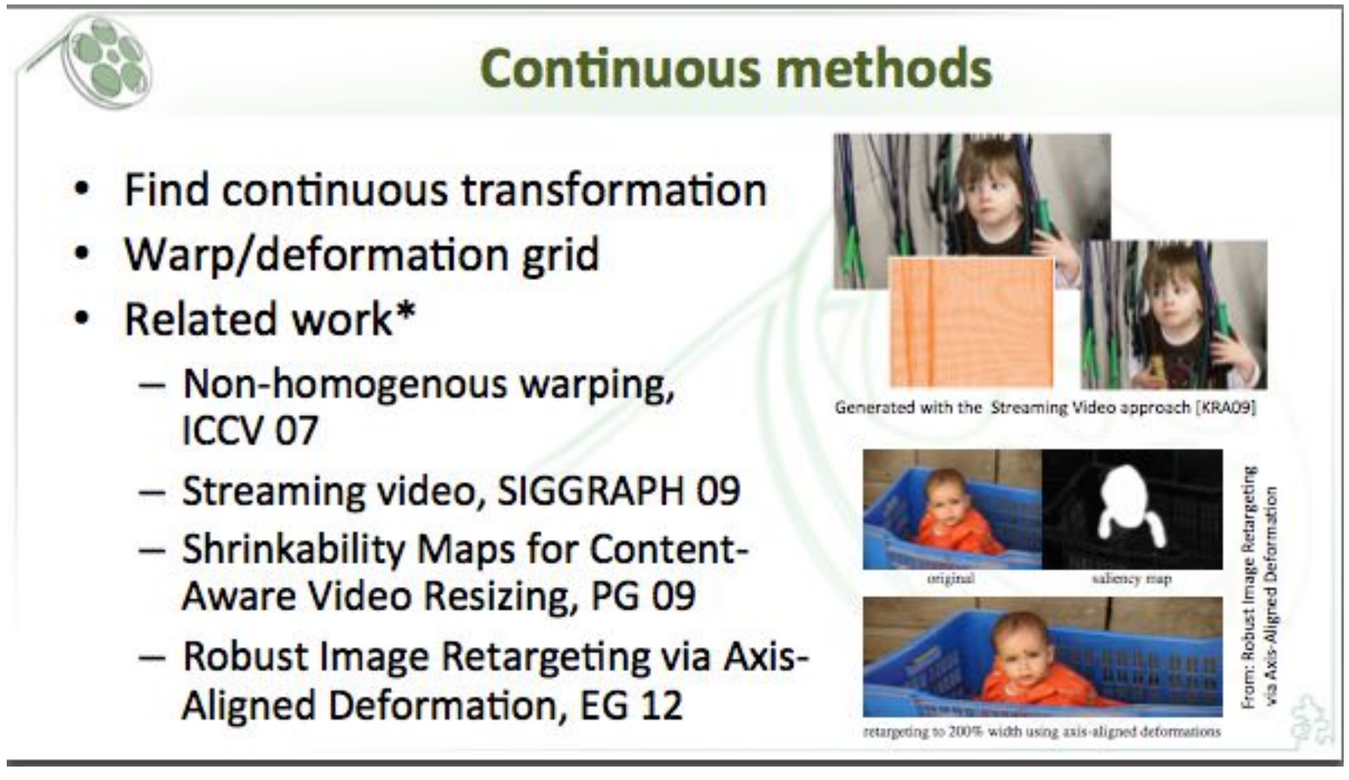
Bad example 2

Who is the audience for this? (how does this benefit them?)



- **Experts on the topic?**
  - **They likely know these papers exist. These slides don't tell them what about these papers is most relevant to this talk**
- **Non-experts?**
  - **They won't learn the related work from these two slides**

- **This type of related work section says little more than "others have worked in this area before".**
  - **I suspect your audience assumes this is the case**
  - **Every sentence matters: if it doesn't provide value, take it out (or replace it with comments that do provide value)**



The goal of the intro and background is to tell the listener:

"During this talk, here is the way I want you to think about the problem I am trying to solve."

An excellent strategy to catch the audience's attention and frame the story is to make them aware that there is something they didn't know they didn't know.

("You might think you know this, but here's a new angle on it")

Intro example #1: [Mullapudi 2019]

The talk intro simply asked the audience to consider the following question:

Why are we working so hard to train general ML models that work in many different situations?

Why don't we just use simple, less general ML models and retrain them constantly for the specific conditions at hand?"

Here's the sequence used to do that…

This is what a traffic camera sees

It seems like it should be easy to train a simple, low-cost ML model to detect cars/pedestrians/etc in this one scene… right?

Problem: distribution shift

But any one scene can change dramatically over time.

We need to acquire a training set for this diverse set of conditions… right?







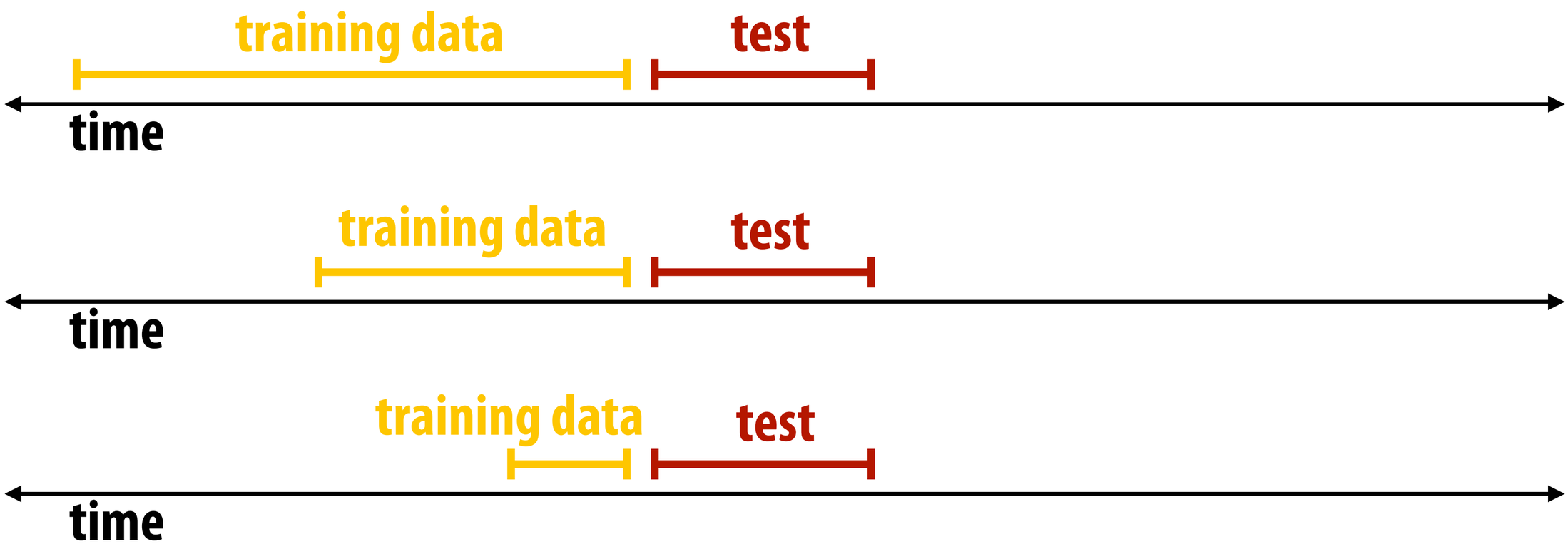




Weather, time-of-day, types of vehicles in view, etc…

Consider this experiment

- Plop camera down in a new environment
- We want a specialized model for processing the stream from this camera
- How much training data is needed to train an accurate model?



Answer: the small amount of recent training data worked best.

Let's embrace continuous adaptation of ML models to the conditions at hand

- Our premise: low cost efficient models can retain high accuracy for complex tasks in challenging environments *if they are continuously specialized to the contents of video streams*

- A.k.a. Don't worry about carefully sampling everything you might see to create a good training set, just make sure you can adapt quickly online when you see it

- Audience member: "But how do I adapt an ML model quickly on the fly with little data or supervision? That sounds hard."
  - Ah, that's the point of the talk…
  - This person has something to say, maybe I shouldn't check email.

Now that we've framed the story, the related work can now be discussed in the context of this framing.

Establishing this framing is the primary value of the talk intro.

In this example: how have other folks tried to quickly adapt ML models to new contexts?

The "meta learning" field tries to train models that can be quickly adapted later using a few examples…

There's a whole body of work on "domain adaptation": taking a model that works well in context X and modifying it to work well in Y…

Instead we adopt an approach based on "model distillation", training a low cost student model to mimic the output of a general purpose teacher model.

Tip 3

Set up the problem: establish inputs, outputs, and constraints (goals and assumptions)

Establish goals and assumptions early

- Given these inputs, we wish to generate these outputs
- We are working under the following constraints
  - Example: the outputs should have these properties
  - Example: the computer graphics algorithm…
    - Should run in real time
    - Should be parallelizable so it can run on a GPU
    - Should not require artist intervention to get good output
- Example: the system…
  - Need not compile all of Python, only this subset that we care about…
  - Should realize about 90% of the performance of hand-tuned code, with much lower development time

Why is knowing the goals and constraints important?

Your contribution is typically a system or algorithm that meets the stated goals under the stated constraints.

Understanding whether a solution is "good" requires having this problem context.

Tip 4

Show, don’t tell

It’s much easier to communicate with figures/images than text

(And it saves the speaker a lot of work explaining)

Example:

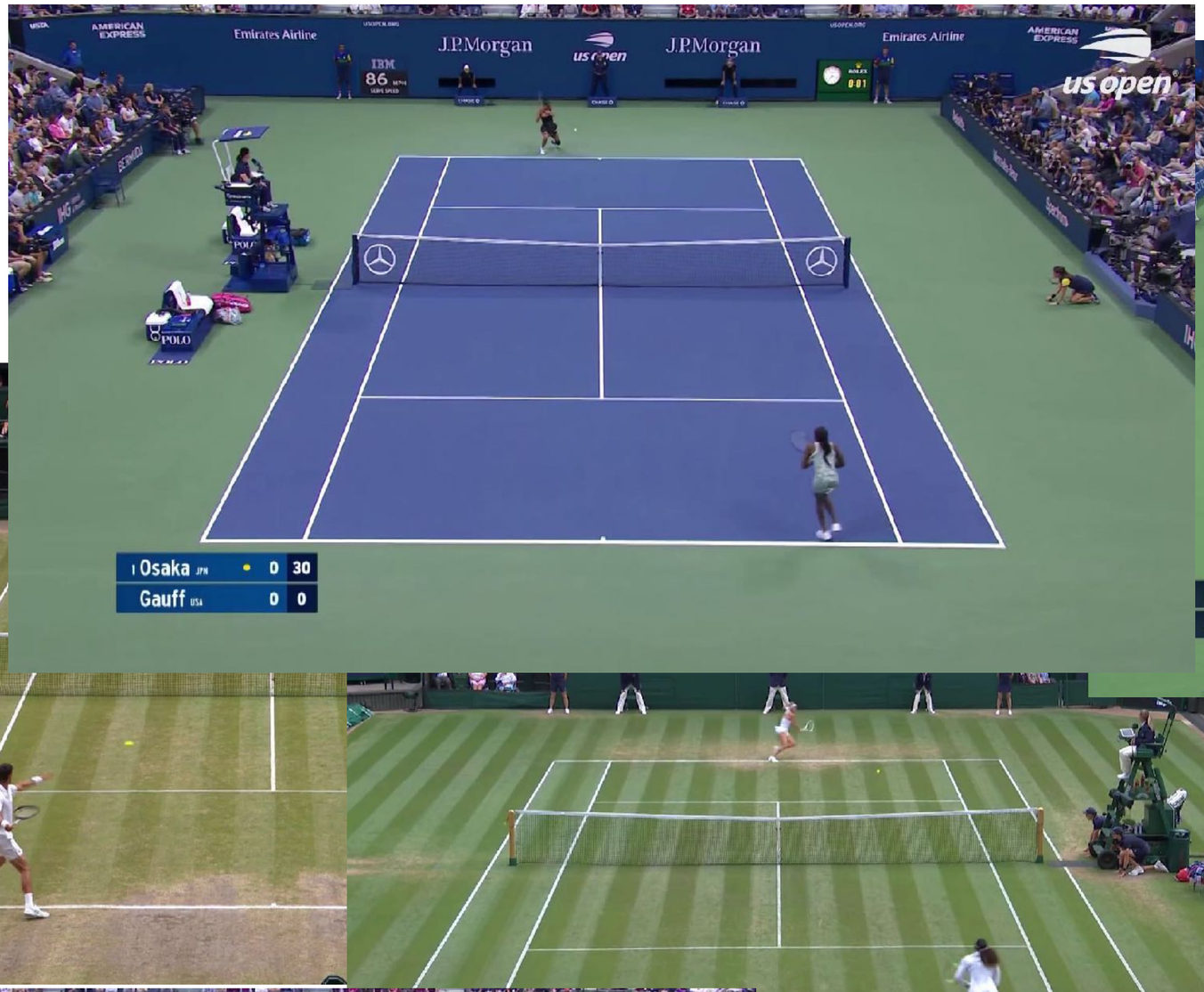
- In a recent project, we asked the question… given enough video of tennis matches of a professional athlete, could we come up with an algorithm for turning all this input video into a controllable video game character?

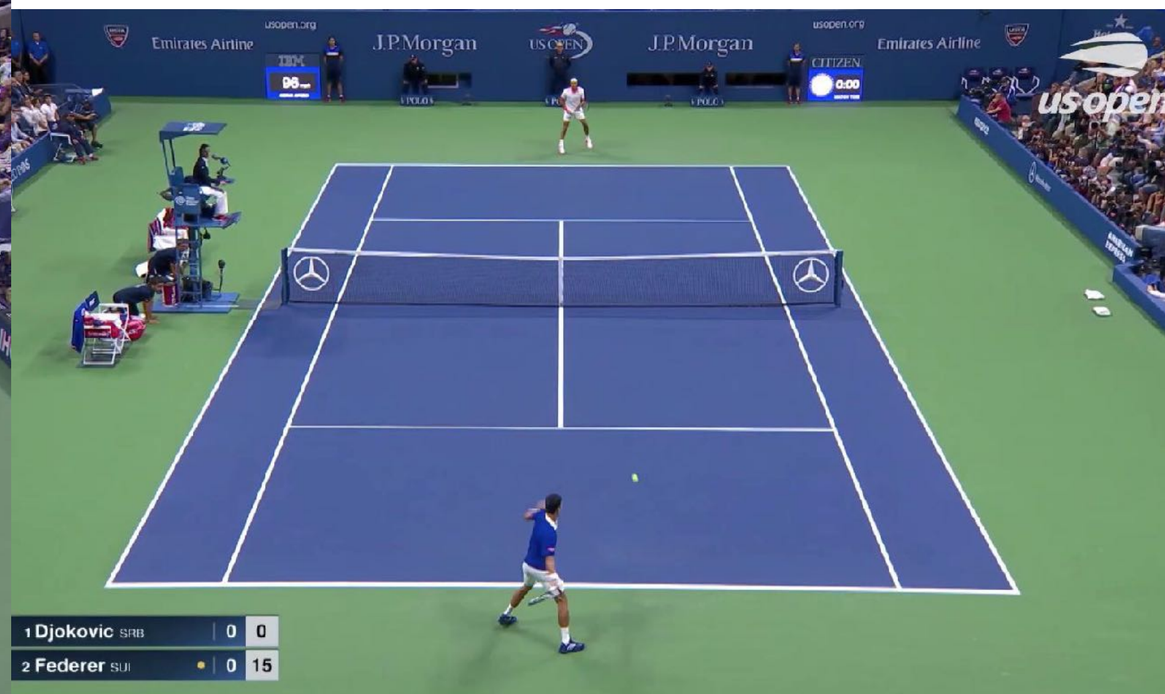
Compare the description above to the following sequence…

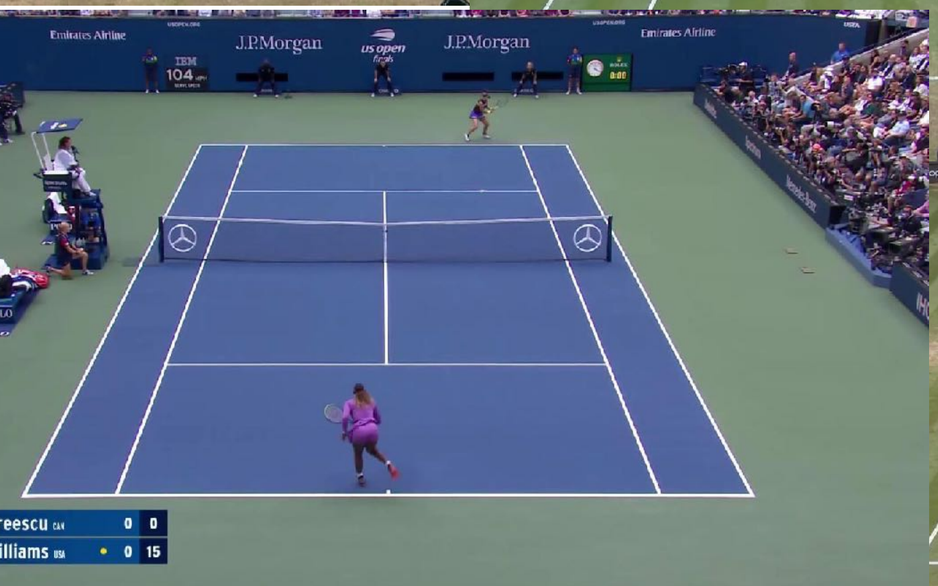
Here's an example of that source video

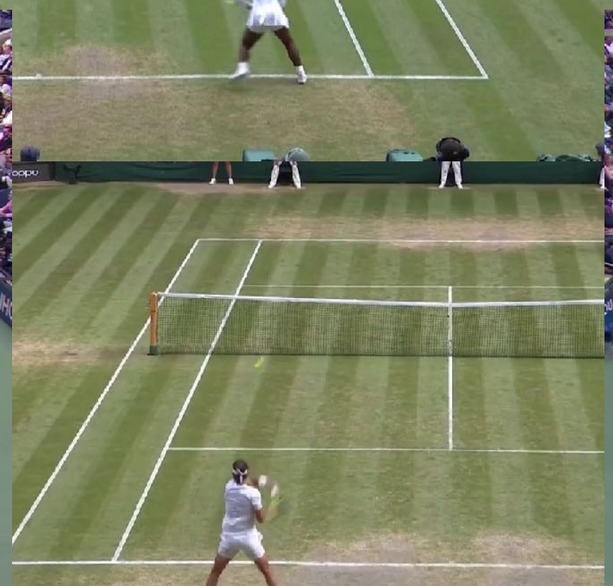
The best way to describe the input data than to just show it!

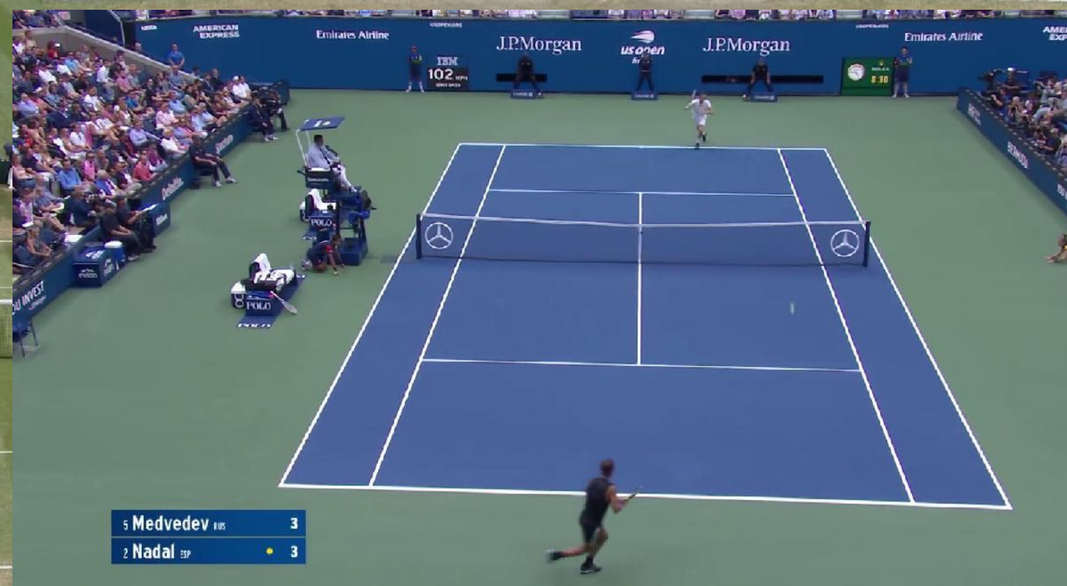
And there's a lot of it!



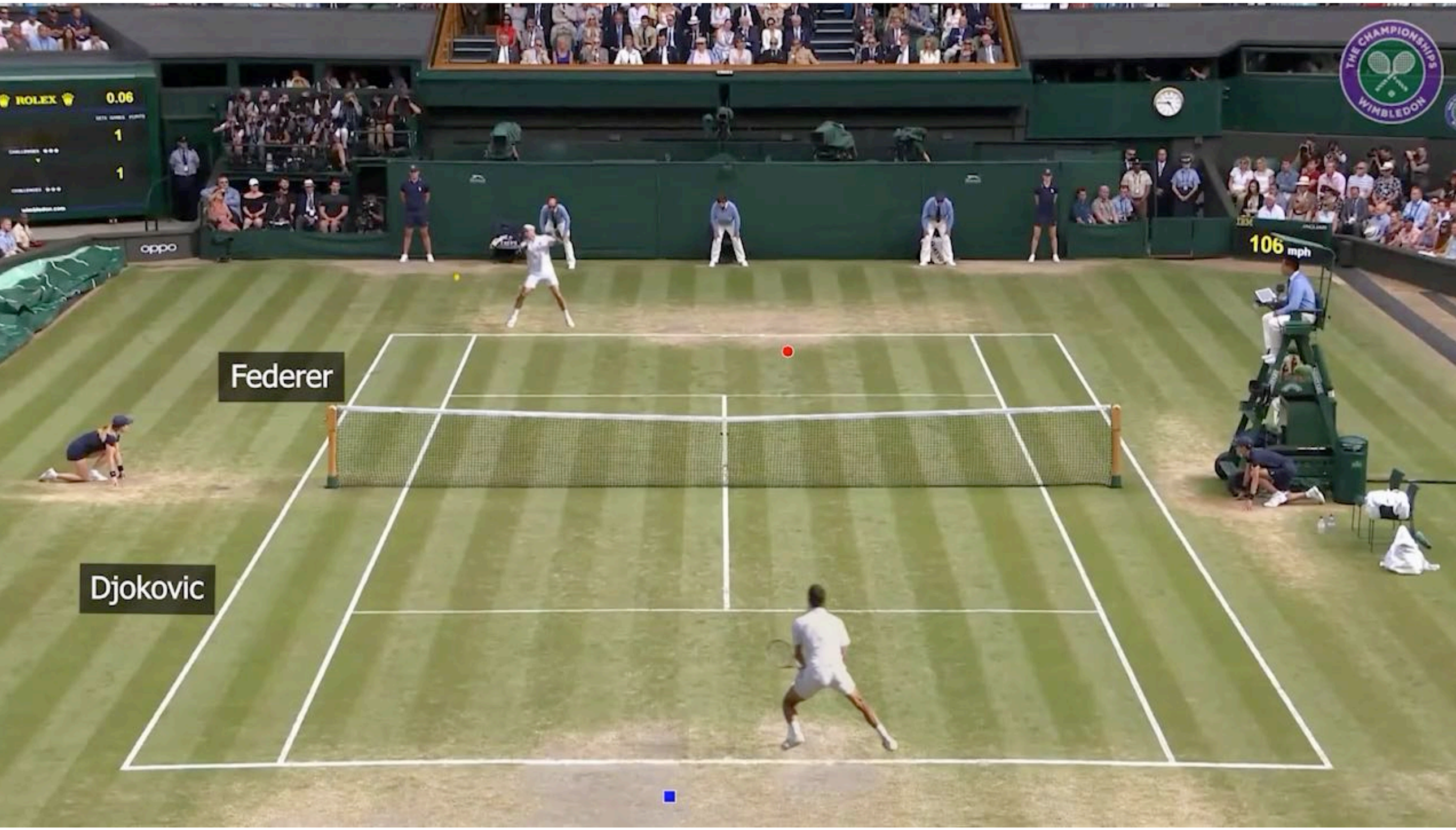








And here's an example of controllable output



The best way to describe the output we seek is just show the result of the system!

Another example:

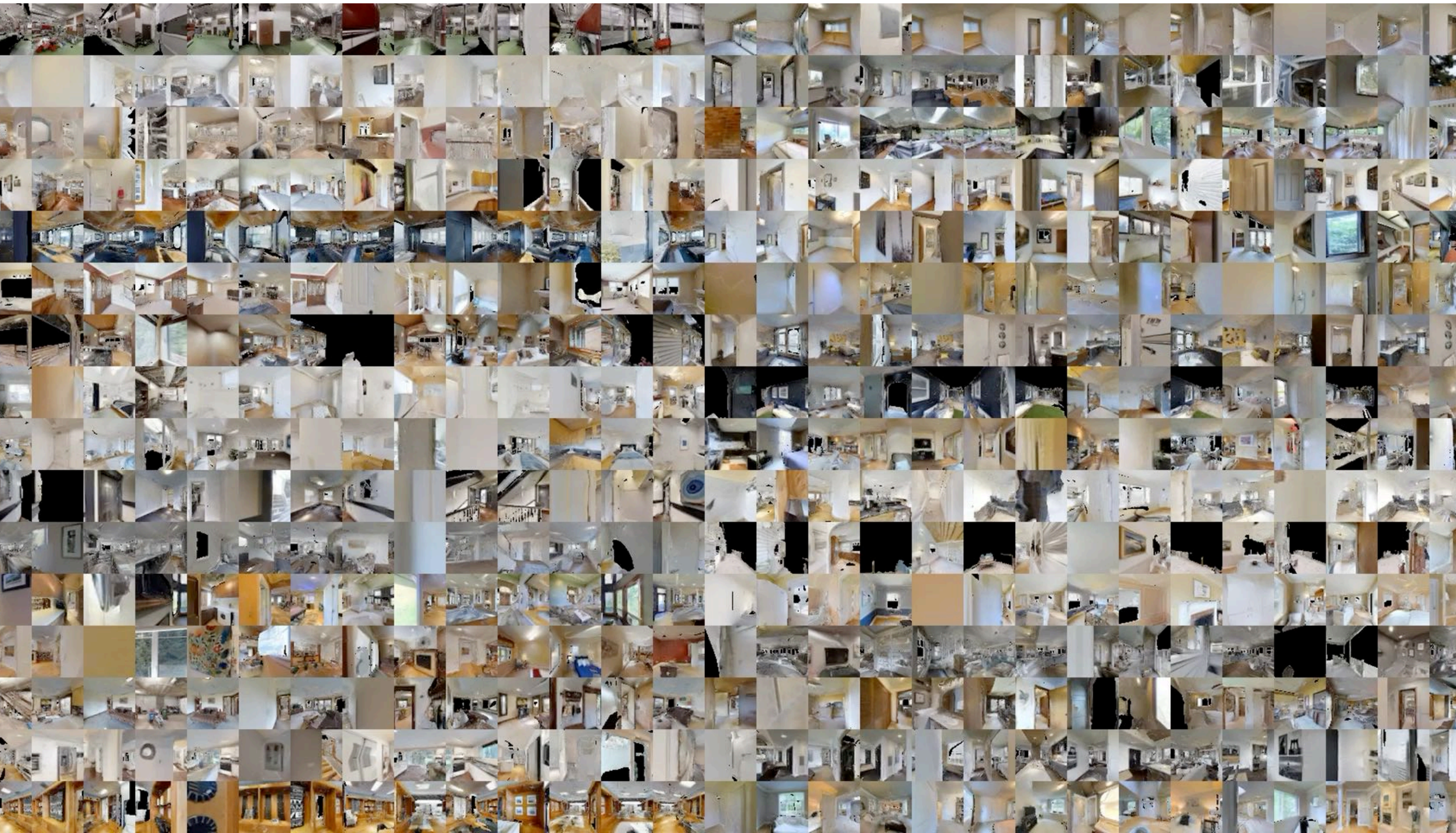
- We had a problem in this project: input videos were taken in different lighting conditions, and these lighting differences were the cause of bad results.

- An anticipated audience question: “what do you mean by lighting differences?”

The problem (lighting differences)

After the fix

Another example: we recently created a renderer that achieved high frame-rate rendering by rendering many views of the scene at the same time



Another example: it is difficult to train detectors for fine-grained object categories. Consider this…

= positive examples

= negative examples

Tip 5

The audience prefers not to think (much)

An audience has a finite supply of mental effort

- **The audience <u>does not</u> want to burn mental effort about things you know and can just tell them.**
  - They want to be led by hand through the major steps of your story
  - They <u>do not</u> want to interpret any of your figures or graphs, they want to be directly told how to interpret them (e.g., what to look for in a graph).
  - They want to be told about your key assumptions

- **The audience <u>does</u> want to spend their energy thinking about:**
  - Potential problems/limitations with what you did (did you consider all edge cases? Is your evaluation sound?)
  - Implications of your approach to their work
  - Connections to their own work

Which leads me to…

The audience does not want to think about "why" you are telling them something.

Tip 6

Surprises* are almost always bad:

Say <u>where</u> you are going and <u>why</u> you must go there before you say <u>what</u> you did.

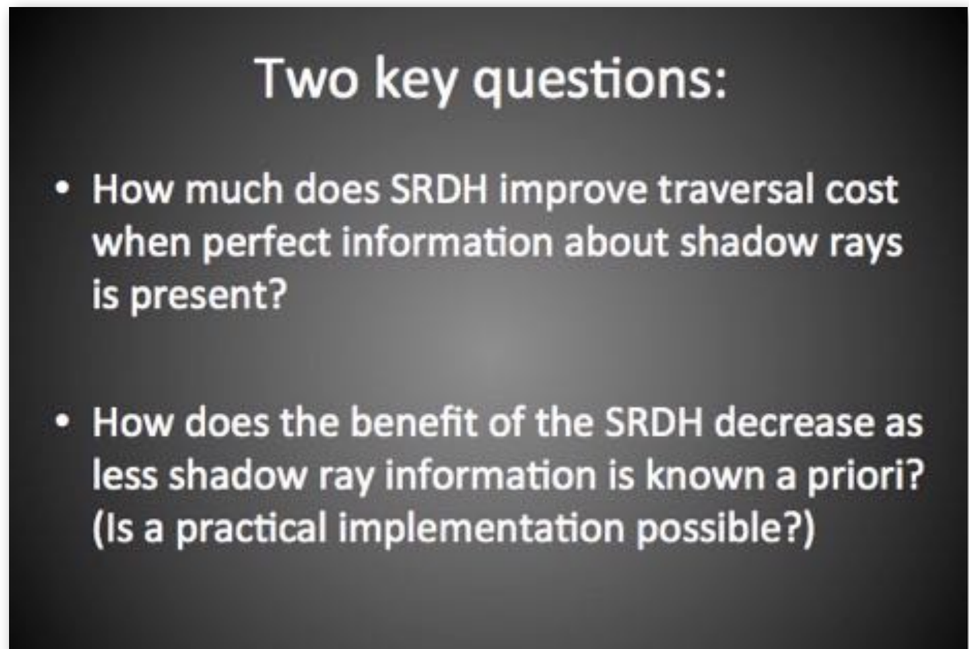
* I am referring to surprises in talk narrative and/or exposition. A surprising result is great.

Give the <u>why</u> before the <u>what</u>

- **Why provides the listener context for…**
  - Compartmentalizing: assessing how hard they should pay attention (is this a critical idea, or just an implementation detail?). Especially useful if they are getting lost.
  - Understanding how parts of the talk relate (“Why is the speaker now introducing a new optimization framework?”)

- **In the algorithm description:**
  - “We need to first establish some terminology”
  - “Even given X, the problem we still haven’t solved is…”
  - “Now that we have defined a cost metric we need a method to minimize it…”

- **In the results/evaluation:**
  - Speaker: “Key questions to ask about our approach are…”
  - Audience: “Thanks! I agree, those are good questions. Let’s see what the results say!”



Big surprises in a narrative are a bad sign

- **Ideally, you want the audience to always be able to anticipate* what you are about to say**
  - **This means: your story is so clear it's obvious!**
  - **It also means the talk is really easy to present without notes or text on slides (it just flows)**

- **If you are practicing your talk, and you keep forgetting what's coming on the next slide (that is, you can't anticipate it)…**
  - **This means: you probably need to restructure your talk because a clear narrative is not there.**
  - **It's not even obvious to you! Ouch!**

*** Credit to Abhinav Gupta for suggesting the term anticipation, and for the example on this slide**

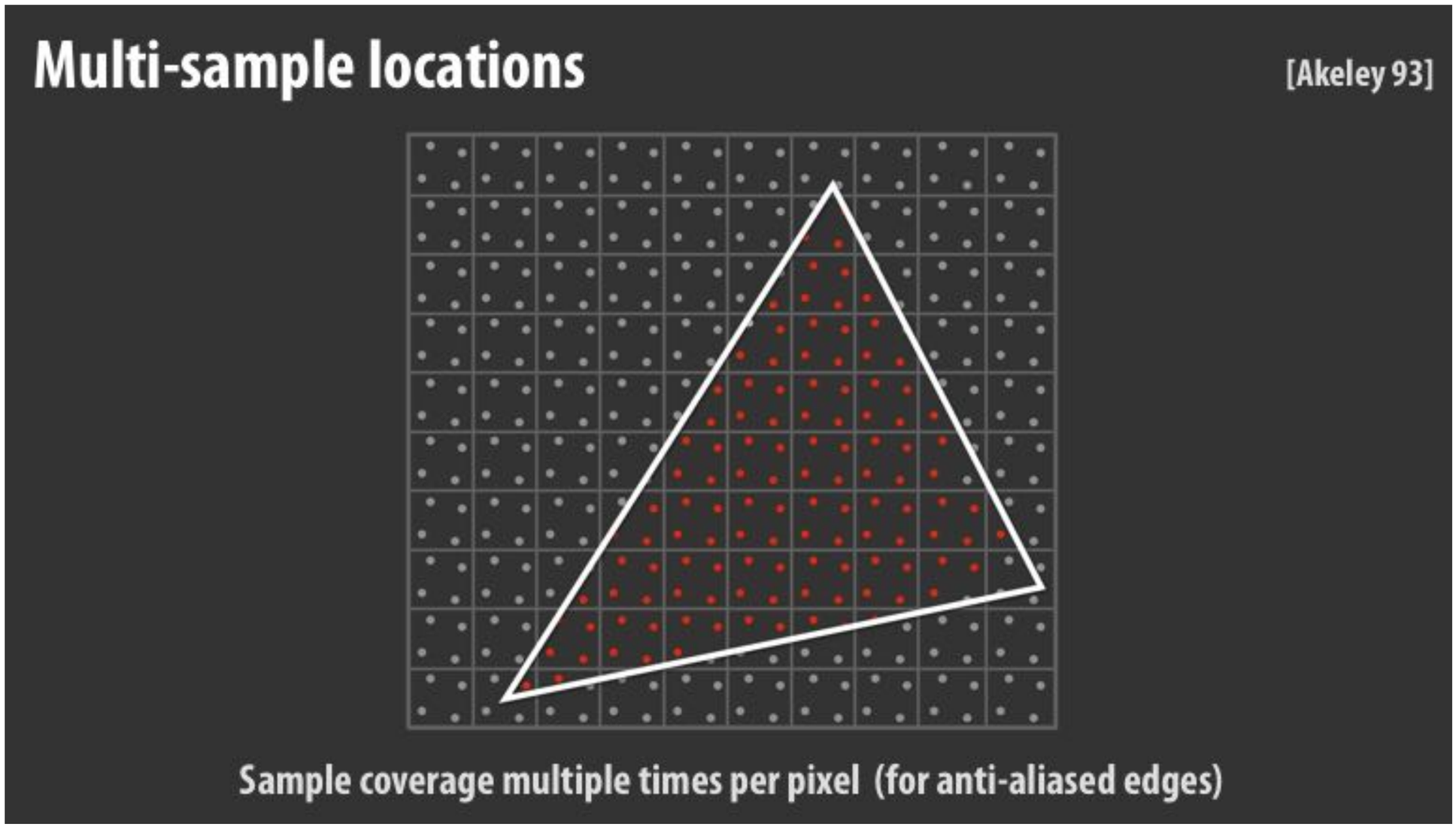
Tip 7

Always, always, always explain any figure or graph

(remember, the audience does not want to think about things you can tell them)

Explain every figure

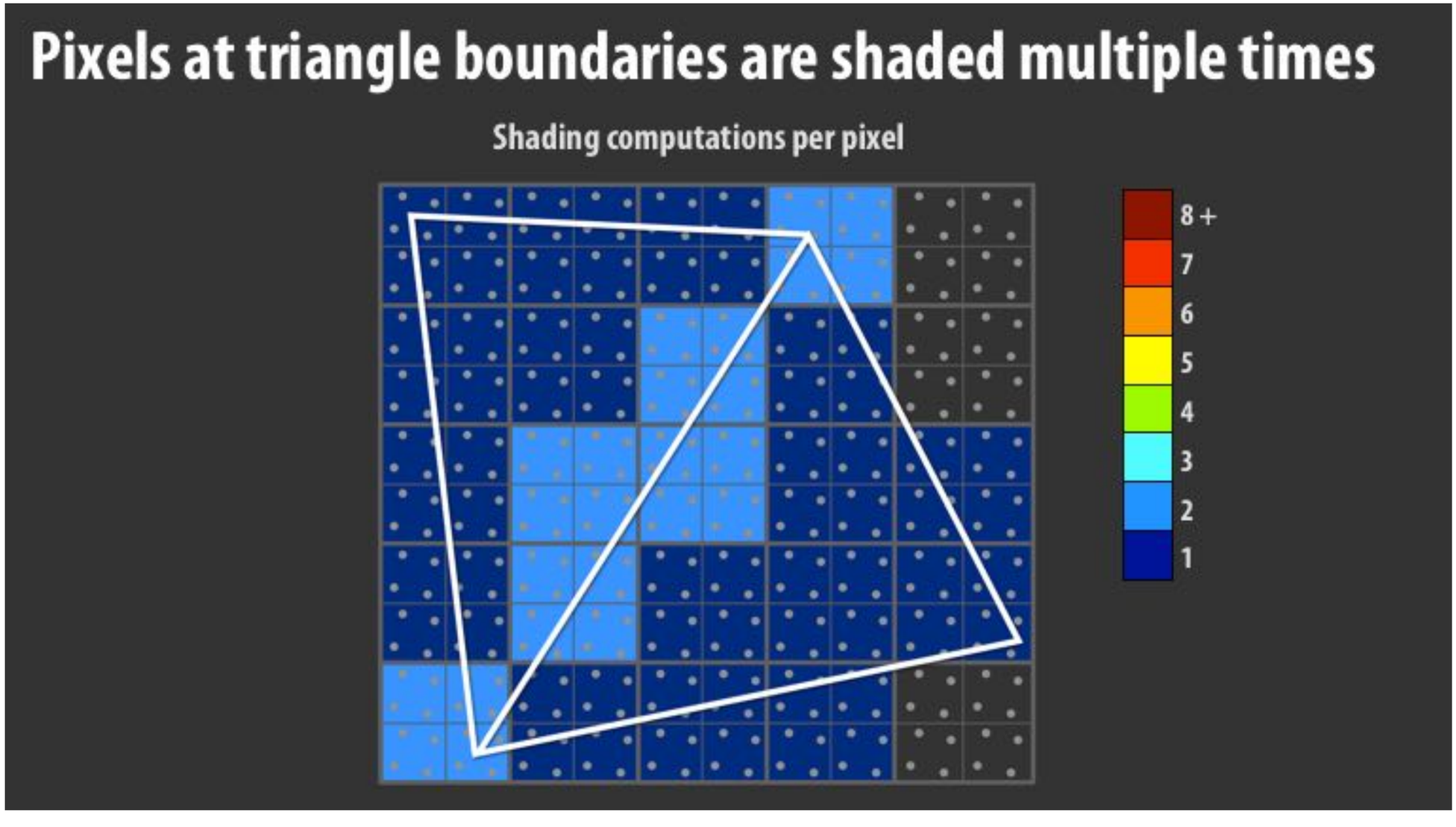
- Explain every visual element in the figure (never make the audience decode a figure)
- Refer to highlight colors explicitly (explain why the visual element is highlighted)



Example voice over: “Here I’m showing you a pixel grid, a projected triangle, and the location of four sample points at each pixel. Sample points falling within the triangle are colored red.

Explain every figure

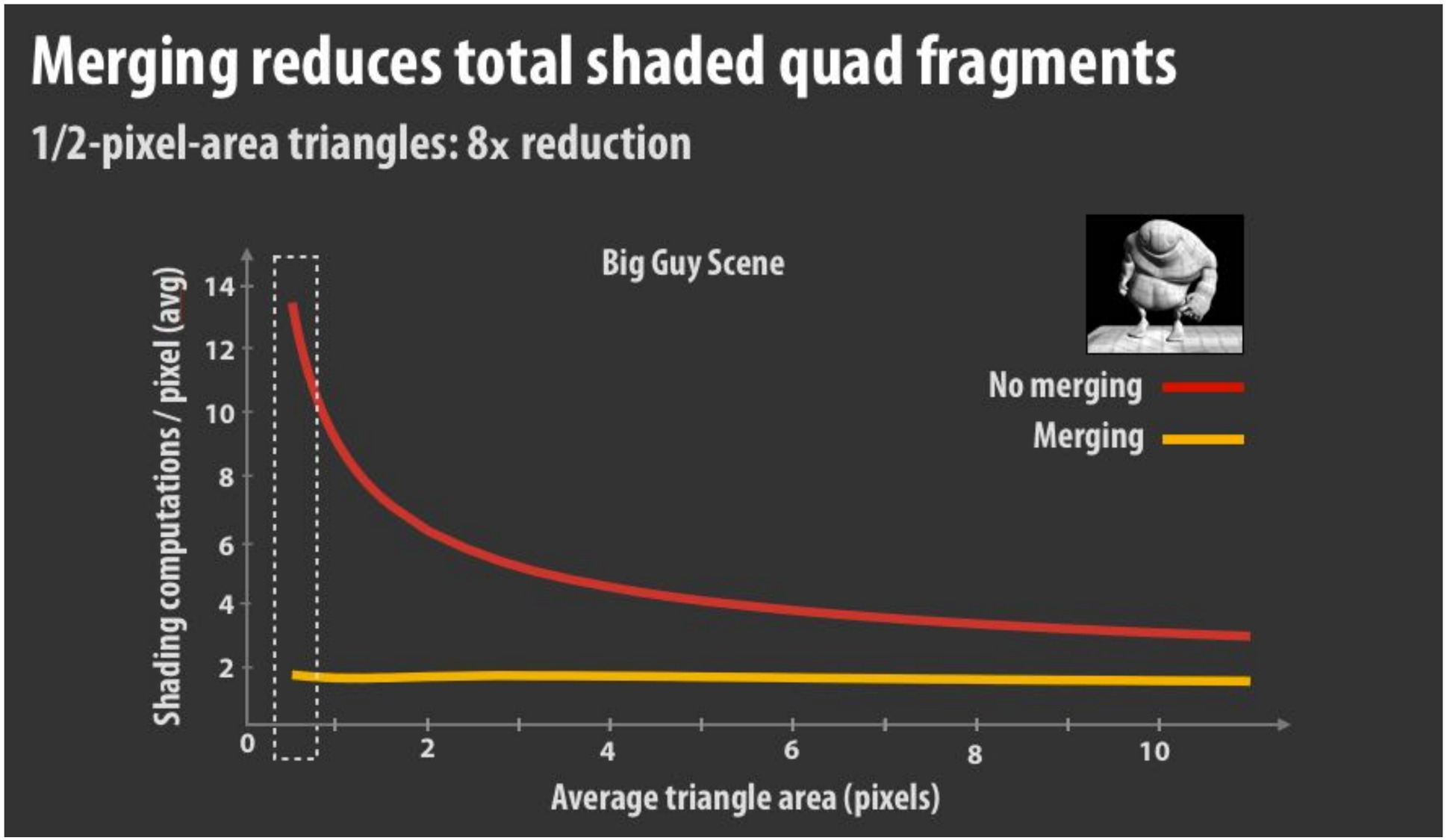
- Lead the listener through the key points of the figure
- Useful phrase: "As you can see…"
  - It's like verbal eye contact. It keeps the listener engaged and makes the listener happy… "Oh yeah, I can see that! I am following this talk!"



Example voice over: "Now I'm showing you two adjacent triangles, and I'm coloring pixels according to the number of shading computations that occur at each pixel as a result of rendering these two triangles. As you can see from the light blue region, pixels near the boundary of the two triangles get shaded twice.

Explain every results graph

- May start with a general intro of what the graph will address ("anticipate" the result)
- Then describe the axes (and your axes better have labels!)
- Then describe the <u>one point</u> that you wish to make with this results slide (more on this later!)



Example voice over: "Our first questions were about performance: how much did the algorithm reduce the number of the shading computations? And we found out that the answer is a lot. This figure plots the number of shading computations per pixel when rendering different tessellations of the big guy scene. X-axis gives triangle size. If you look at the left side of the graph, which corresponds to a high-resolution micropolygon mesh, <u>you can see</u> that merging, shown by yellow line, shades over eight times less than the convention pipeline.

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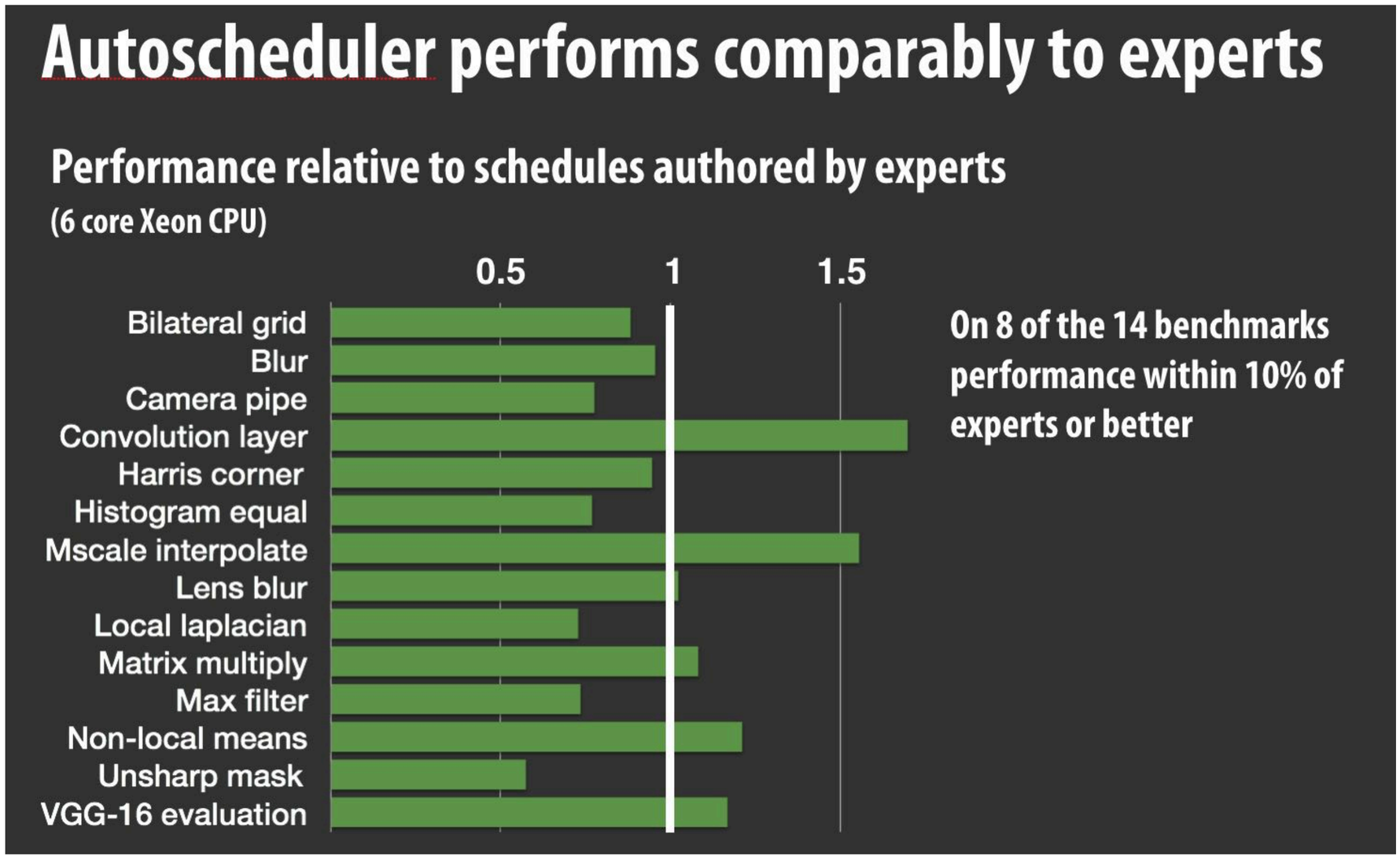


Example voice over: "Our first question was about performance: how fast is the auto scheduler compared to experts? And we found out that it's quite good. This figure plots the performance of the autoscheduler compared to that of expert code. So expert code is 1. Faster code is to the right. As you can see, the auto scheduler is within 10% of the performance of the experts in many cases, and always within a factor of 2.

Tip 8

In the results section:

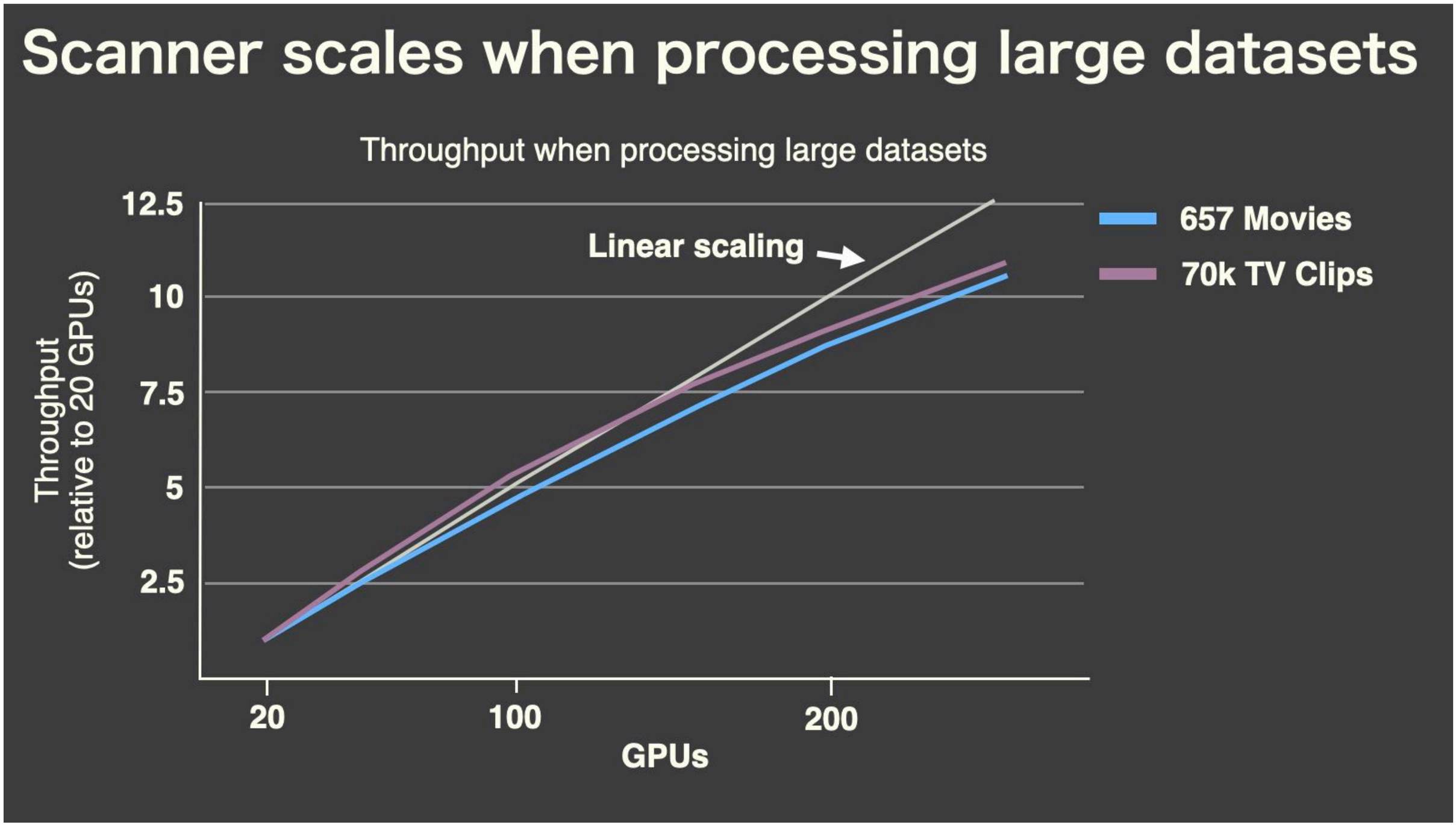
One point per slide!

One point per slide!

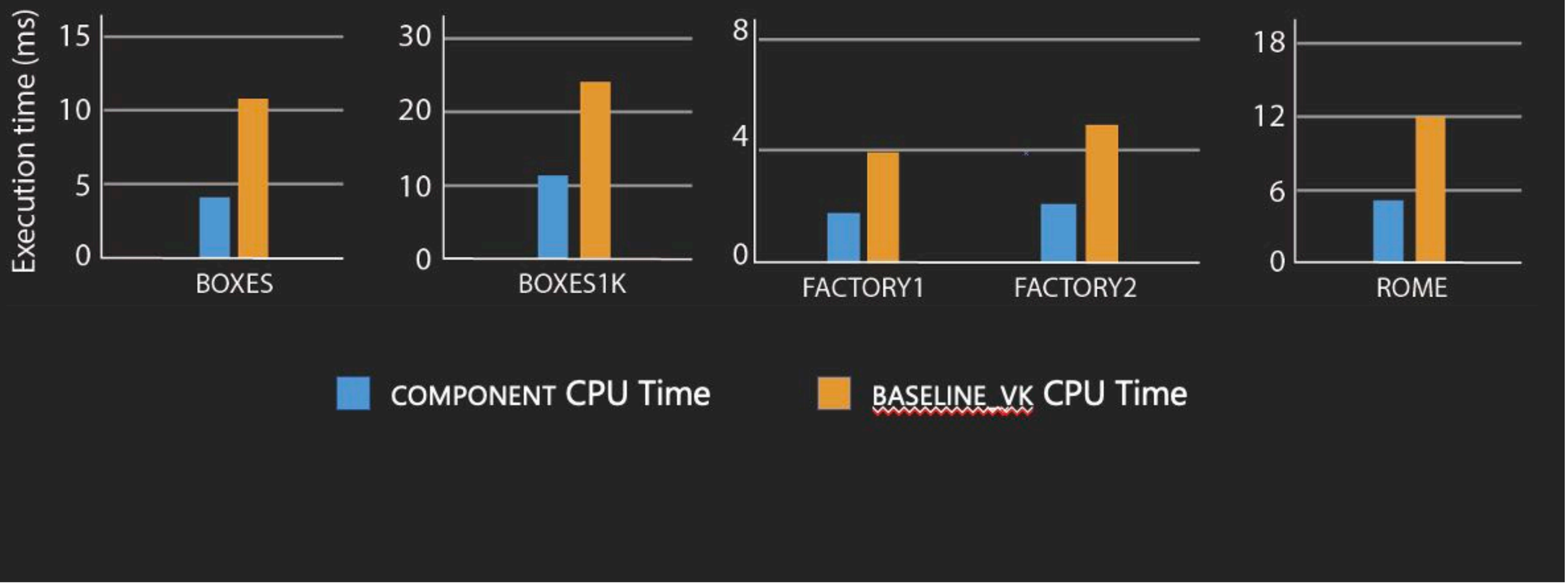
One point per slide!

(and the point is the title of the slide!!!)

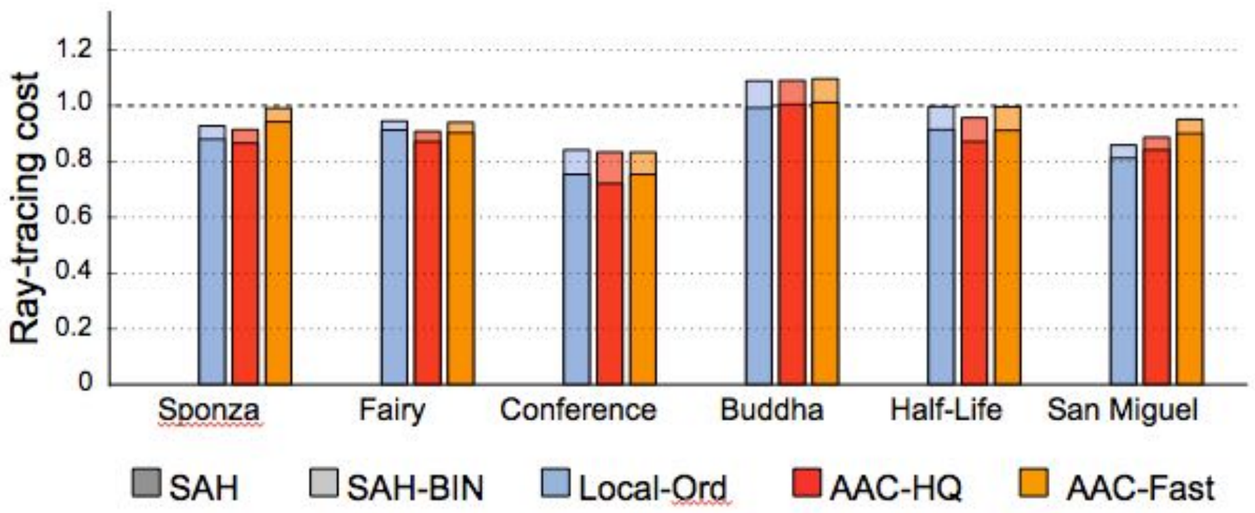
- **Make the point of the graph the slide's title:**
  - It provides audience context for interpreting the graph ("Let me see if I can verify that point in the graph to check my understanding")
  - Another example of the "audience prefers not to think" principle

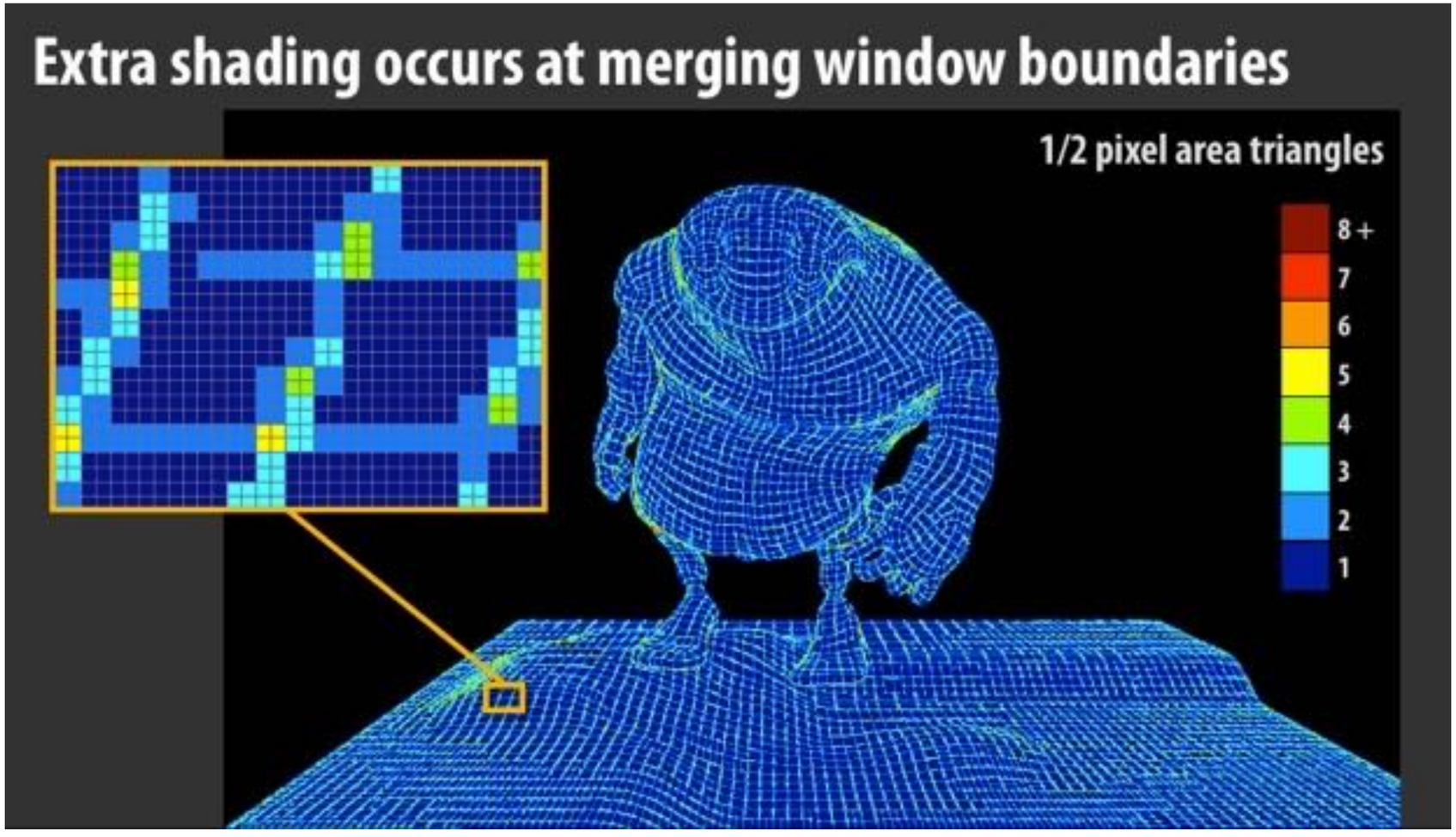


The COMPONENTS renderer uses 2x less CPU time than BASELINE_VK



AAC-Fast produces BVHs with equal or lower cost than the **full sweep build** in all cases except Buddha.





Corollary to the one point per slide rule

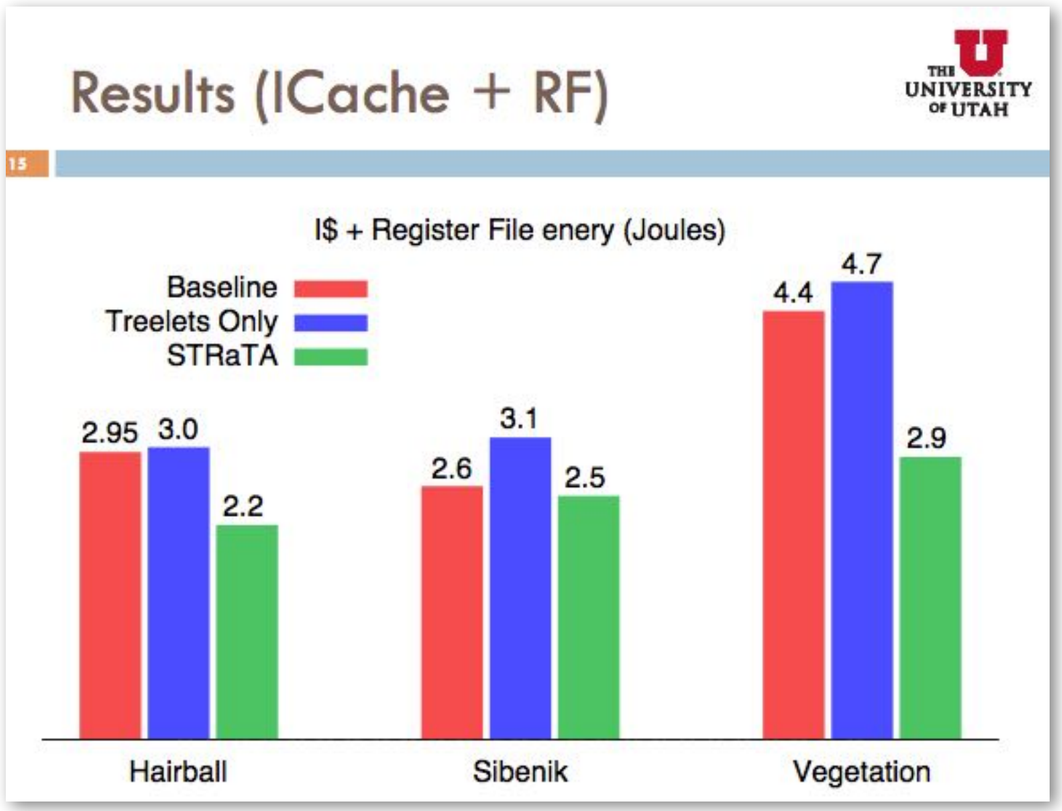
- In general, you don't want to show data on a results slide that is unrelated to the point of the slide

- This usually means you need to remake the graphs from your paper (it's a pain, but sorry, it's important) *

- This is the "every sentence matters" principle applied to visual details on a slide

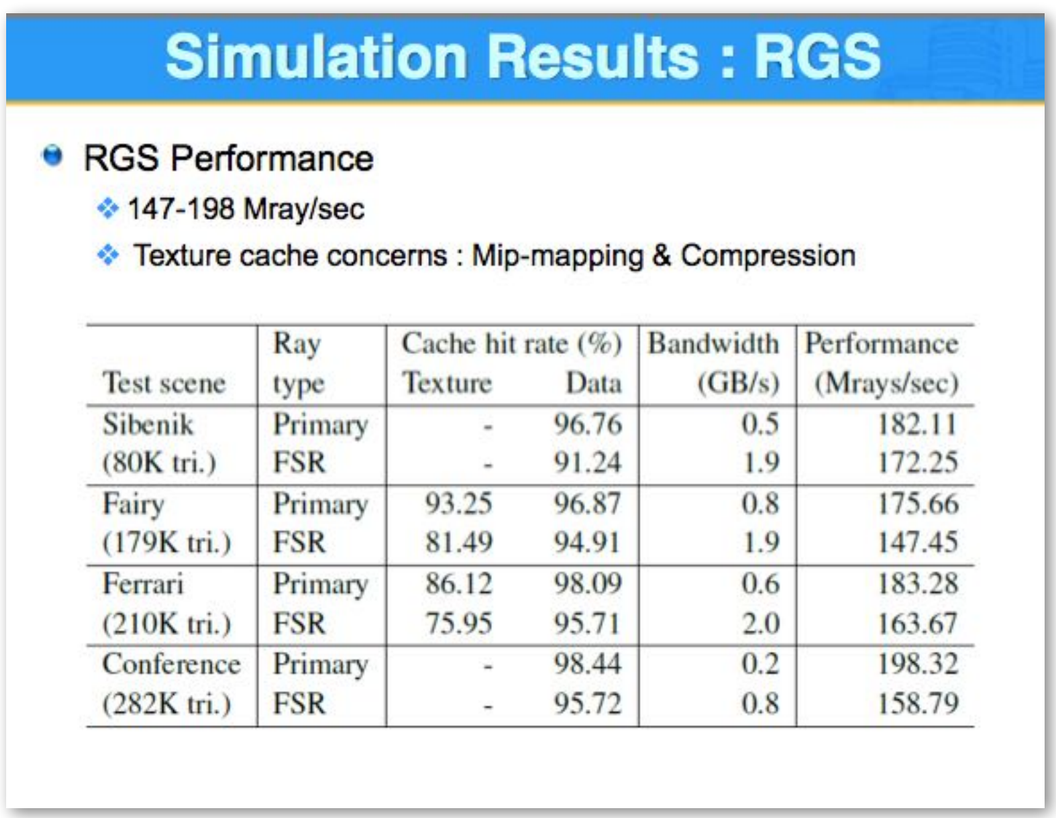
* This is an example of a tip for conference talk polish: not necessary for informal talks

Bad examples of results slides



- Notice how you (as an audience member) are working hard to interpret the trends in these graphs
  - You are asking: what do these results say?

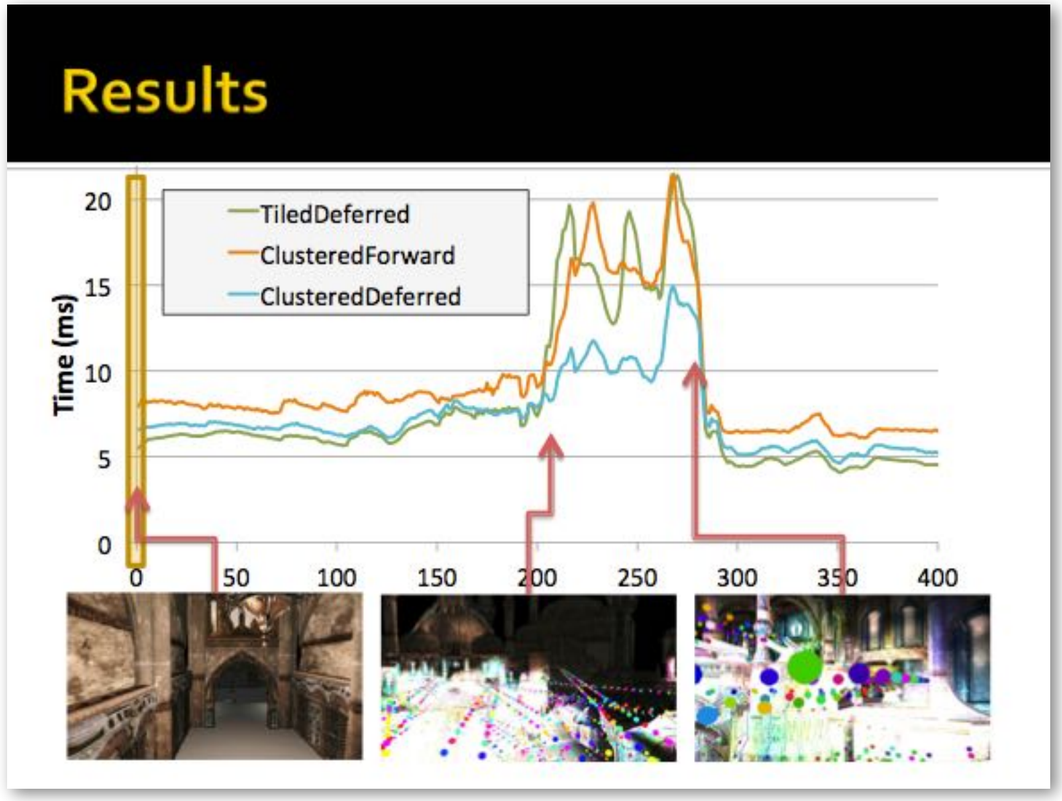
- You just want to be told what to look for



Simulation Results : RGS

- RGS Performance
  - 147-198 Mray/sec
  - Texture cache concerns : Mip-mapping & Compression

Test scene	Ray type	Cache hit rate (%) Texture	Data	Bandwidth (GB/s)	Performance (Mrays/sec)
Sibenik	Primary	-	96.76	0.5	182.11
(80K tri.)	FSR	-	91.24	1.9	172.25
Fairy	Primary	93.25	96.87	0.8	175.66
(179K tri.)	FSR	81.49	94.91	1.9	147.45
Ferrari	Primary	86.12	98.09	0.6	183.28
(210K tri.)	FSR	75.95	95.71	2.0	163.67
Conference	Primary	-	98.44	0.2	198.32
(282K tri.)	FSR	-	95.72	0.8	158.79



Tip 9

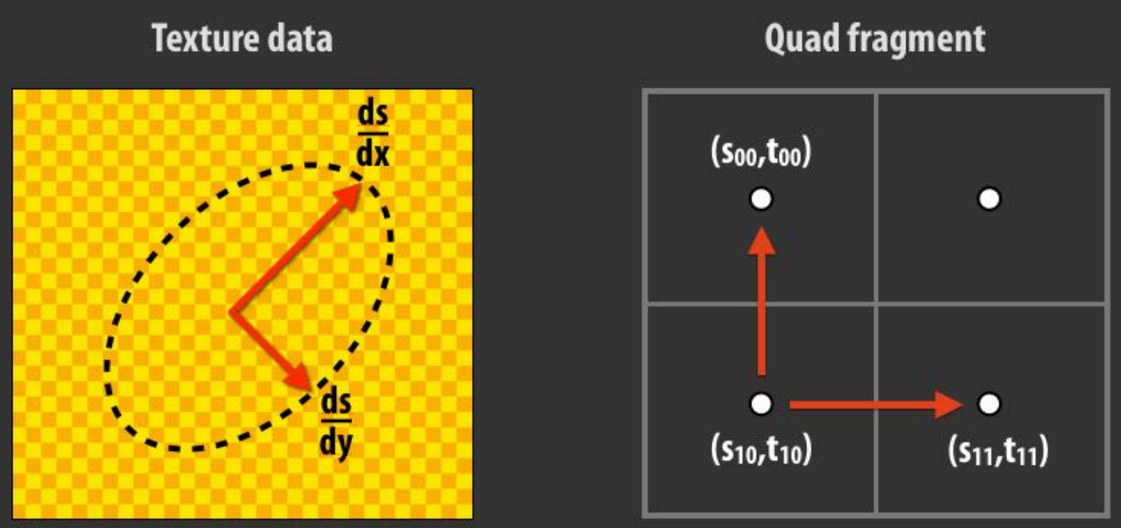
Titles matter

If you read the titles of your talk all the way through, it should be a great summary of the talk.

(basically, this is “one-point-per-slide” for the whole talk)

Examples of good slide titles

GPUs shade quad fragments (2x2 pixel blocks)



use differences between neighboring texture coordinates to estimate derivatives

Greedy SRDH build optimizes over partitions and traversal policies

SAH:

```
forall(partitions in set-of-partitions)
    …evaluate SAH and pick min…
```

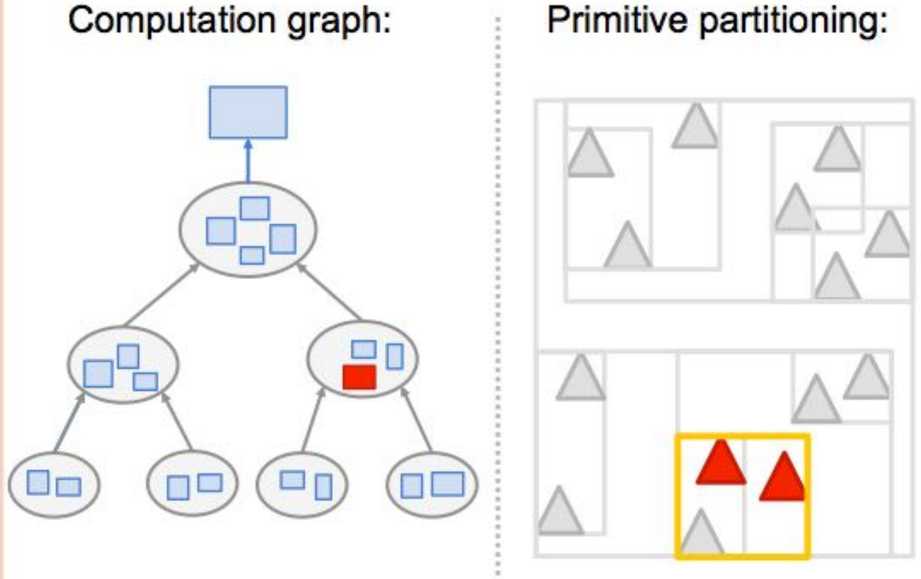
SRDH:

```
forall(partitions in set-of-partitions)
    forall(traversalKernels in set-of-kernels)
        …evaluate SRDH and pick min…
```

$$SRDH(R,L,\kappa,r)=(1-\kappa(r)H(L,r))|R|+(1-\kappa(r)H(R,r))|L|$$

51

AAC IS AN APPROXIMATION TO THE TRUE AGGLOMERATIVE CLUSTERING SOLUTION.



The reason for meaningful slide titles is convenience and clarity for the audience

"Why is the speaker telling me this again?"

(Recall "why before what")

Read your slide titles in thumbnail view

Do they make all the points of the story you are trying to tell?

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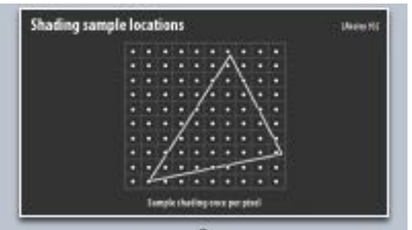

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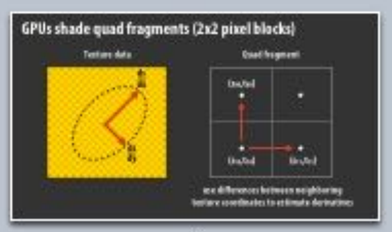

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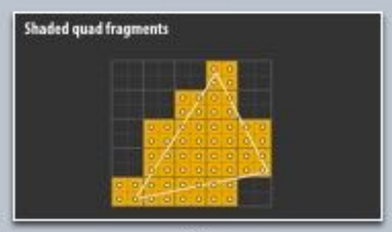

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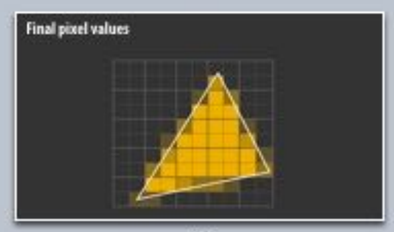

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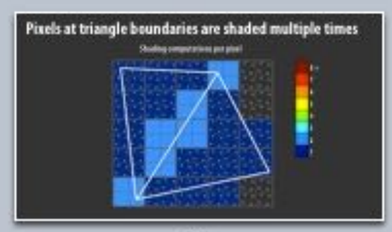

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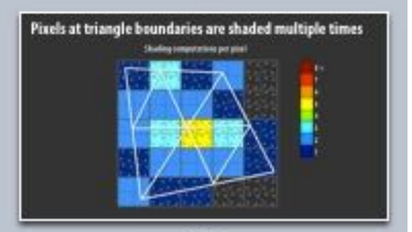

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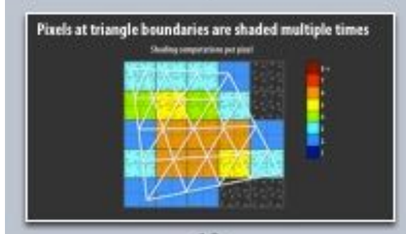

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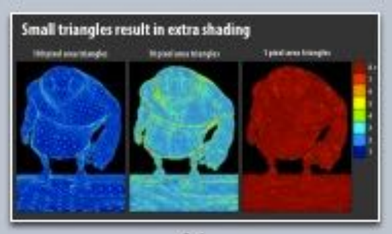

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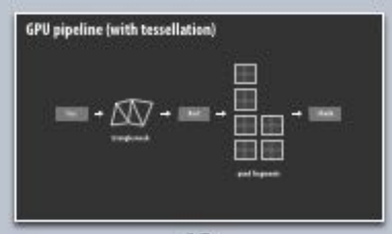

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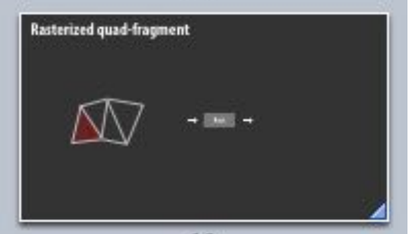

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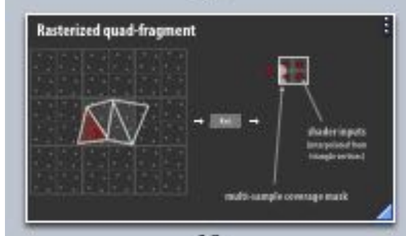

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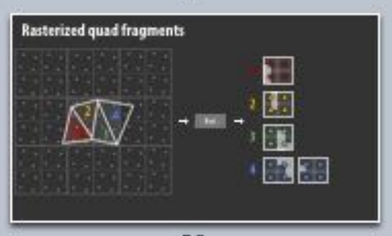

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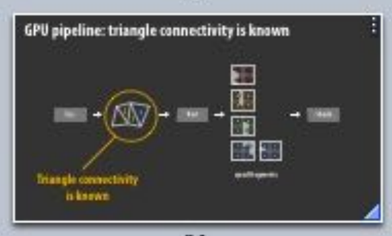

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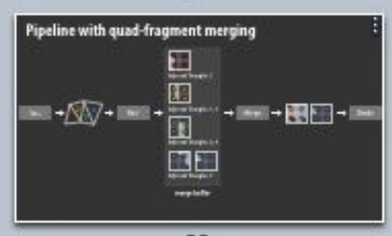

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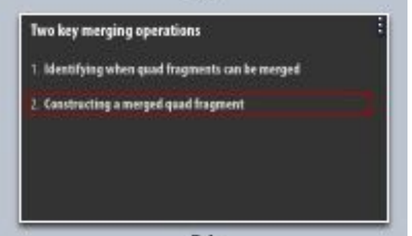

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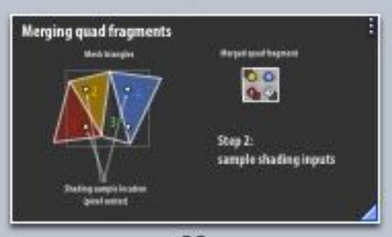

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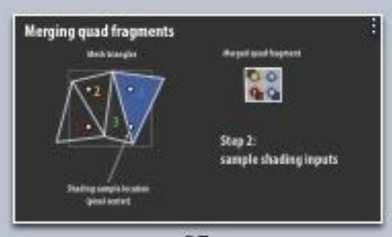

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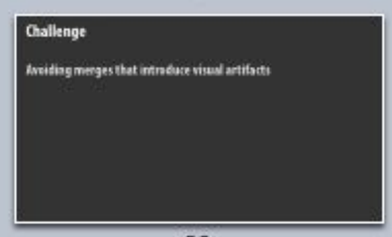

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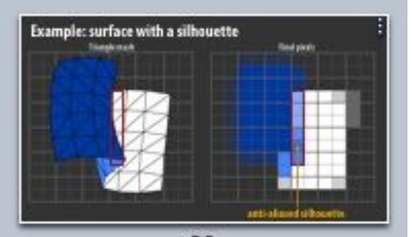

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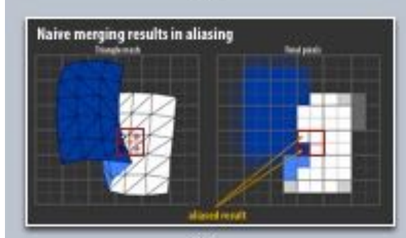

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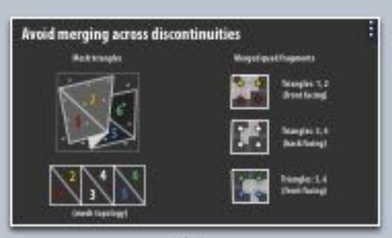

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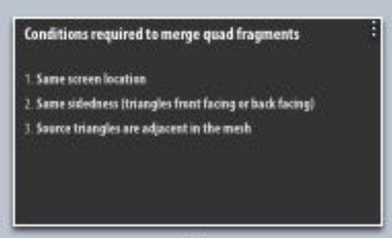

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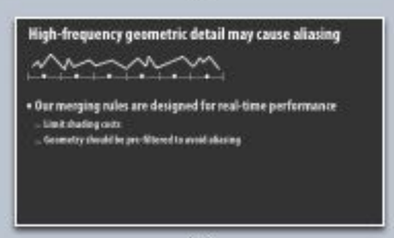

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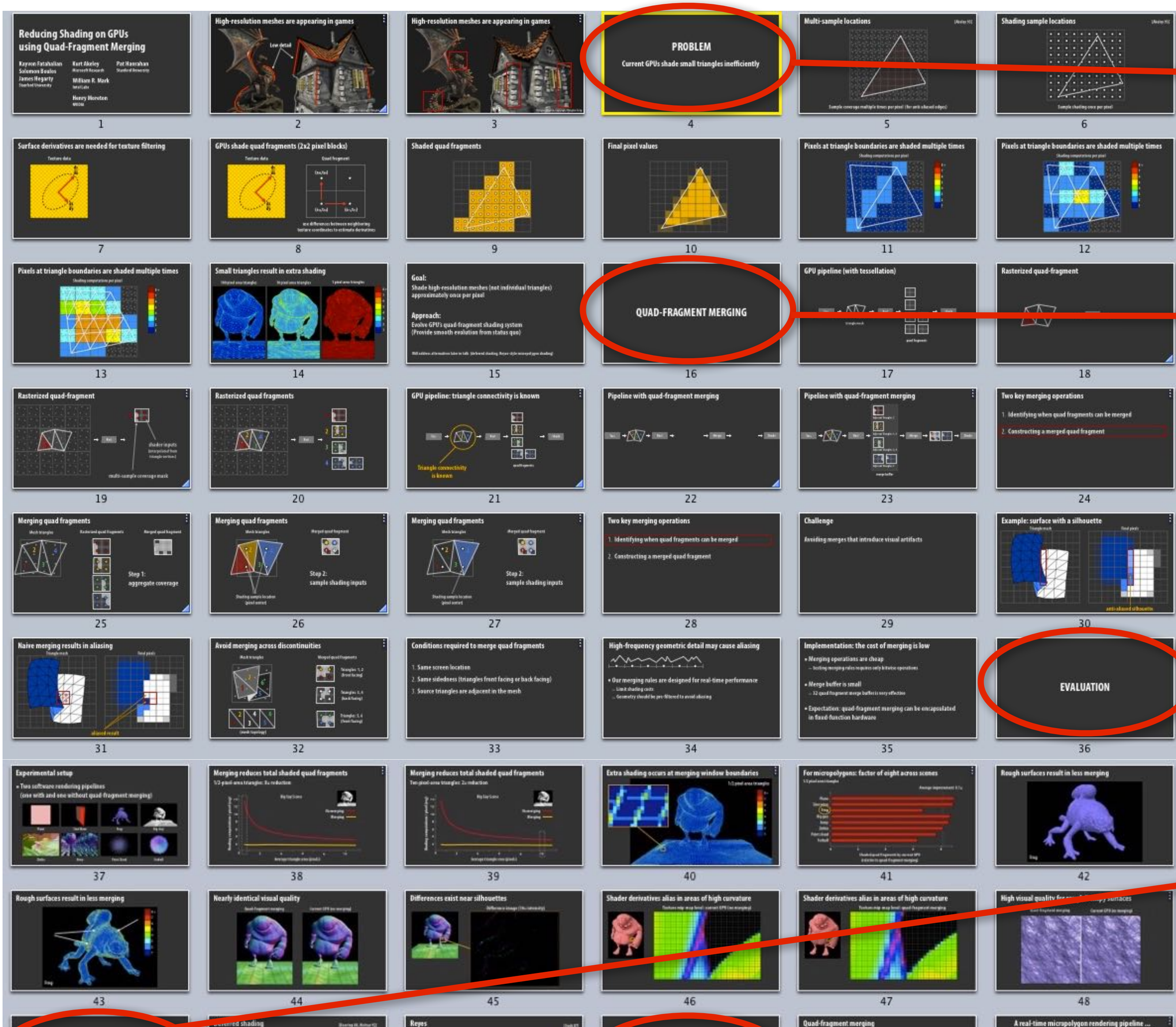
Tip 10

Organize your talk with section slides



I'm about to frame the problem in my terms

Ok, let's talk about our solution

Let's take a look at how well it works

Of course there are some potential alternatives that we didn't go with

Let me wrap up

Stage your talk with section slides

- **Useful for your audience**
  - It provides guidance for <u>what</u> you hope to achieve next (no surprises!)
  - Compartmentalization: it's absolutely clear where the shifts are
  - If a listener got lost, it's a good place for them to re-engage
  - It's a place for the audience to take a breath
  - It gives the talk a more colloquial tone

- **Useful for you**
  - It's a chance for you to pause and take a breath
  - It's a great breakdown of the talk for practicing subsections

Tip 11

End on a positive note!

End on a positive note!

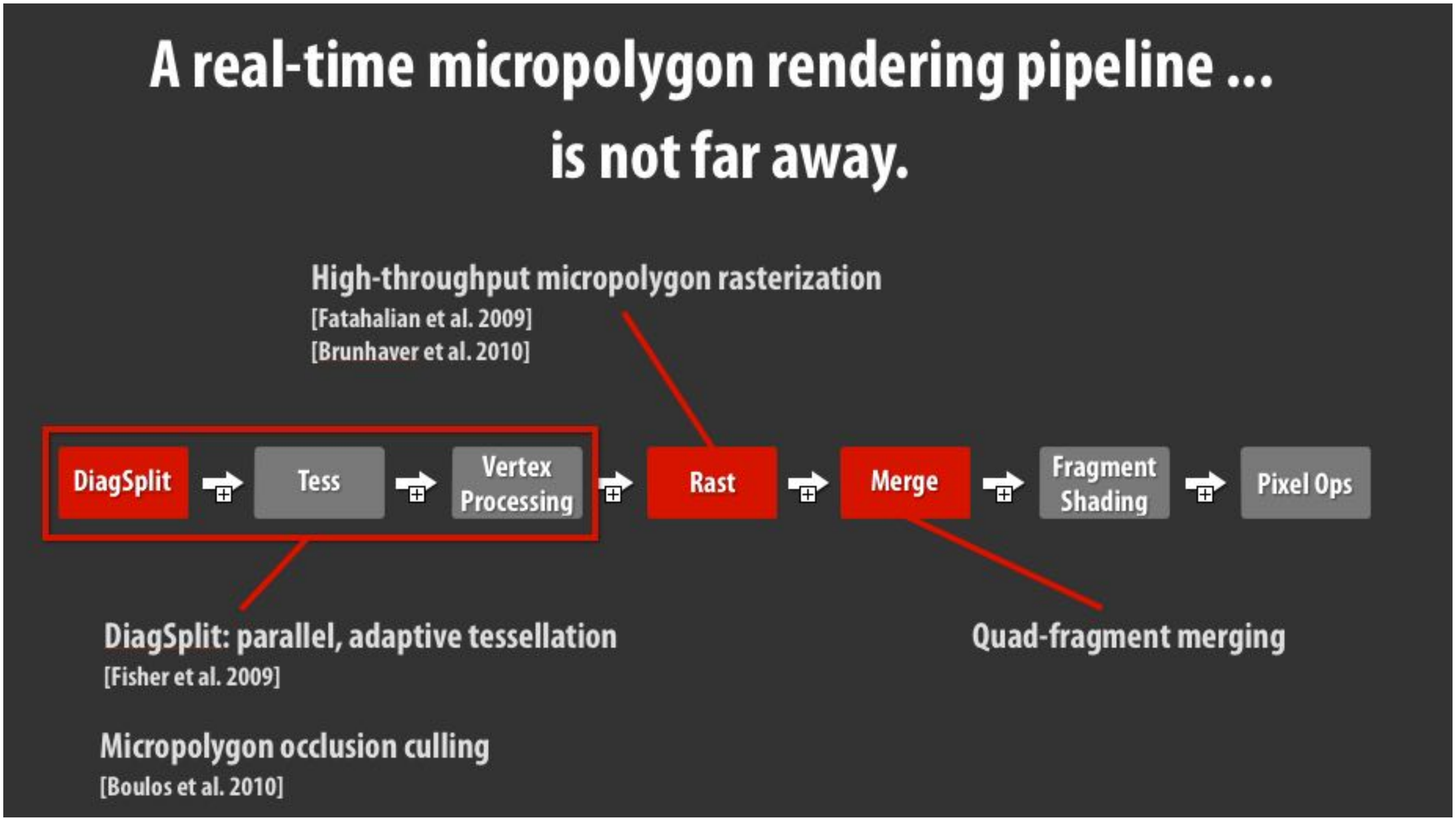
The future is bright!
Lots of new work to do, here are some ideas!
This is one part of something bigger!

Many talks end on future work in a manner that stresses problems with the current work or enumerates obvious next steps

- **It's boring and sort of a bummer for everyone involved.**
  (Audience: "well, that was a bit incremental.")
- **It's a lost opportunity to impart critical intellectual thought to the field ***
  - **Recall: introduction was where you contributed critical intellectual thought in how to think about the problem being solved today.**
  - **Conclusion is where you contribute intellectual thought that reflects on what you have done, or about the future.**

* **Every sentence matters**

Final SIGGRAPH slide as a Ph.D. student



An earlier draft had a very simple future work slide ("we could do X, Y, Z"). I was told by my advisor that it was a let down and to think about how to end on a broader note. This slide took about four hours to come up with.

Result: Tony DeRose got it! He realized the point wasn't just the one particular optimization that was the contribution of the SIGGRAPH paper, but a broader line of work on rethinking the graphics pipeline for high-quality rendering: his comment was of the effect, "I'm glad someone's finally figured the big pieces of this out."

Tip 12

The audience is always right:
When receiving feedback on a practice talk, do not be defensive!

The audience is always right

- Your tendency will be to be defensive when someone claims an idea in your talk was not explained well or was not clear
- You will find yourself turning to the relevant slide in your talk and saying "I mentioned that here".
- The customer (the audience) is right in this situation. Sure, you might have mentioned it, but if it wasn't understood, it's your fault not theirs.
  - Find a way to make it more clear!
- The correct response is to turn to the appropriate slide and say:
  - "I tried to explain that idea here. And this is what I was thinking. What could I have said to make that point more clear?"
- The complainer should then work with you to explain what they interpreted instead, and offer suggestions on what information they would require to have better understood.

Wrap Up

General principles to keep in mind

Identify your audience, and strive for perfect clarity for them.

“Every sentence matters.”

“Show, don’t tell.”

“The audience prefers not to think” (about things you can just tell them)

“Surprises are bad”: say <u>why</u> before what

(indicate why you are saying something before you say it)

Explain every figure, graph, or equation

When improving the talk, the audience is always right

Useful reminders

- In general:
  - Every sentence matters. Pick your target audience level and aim for them to understand everything. If it's not clear to this audience, take it out.

- In your introduction
  - Your goal is to tell the audience how you want them to think about the problem your talk is about.

- In the remainder of the talk (in particular, the evaluation)
  - Always explain every figure, graph, or equation
  - One point per slide
  - Place the point in title of slide

Summary…
Some very simple principles enable much more efficient, and much more rigorous, communication about technical content.

Take pride in your craft. All students should follow these principles until they become second nature, and then you can start violating them.