

Writing a Paper and Peer Review

CS 197 & 197C | Stanford University | **Sean Liu** & Lauren Gillespie
cs197.stanford.edu | cs197c.stanford.edu

Slides adapted from previous iterations of the course by Michael Bernstein

Writing a Paper and Peer Review

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Administrivia

197

Due Thurs 5/24, 10am:

Assignment 7: Evaluation Plan
& Progress Report IV

197C

Due Thurs 5/24, 10am:

Assignment 7: Proposed
Solution & Evaluation Plan

Overview From Here



Due **Tues** 5/30, 10am:

197: **Draft paper:**

Section 3 (Methods/Systems), Discussion, Conclusion

Recommended but not required: update previous sections to get more feedback before final submission (e.g., Introduction, RW)

Note: we'll be doing peer review in section.

197C: **Draft Proposal & Timeline**

Ask for feedback from your research mentor & incorporate changes

Note: Peer review with your small group partner

Overview From Here



Due **Thurs** 6/1 in section:

Draft talk: 5-min presentation of your project

Due **Tues** 6/13, 3:30pm:

Final paper and final talk.

Final exam slot: (3:30-6:30pm): we will meet in 60-109 for presentations!

Team Dynamics: Mid-point Check-in

Thank you all for filling it out!

For some teams:

- CAs will reach out to understand the situation more

- Possibly devise a plan to split up the work

 - Implement individual grading — downside: lose flexibility

Reminder: After 197

Taking this class helps open doors to research opportunities in other labs!

Informal applications: PhD students match with 197 alumni — high demand!

Note: PhD students will ask your CA to provide a recommendation

Your performance matters:

Communication & Teamwork

Proactive in taking on challenges

Engineering

Research

Poll: CS 197 Demand

Past: CS 197 is offered only in the fall — high demand

This year: CS 197 offered in fall and **spring**

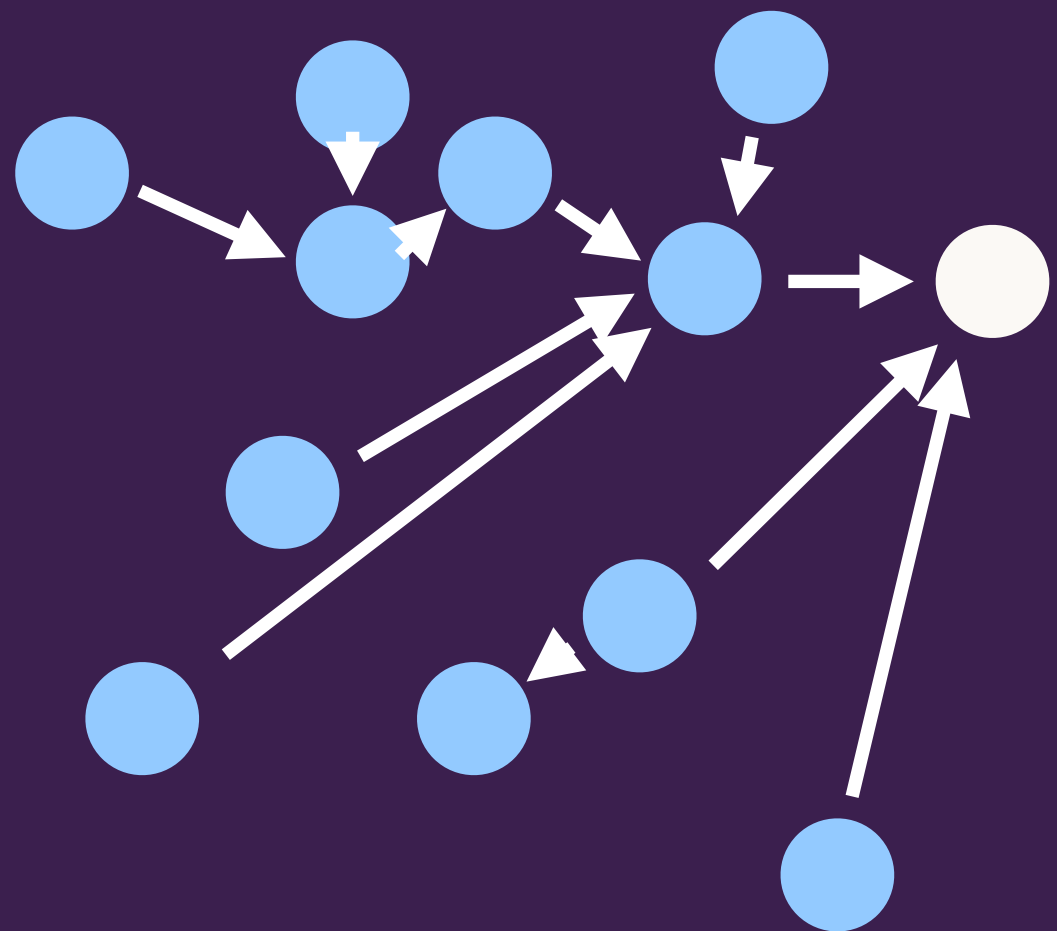
Poll: would you / your friends want to take it in the spring only?

Future: offer CS 197 in the fall, **winter**, and spring

Poll: Low demand? High demand?

Are there required winter CS classes that would take away demand?

Previously.....



Related work
and Lit search

Problem motivation

Set up the bit

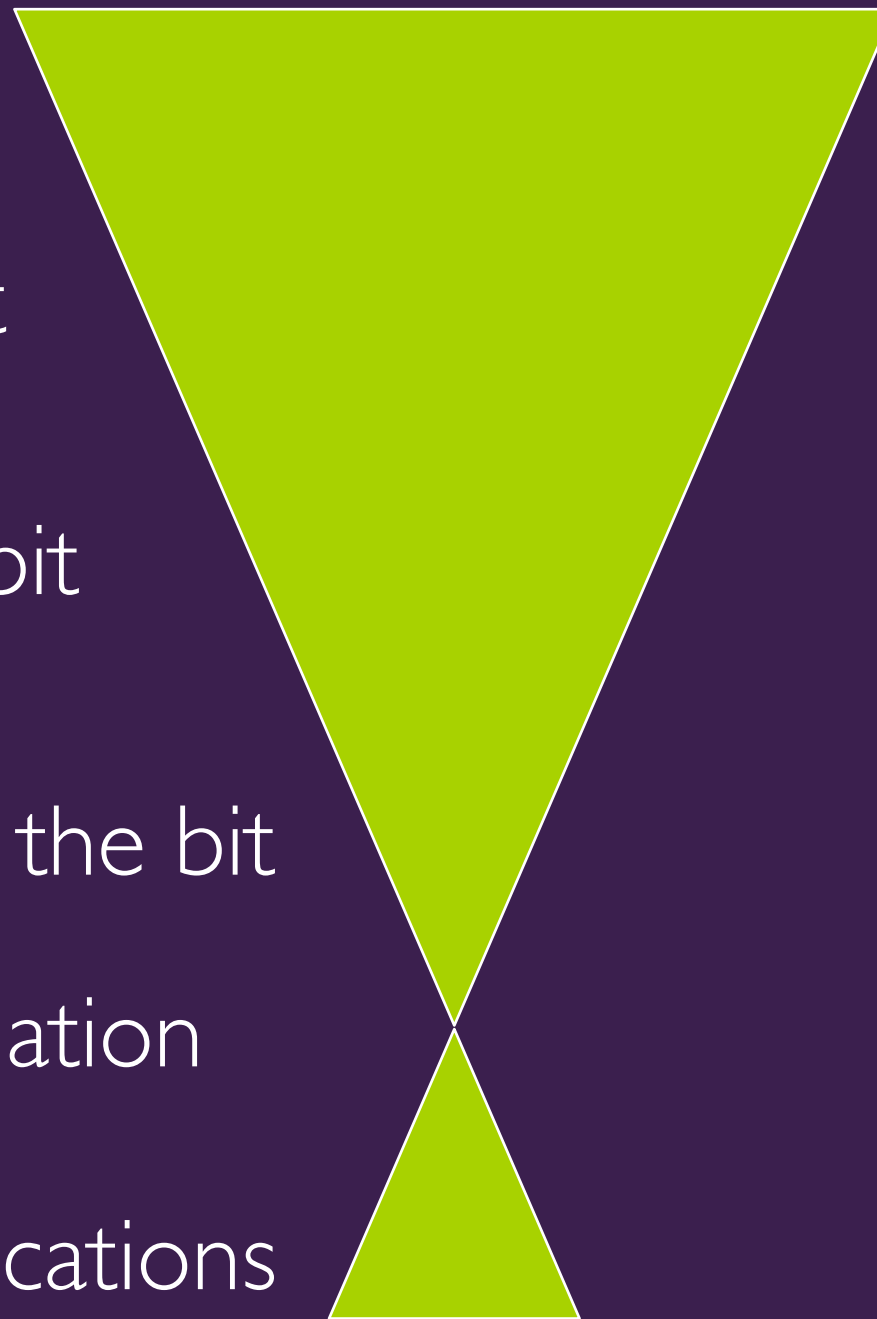
Flip the bit

Instantiate the bit

Evaluation

Broader Implications

Introduction



Vectoring & Velocity

Evaluation

$x > y$

$\exists x$

**bounding x /
measuring x**

Today's goals

Time to put everything together! How do we write the paper?

Introducing the concept of **model papers** and how to use them

What happens **after** you write a paper?

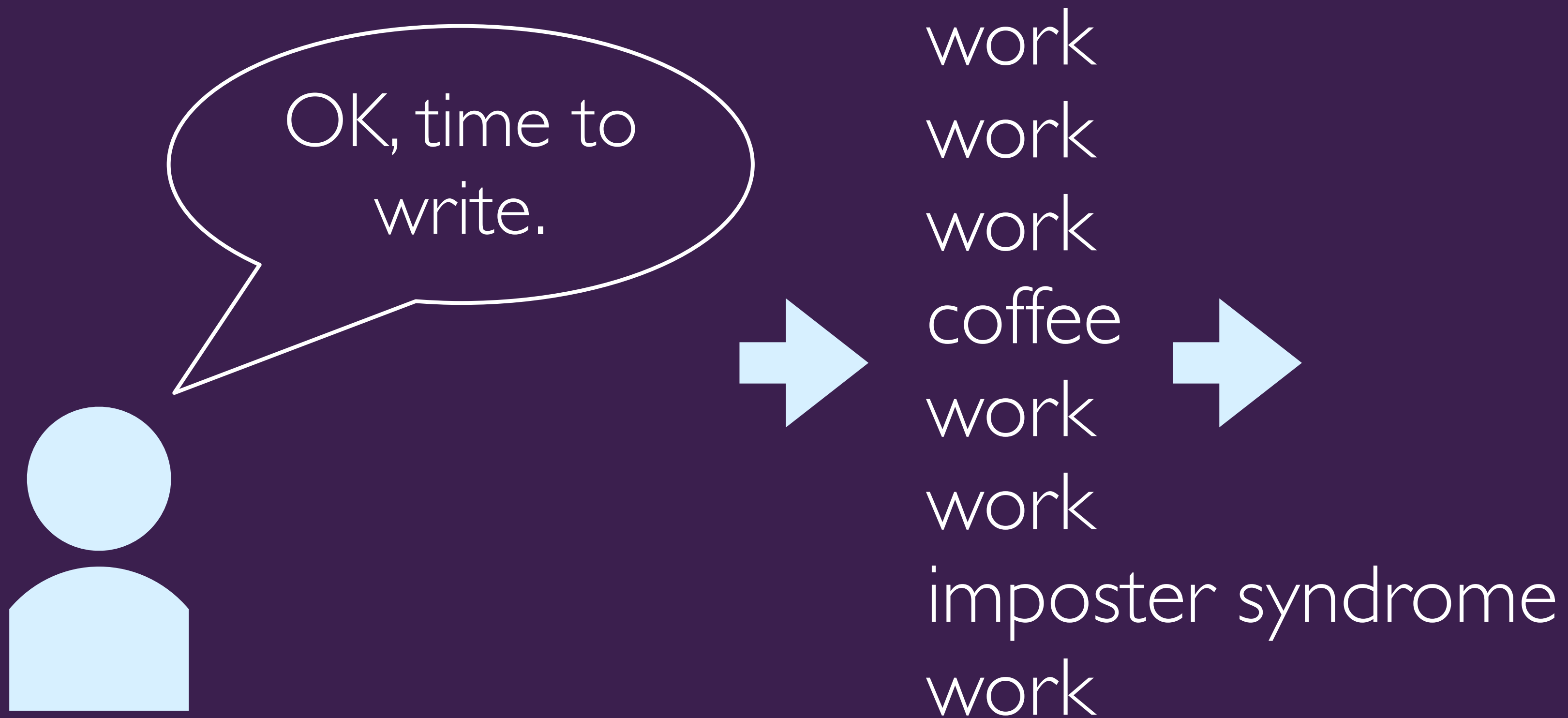
What **peer review** is, why it matters, and how it works

How to develop a **high-quality review**

What are conferences, journals, arXiv, and what role do they play?

Writing A Paper

The common malpractice



Why is this malpractice?

Research papers are complex documents, with too many degrees of freedom to “just write”. Being strategic will save time and avoid dead ends.



...so what do we do instead?

There are many genres

Even within areas, there exist many different genres of paper. Each genre is typically built around the claim you are making, and implies a structure to the sections and to the writing. For example:

We solve a problem:

articulate the problem, explain what causes that problem and what others have done to deal with it, detail your approach, and prove that you make progress on the problem

We measure an

outcome: explain that nobody has bothered understanding how a phenomenon behaves, explain how to create a study that sheds light, and report the outcomes of it

We introduce a

technique: articulate a problem as above, but focus the narrative on the technique you've created, since it will generalize

Genres imply structure

Common “We Solve A Problem” structure:

Introduction: overview and thesis

Related Work: situate your contribution relative to prior research

Approach: describe your approach and important implementation details

Evaluation: test whether your approach succeeds at its stated goals

Method

Results

Discussion: reflect on limitations, implications, and future work

Conclusion: summarize and restate your contribution

*But, this will vary
by area!*

Contribution Type

What type of contribution is your project making?

HCI: interaction technique, system, etc

AI: theory, system / architecture, etc.

Different contributions may have different paper structures or expectations for each paper section.

Model papers

A model paper is a paper that you can use as a model or template for constructing your paper.

You should be able to structure your paper in the same way as your model paper

- Follow its general flow of argument in the introduction

- Use similar section and subsection heading organization

- Create figures, tables, and graphs that fulfill the same function as theirs

- Apply the same general proportions, e.g., number of pages per section

Selecting your model paper

Model paper \neq nearest neighbor paper

The model paper should be a paper that makes the same type of argument as yours. It should be in the same genre as you seek.

Often the nearest neighbor paper will make a similar form of argument, but not necessarily

Often the nearest neighbor paper will be a well-written paper, but not necessarily

Find your model paper and share it with your CA for a thumbs up before writing.

From model to paper

Start by reverse-outlining the model paper:

How does it structure its argument into sections?

What is the main expository goal of each section? What is its sub-thesis?

What role does each figure play?

Example: HCI (Interaction Technique)

Introduction

RW

System

User Study & Results

Discussion

Limitations & Future Work

Conclusion

In-Depth Mouse: Integrating Desktop Mouse into Virtual Reality

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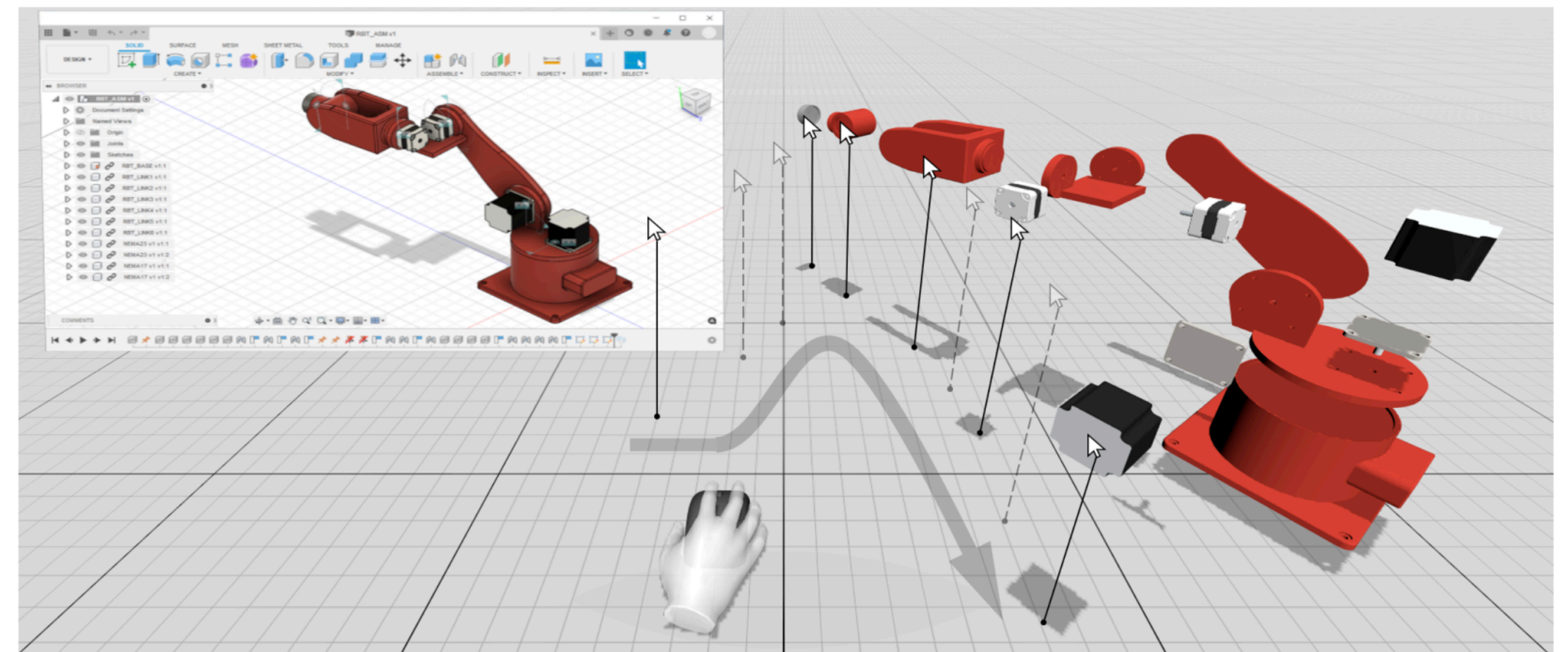


Figure 1: We investigate a technique that integrates a desktop mouse into VR to support productive knowledge work. Our approach uses *Depth-Adaptive Cursor*, a 2D-mouse driven pointing technique for 3D selection with depth-adaptation that continuously interpolates the cursor depth by inferring what users intend to select based on the cursor position, the viewpoint, and the selectable objects. Vertically dropped lines and arrow are added for illustration of depth.

ABSTRACT

Virtual Reality (VR) has potential for productive knowledge work, however, midair pointing with controllers or hand gestures does not offer the precision and comfort of traditional 2D mice. Directly integrating mice into VR is difficult as selecting targets in a 3D space is negatively impacted by binocular rivalry, perspective mismatch, and improperly calibrated control-display (CD) gain. To address these issues, we developed *Depth-Adaptive Cursor*, a

that *Depth-Adaptive Cursor* significantly improved performance compared with an existing mouse-based pointing technique without depth-adaption in terms of time (21.2%), error (48.3%), perceived workload, and user satisfaction.

CCS CONCEPTS

• Human-centered computing → Pointing; Virtual reality.

Example: HCI (Interaction Technique)

Introduction

RW

System

User Study & Results

Discussion

Limitations & Future Work

Conclusion

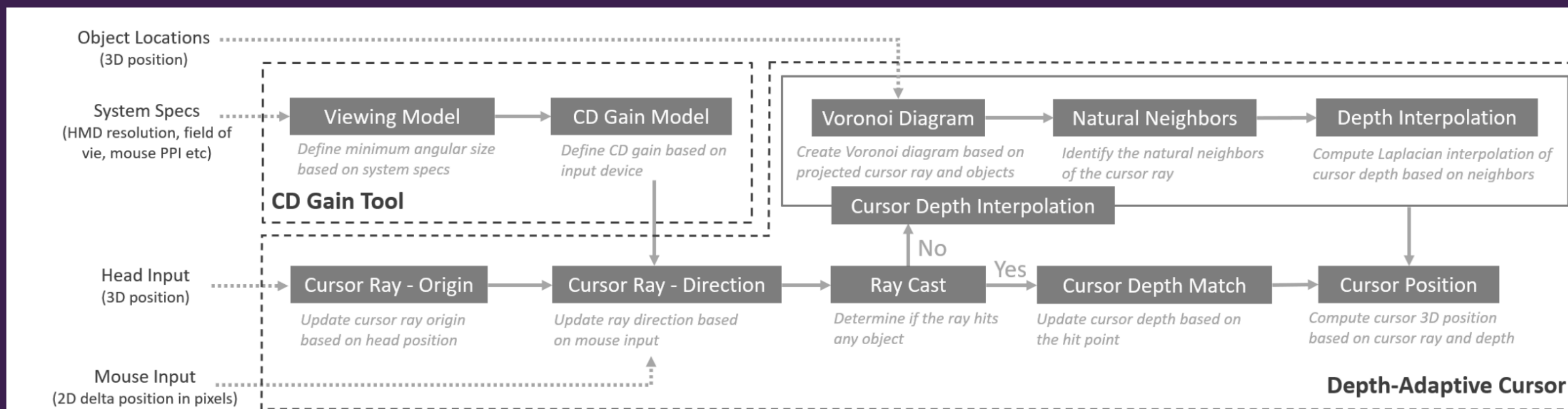
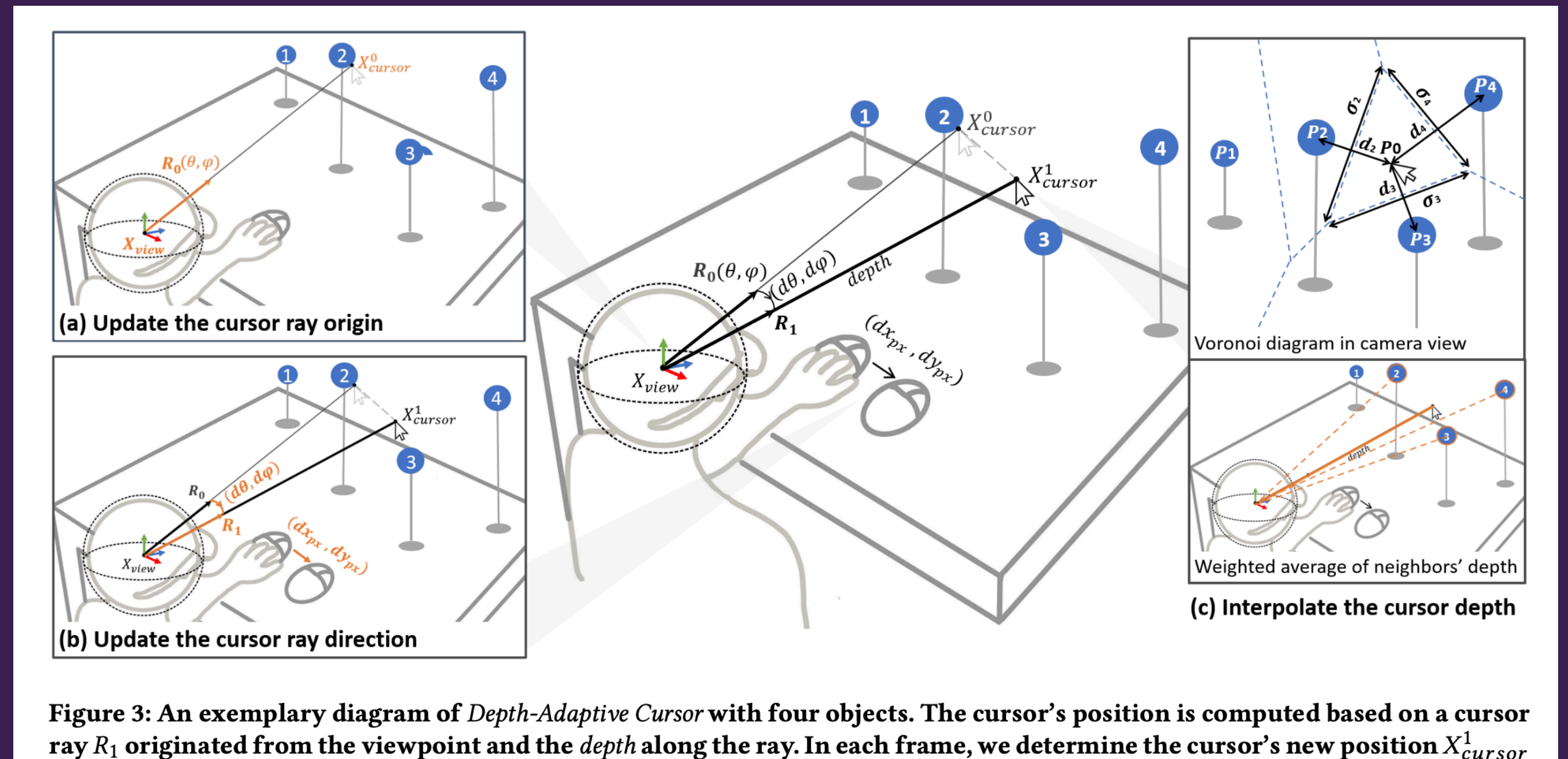


Figure 4: Our system pipeline, including *Depth-Adaptive Cursor*, a mouse-based pointing technique for 3D targets with depth adaptation and a CD gain tool that analytically determines a usable range of CD gains based on the capabilities of VR HMDs. In each frame, *Depth-Adaptive Cursor* gets updated with a cursor ray and cursor depth. The cursor ray is determined by the cursor

Example: HCI (Interaction Technique)

Introduction

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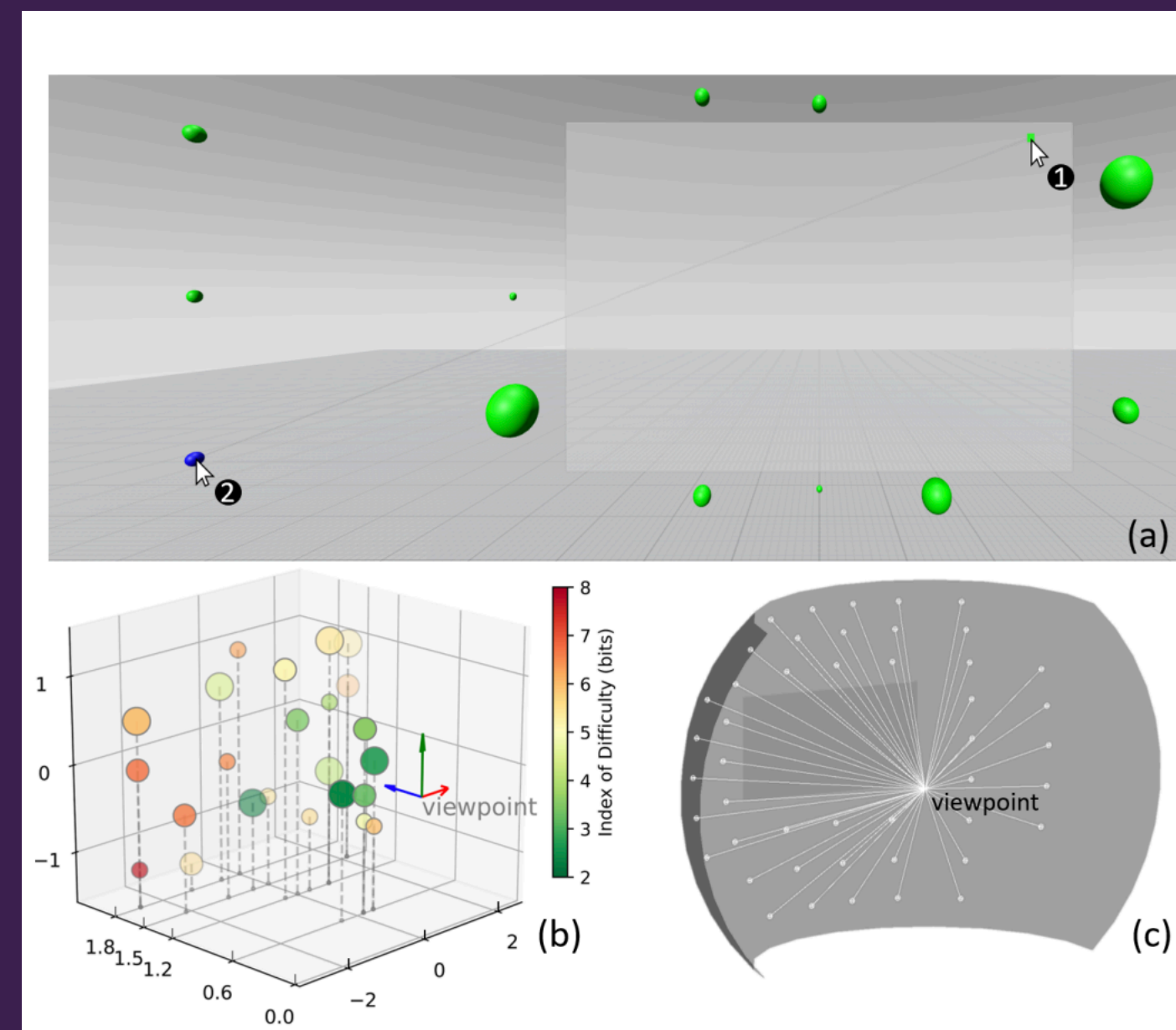
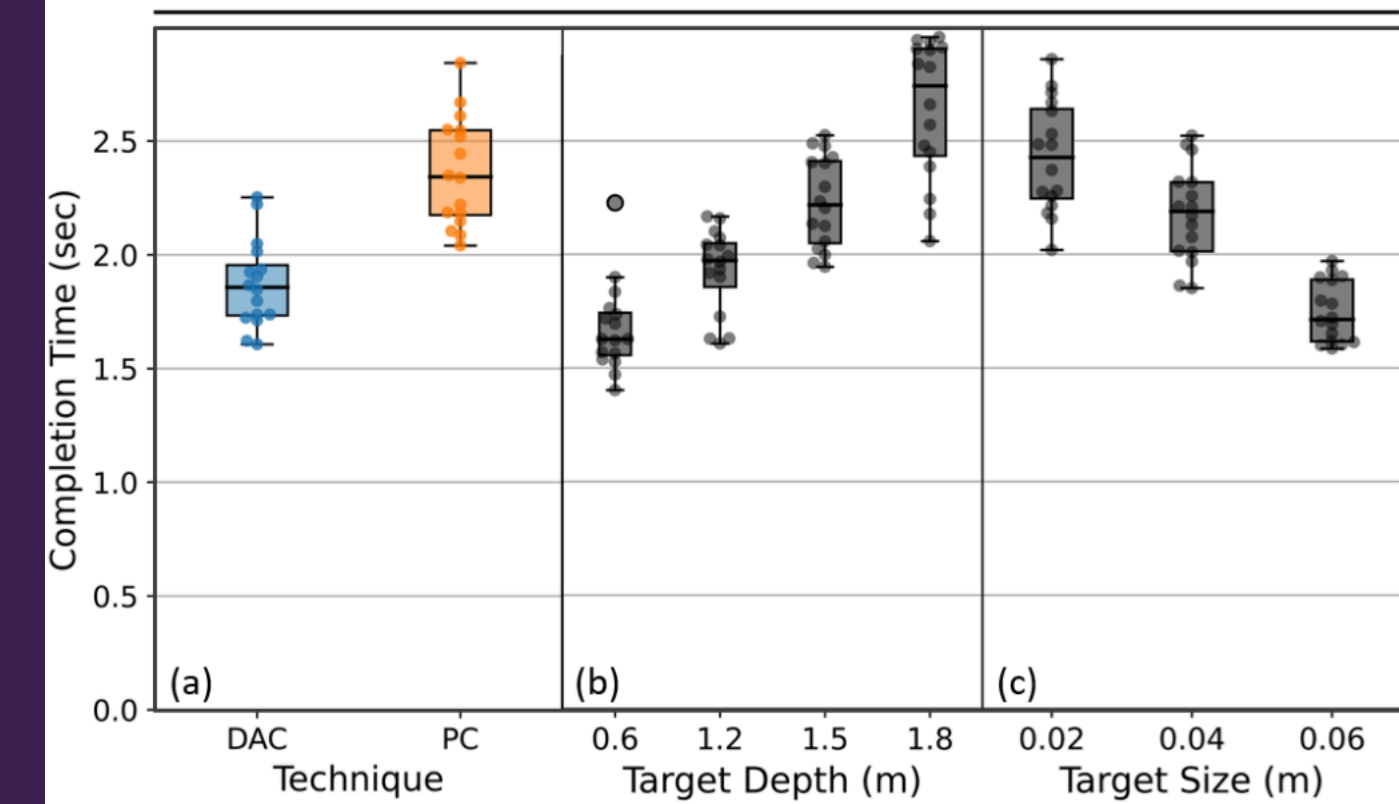


Figure 6: Setup of the 3D Pointing Task: (a) The task is to select an origin 2D target (a square on a 2D plane) and then again in a destination 3D target (a blue sphere in a 3D space). We use the combination of 2D and 3D targets to represent

Illustrate User Task

	F	p	η_p^2	Level	Mean	SE
(a) Technique	57.52	<.001	0.793	DAC	1.872	0.048
				PC	2.376	0.060
				0.6	1.676	0.049
(b) Target Depth	86.12	<.001	0.852	1.2	1.929	0.046
				1.5	2.231	0.051
				1.8	2.669	0.080
				0.02	2.445	0.060
				0.06	1.747	0.034
(c) Target Size	131.32	<.001	0.897	0.04	2.179	0.052
				0.06	1.747	0.034



Statistical Results

Example: AI

Introduction

RW

Method

Implementation

Evaluation

Limitations & Discussion

Conclusion

Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks

Jun-Yan Zhu* Taesung Park* Phillip Isola Alexei A. Efros
Berkeley AI Research (BAIR) laboratory, UC Berkeley

Figure 1: Given any two unordered image collections X and Y , our algorithm learns to automatically “translate” an image from one into the other and vice versa: (left) Monet paintings and landscape photos from Flickr; (center) zebras and horses from ImageNet; (right) summer and winter Yosemite photos from Flickr. Example application (bottom): using a collection of paintings of famous artists, our method learns to render natural photographs into the respective styles.

Example: AI

Introduction

RW

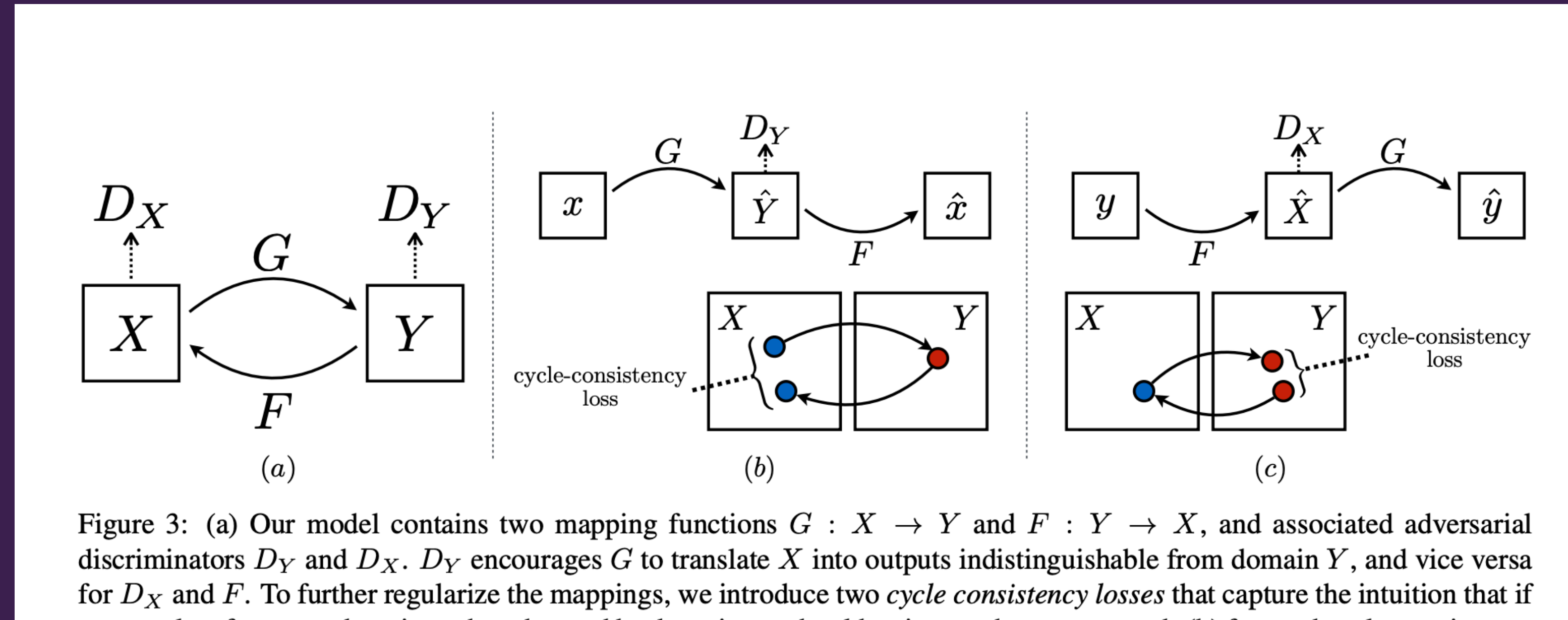
Method

Implementation

Evaluation

Limitations & Discussion

Conclusion



$$\begin{aligned} \mathcal{L}_{\text{GAN}}(G, D_Y, X, Y) = & \mathbb{E}_{y \sim p_{\text{data}}(y)} [\log D_Y(y)] \\ & + \mathbb{E}_{x \sim p_{\text{data}}(x)} [\log(1 - D_Y(G(x)))] \end{aligned} \quad (1)$$

$$\begin{aligned} \mathcal{L}_{\text{cyc}}(G, F) = & \mathbb{E}_{x \sim p_{\text{data}}(x)} [\|F(G(x)) - x\|_1] \\ & + \mathbb{E}_{y \sim p_{\text{data}}(y)} [\|G(F(y)) - y\|_1]. \end{aligned}$$

$$\begin{aligned} \mathcal{L}(G, F, D_X, D_Y) = & \mathcal{L}_{\text{GAN}}(G, D_Y, X, Y) \\ & + \mathcal{L}_{\text{GAN}}(F, D_X, Y, X) \\ & + \lambda \mathcal{L}_{\text{cyc}}(G, F), \end{aligned}$$

Example: AI

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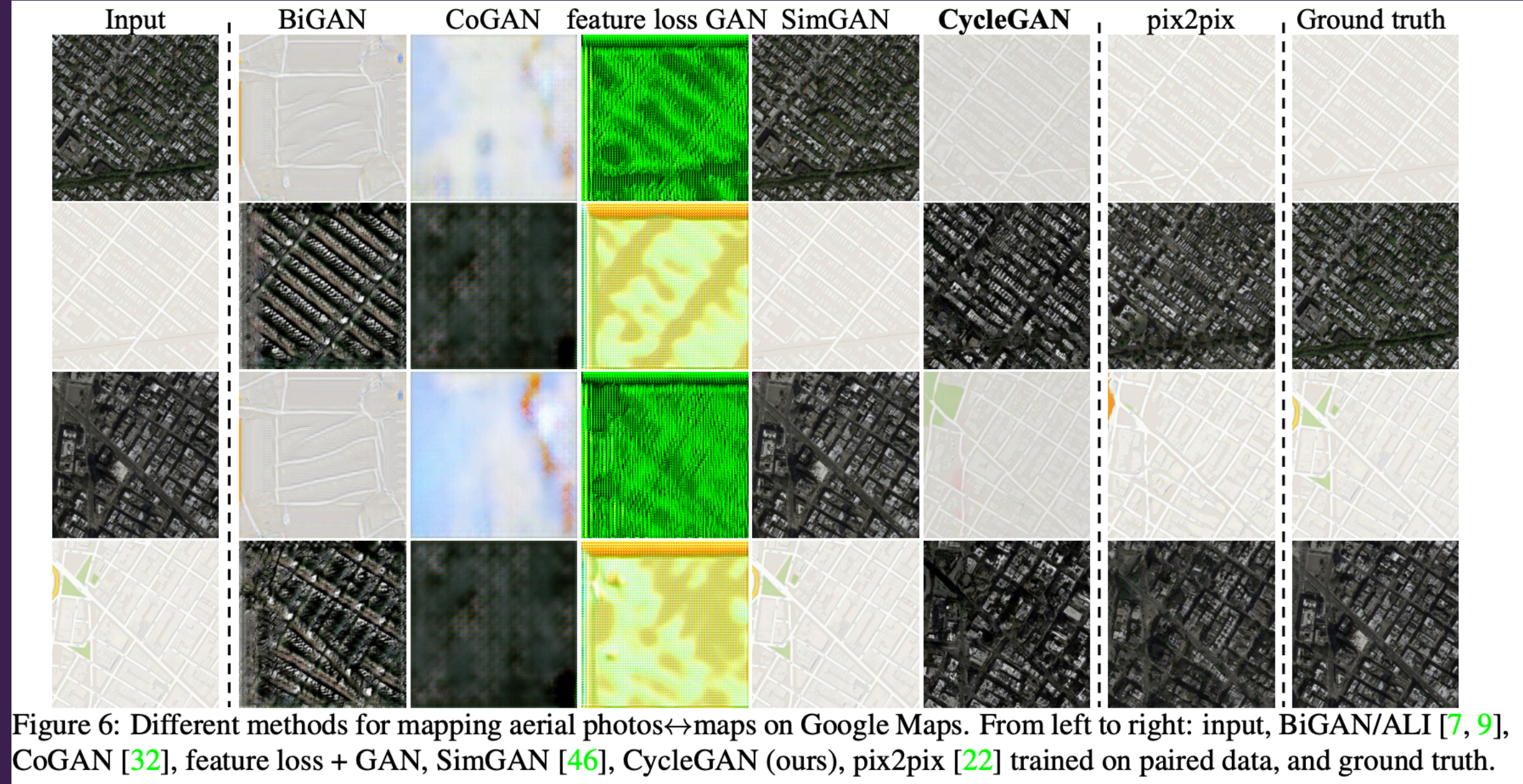


Figure 6: Different methods for mapping aerial photos \leftrightarrow maps on Google Maps. From left to right: input, BiGAN/ALI [7, 9], CoGAN [32], feature loss + GAN, SimGAN [46], CycleGAN (ours), pix2pix [22] trained on paired data, and ground truth.

Loss	Map \rightarrow Photo	Photo \rightarrow Map
	% Turkers labeled real	% Turkers labeled real
CoGAN [32]	0.6% \pm 0.5%	0.9% \pm 0.5%
BiGAN/ALI [9, 7]	2.1% \pm 1.0%	1.9% \pm 0.9%
SimGAN [46]	0.7% \pm 0.5%	2.6% \pm 1.1%
Feature loss + GAN	1.2% \pm 0.6%	0.3% \pm 0.2%
CycleGAN (ours)	26.8% \pm 2.8%	23.2% \pm 3.4%

Table 1: AMT “real vs fake” test on maps \leftrightarrow aerial photos at 256×256 resolution.

Loss	Per-pixel acc.	Per-class acc.	Class IOU
CoGAN [32]	0.40	0.10	0.06
BiGAN/ALI [9, 7]	0.19	0.06	0.02
SimGAN [46]	0.20	0.10	0.04
Feature loss + GAN	0.06	0.04	0.01
CycleGAN (ours)	0.52	0.17	0.11
pix2pix [22]	0.71	0.25	0.18

Table 2: FCN-scores for different methods, evaluated on Cityscapes labels \rightarrow photo.

Loss	Per-pixel acc.	Per-class acc.	Class IOU
CoGAN [32]	0.45	0.11	0.08
BiGAN/ALI [9, 7]	0.41	0.13	0.07
SimGAN [46]	0.47	0.11	0.07
Feature loss + GAN	0.50	0.10	0.06
CycleGAN (ours)	0.58	0.22	0.16
pix2pix [22]	0.85	0.40	0.32

Table 3: Classification performance for different methods, evaluated on Cityscapes labels \rightarrow photo.

Loss	Per-pixel acc.	Per-class acc.	Class IOU
Cycle alone	0.22	0.07	0.02
GAN alone	0.51	0.11	0.08
GAN + forward cycle	0.55	0.18	0.12
GAN + backward cycle	0.39	0.14	0.06
CycleGAN (ours)	0.52	0.17	0.11

Table 4: Ablation study: FCN-scores for different variants of our method, evaluated on Cityscapes labels \rightarrow photo.

Loss	Per-pixel acc.	Per-class acc.	Class IOU
Cycle alone	0.10	0.05	0.02
GAN alone	0.53	0.11	0.07
GAN + forward cycle	0.49	0.11	0.07
GAN + backward cycle	0.01	0.06	0.01
CycleGAN (ours)	0.58	0.22	0.16

Table 5: Ablation study: classification performance of photo \rightarrow labels for different losses, evaluated on Cityscapes.

method, on the other hand, can produce translations that are often of similar quality to the fully supervised pix2pix.

Table 1 reports performance regarding the AMT perceptual realism task. Here, we see that our method can fool participants on around a quarter of trials, in both the maps \rightarrow aerial photos direction and the aerial photos \rightarrow maps direction at 256×256 resolution³. All the baselines almost

From model to paper

Next, build a mapping from their outline to yours.

Translate each section and sub-section heading into what the equivalent heading is for you

Translate each sub-thesis into what the equivalent sub-thesis is for you

Translate each figure into what the equivalent figure is for you

What if it doesn't quite fit?

Model papers should be templates, not straightjackets. You will probably need to adapt your mapping slightly from what your model paper does.

e.g., you require a slightly different evaluation structure or visualization than them

e.g., you're drawing on a different literature than them, and need to explain something that they didn't

You can play with the genre — just don't discard the genre. Check with your CA for any substantial changes that you want to make.

Publication culture

I finished the paper. Now what?

Now it's time for your research to take flight and enter the academic record.

...but why do we do this? Why care? And what are even the options?

Why peer review?

We often think of peer review as gating correctness, but it also performs another equally important function: gating contribution impact

There is a massive amount of research generated each year in computer science. (If you want to drink from the firehose, subscribe to daily announcements from [arXiv.org](https://arxiv.org).)

So what do you pay attention to?

An example in CS Theory

Amongst the papers written in Computer Science theory, the vast majority of them are correct proofs.

So, researchers in CS Theory are faced with a large pile of true facts about the world.

The role of the top-tier conferences is to establish **which of those true facts are the most important ones.**

(And yes, also to weed out any incorrect proofs.)

Typical gold standard: conference

Computer Science, unlike other fields, is a conference-oriented field.

There are a small set of top-tier conferences for each area. These are generally known to be the venues that publish the best work in the area.

There also exist a variety of second-tier and other conferences, which are less prestigious and often easier to get into.

Journals, and conference-journal hybrids, fit into this category too.

Work-in-progress venues

You can only publish a research result once. Conferences and journals are known as **archival**, meaning that they are archived permanently in the academic record.

There also exist a variety of **non-archival venues** that are intended for feedback and exposure.

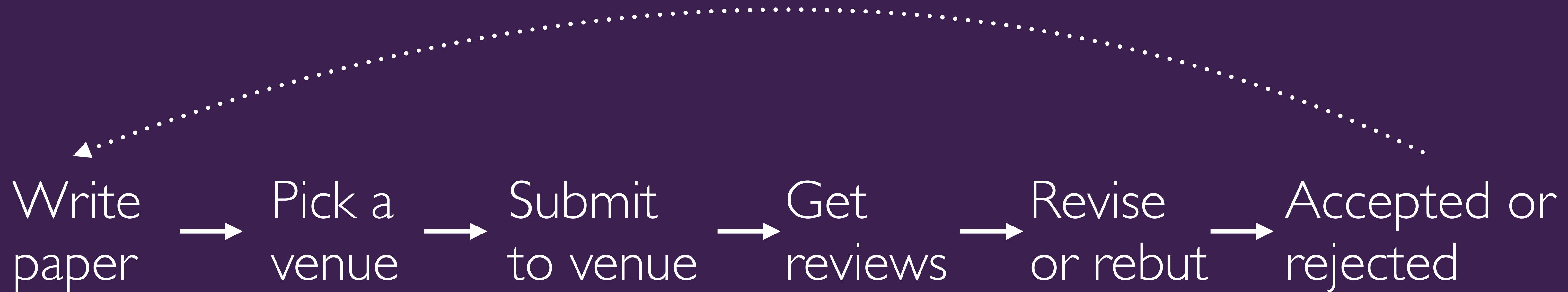
Workshops

Posters

Demos

arXiv.org

Life of a paper



“WIP venues sound fun...”

They should! VPUE provides Conference Grants for up to \$1,500 to travel to present your research at a conference.

If you're interested, ask your CA!

They can work with you to identify a reasonable non-archival venue to submit to, and point you at the format requirements.

studentgrants.stanford.edu

Peer review

The dual role of peer review

You can always put your paper on a public report archive such as arXiv.org. But getting your research into a conference requires peer review.

Peer review relies on experts in the field to judge two questions:

- 1) Is this research correct? Does it actually achieve what it claims?
- 2) Is the contribution valuable enough to publish at this venue?

Who are the peers?

Ideally, your paper gets routed to people who are experts in the topic of your research.

People who publish in the area that you're working in

People who you cite in your submission

Anatomy of a peer review

Exact details vary, but many reviews contain the following elements:

- Overall score: 1-5

- Textual review
(~5 paragraphs)

The process

External review model

Associate Chair (AC)
Secondary Chair (2AC)



Invited reviewer 1
Invited reviewer 2
Invited reviewer 3

Internal review model

Senior Committee Member (SPC)
Senior Committee Member (SPC)



Committee member 1
Committee member 2
Committee member 3

Double-blind review

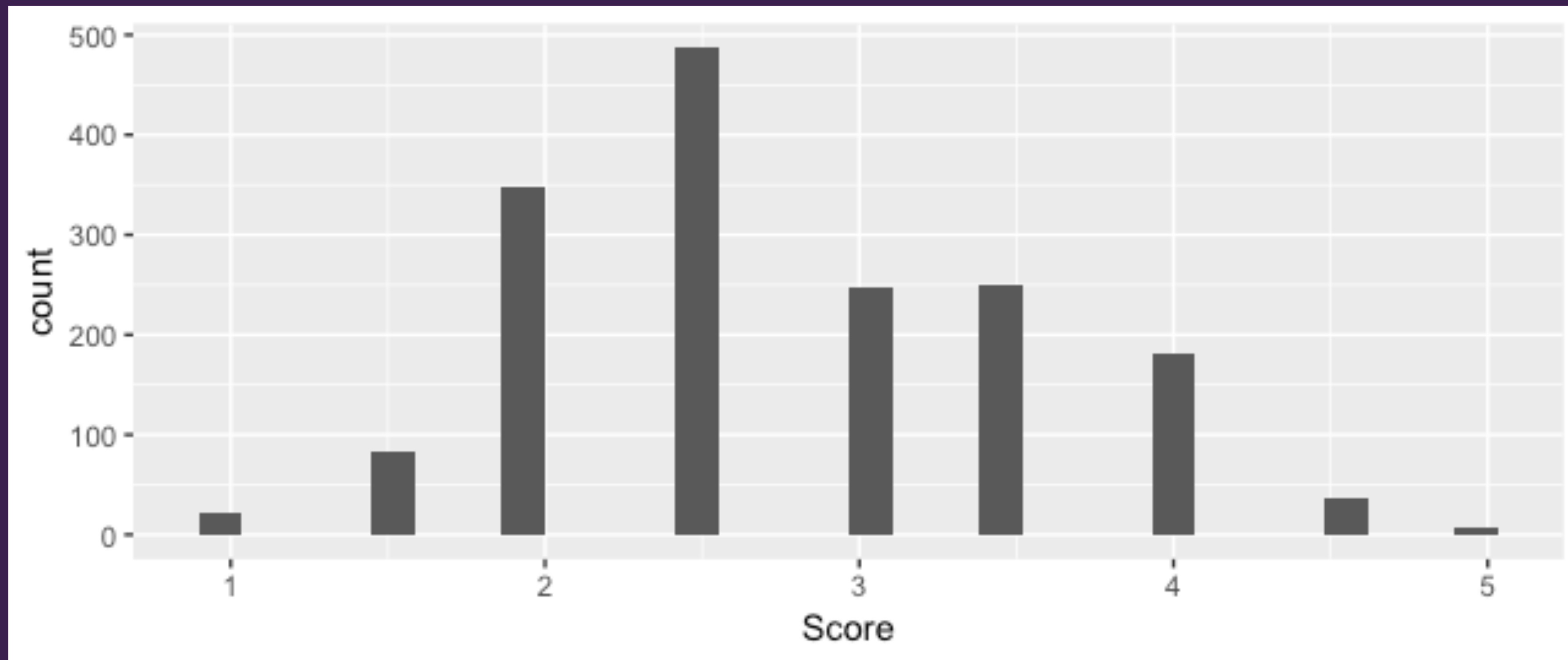
Typically, when you submit a paper to a conference, you anonymize yourself by not including your name or affiliation in the author block of the paper.

Goal: ensure that papers are reviewed on content, not on reputation

Likewise ACs' and reviewers' identities are hidden from the authors

Goal: avoid retaliatory behavior, focus on the institution of peer review rather than the people

What happens with reviews?



Example score distribution from a top-tier conference

Rebuttal and revision

Some conferences use **rebuttals**, where you have a short period of time (~1 week) to reply to the reviews. Reviewers read your rebuttal, adjust scores if desired, and then a final decision is made.

Other conferences and all journals use **revisions**, where a paper is given a specified period of time (a few weeks to a few months) to directly make changes based on the reviews. Reviewers read the revised paper, adjust scores if desired, and then a decision is made.

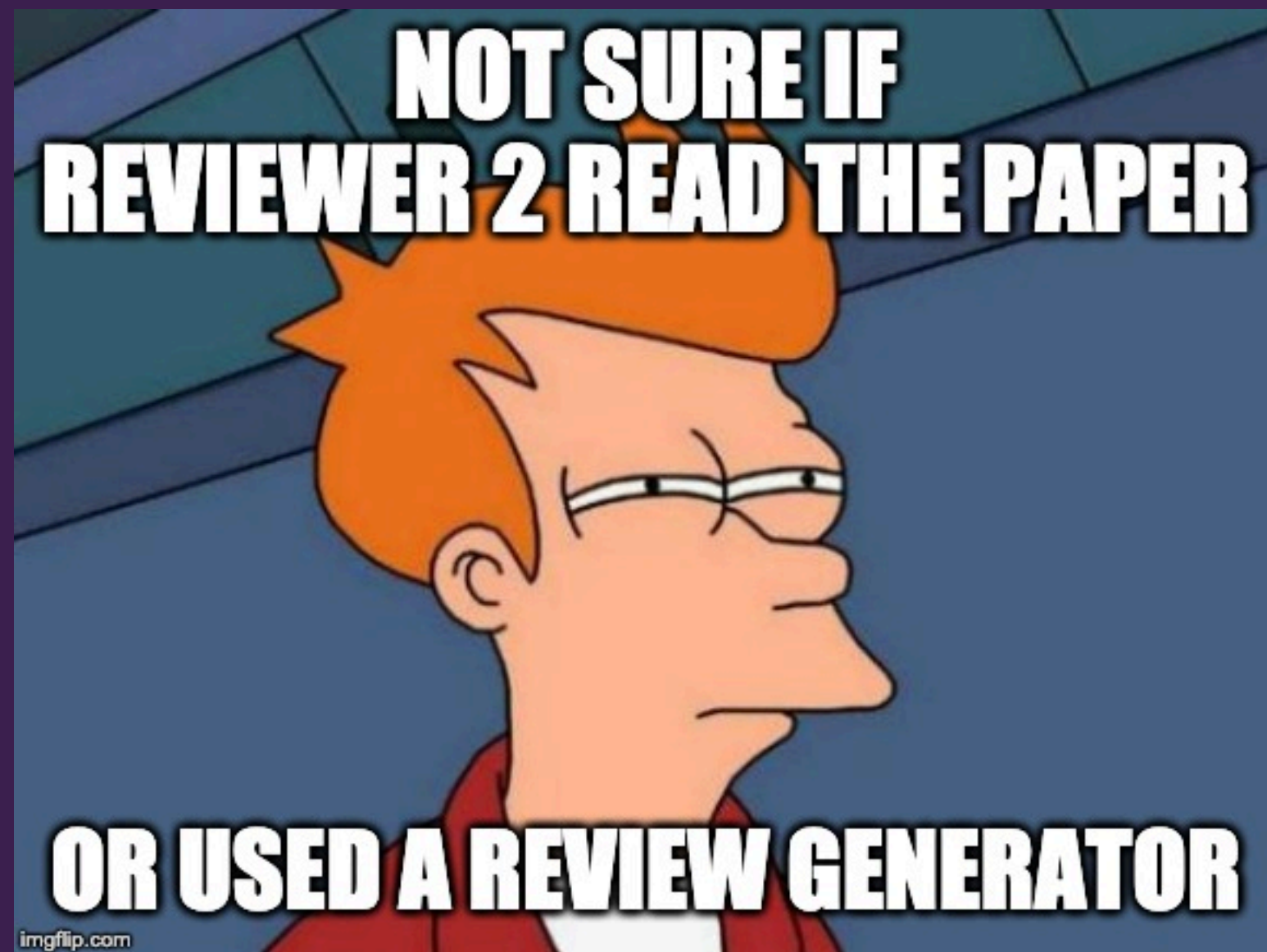
Who makes the final decision?

Typically, the senior members of the committee (ACs/SPCs) make a final recommendation based on the input of the reviewers.

Conference acceptance rates are often ~25%.

Why do we shake our fist at R2?

Reviews can be quite harsh to read. Researchers refer half-jokingly to Reviewer 2 as the one who always has some bone to pick with your research and is unreasonably negative, trying to sink the paper.



How to write an effective review

The tempting behavior

- 1) Read the paper
- 2) Keep track of objections you have as you read the paper
- 3) Collate those objections into a review
- 4) Decide what score to give based on your objections

Why is that behavior problematic?

This winds up with nitpicky reviews: here's what's wrong, without placing those issues in context of the broader contribution.

Peer review is not an invitation to demonstrate your skill at identifying small flaws.

Writing a good review

Step one: ask yourself, **what goal is the paper trying to achieve?**

This may not be super clear from the paper. As a reviewer, your goal is to figure out what the bit flip is that they are arguing for, even if the authors aren't great at articulating it themselves.

Step two: **how well did the paper achieve that goal?**

Did they follow through on what their goal was? Did they demonstrate their thesis well?

Step three: **how could it have better achieved that goal?**

This is where you offer constructive critiques.

Writing a good review

Once you've taken those three steps, you can translate the result into a review. Essentially (but in your own words):

This paper sets out to [goal]. [Goal] is...

An important goal and well executed...

Making an implicit assumption that I disagree with...

(If relevant:) the execution...

Is a tour de force exploration of [goal]

Doesn't follow through on [goal] in the following way: [...]

(The execution may be a secondary matter if the goal is ill-formed!)

**What questions
do you have?**

Try it

Think back to your nearest neighbor paper. Take five minutes with your group to construct a review of that paper.

What goal is the paper trying to achieve?

How well does it achieve that goal?

How could the paper have better achieved that goal?

Assignment 8

197

Due next Tues 5/30:

Draft Paper

Due next Thurs 6/1:

Draft Talk

Note: Meet in section on Thurs 6/1

197C

Due next Tues 5/30:

Draft Proposal

Due next Thurs 6/1:

Draft Talk

Reminder:

Submit your attendance on Canvas!

Writing a Paper and Peer Review

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