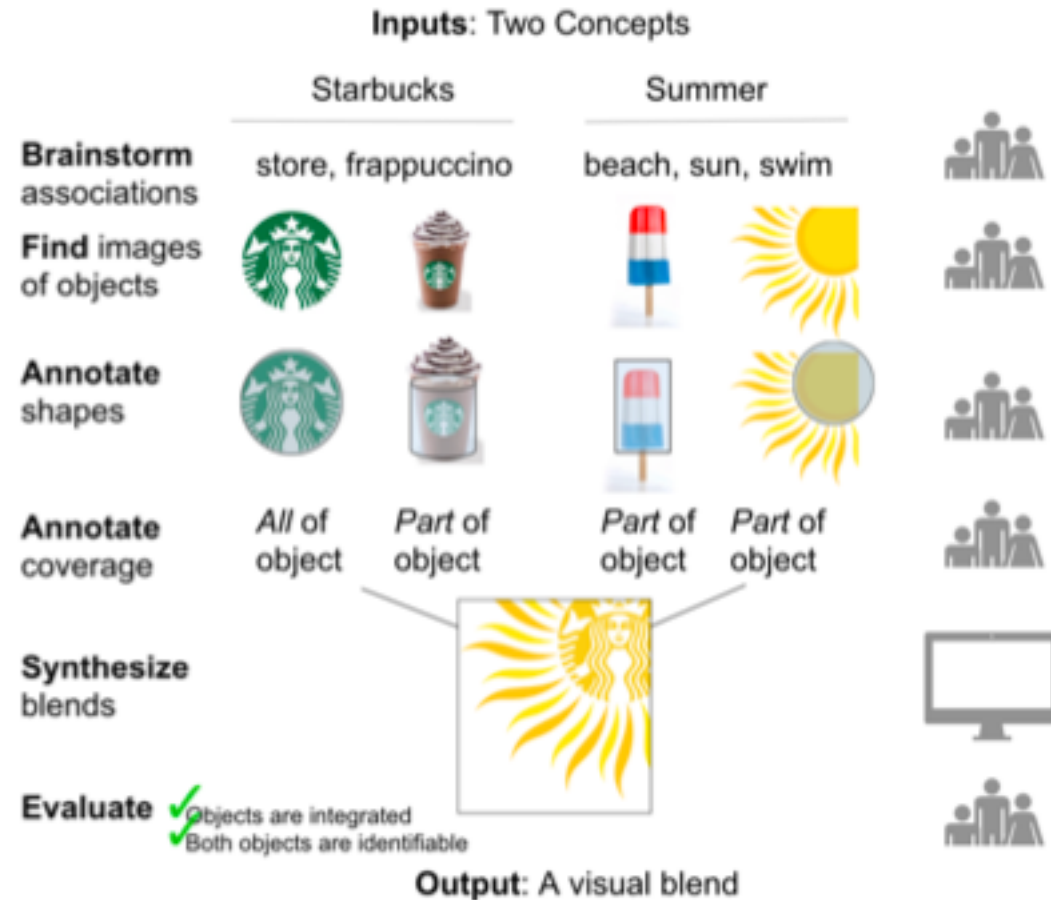
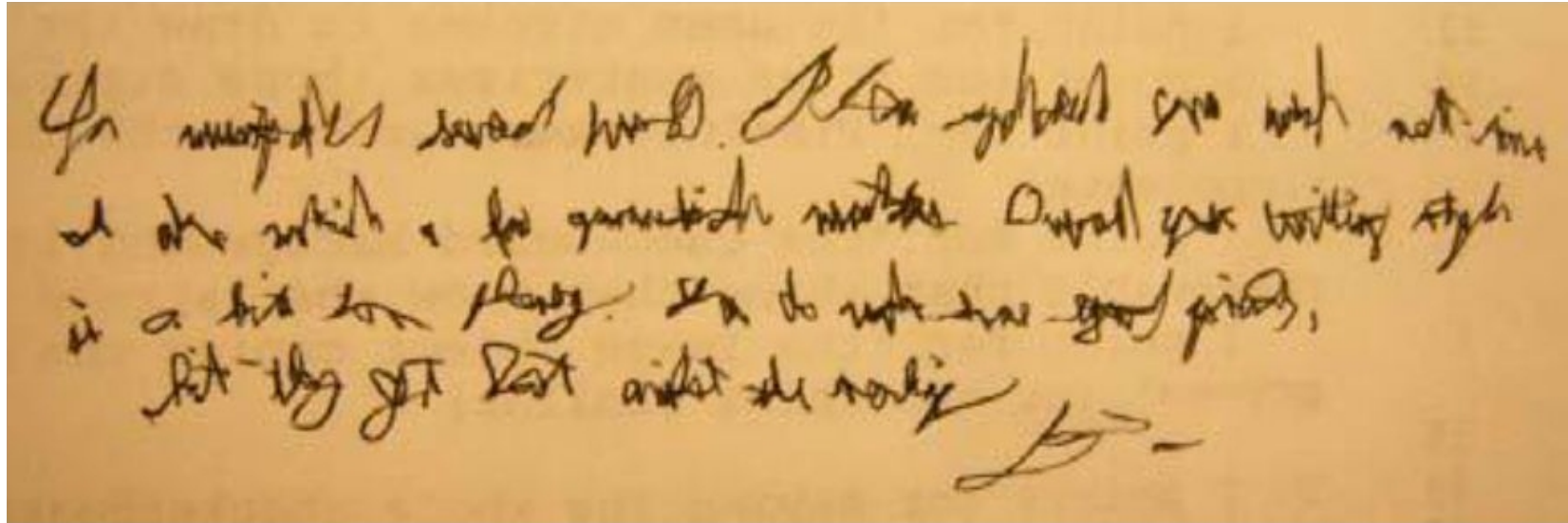


# Creating **VisuaMetaphors** with Crowds and Machines

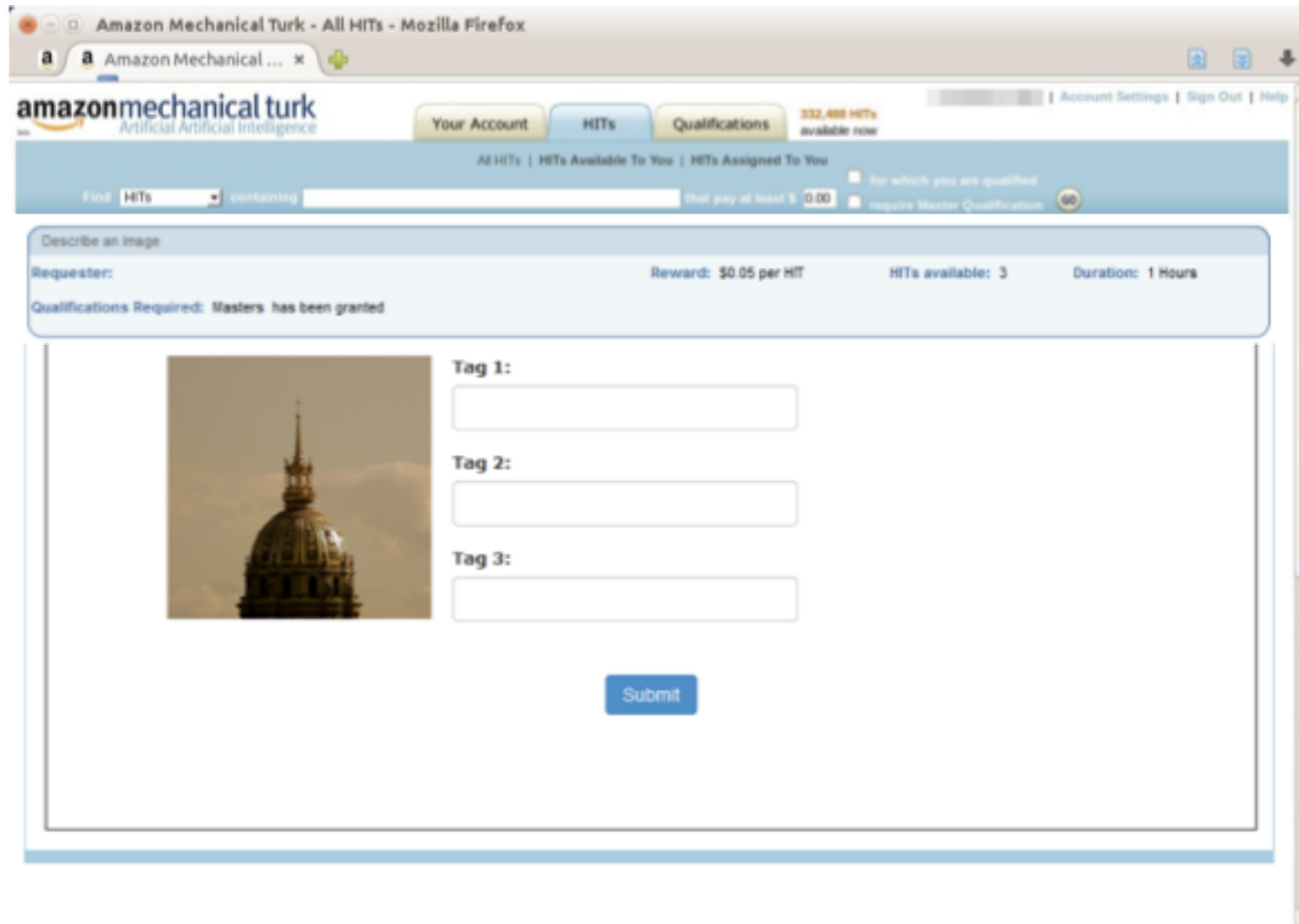


My background **Crowdsourcing**:  
Decompose a problem and let people do the  
tasks a computer can't



For multiple small tasks. Also jobs are not in  
of the which a few guaranteed makes. Overall you writing style  
is a bit too heavy. It is to note that you find,  
but they get lost and the work  
L.

# Microtask Crowdsourcing



The screenshot shows the Amazon Mechanical Turk interface in a Mozilla Firefox browser window. The page title is "Amazon Mechanical Turk - All HITs - Mozilla Firefox". The browser address bar shows "Amazon Mechanical Turk". The page header includes the Amazon Mechanical Turk logo, navigation tabs for "Your Account", "HITs", and "Qualifications", and a notification for "332,488 HITs available now". The main content area displays a search bar for HITs, a filter for "for which you are qualified", and a "require Master Qualification" checkbox. Below this is a task card for "Describe an image". The task details include "Requester:", "Reward: \$0.05 per HIT", "HITs available: 3", and "Duration: 1 Hours". The "Qualifications Required" section states "Masters has been granted". The task content features an image of a golden dome with a spire, followed by three input fields labeled "Tag 1:", "Tag 2:", and "Tag 3:". A blue "Submit" button is located at the bottom of the task card.

# Pay people to do microtasks on Amazon's Mechanical Turk

Amazon Mechanical Turk - All HITs - Mozilla Firefox

amazonmechanicalturk Artificial Intelligence

Your Account | HITs | Qualifications | 332,488 HITs available now

Account Settings | Sign Out | Help

All HITs | HITs Available To You | HITs Assigned To You

Find: HITs containing [ ] that pay at least \$ 0.00

for which you are qualified

require Master Qualification 60

### All HITs

1-10 of 2948 Results

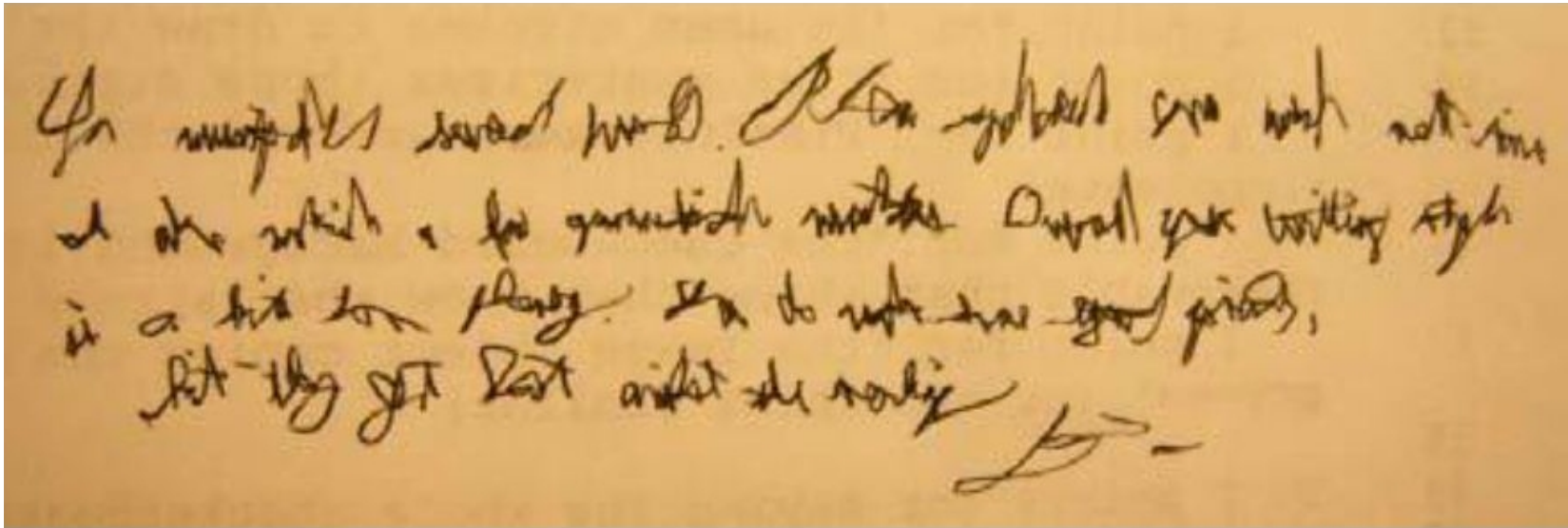
Sort by: HIT Creation Date (newest first)

Show all details | Hide all details

1 2 3 4 5 Next Last

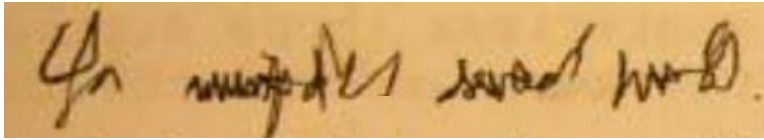
<b>Tao Runner Photos with bib number</b>	Not Qualified to work on this HIT (Why?)   View a HIT in this group	
Requester: <a href="#">Tate</a>	HIT Expiration Date: Apr 26, 2015 (6 days 23 hours)	Reward: \$0.02
	Time Allotted: 3 minutes	HITs Available: 653
<b>Review the transcription of up to 25 Seconds of Media - Earn up to \$0.10 per HIT!</b>	Not Qualified to work on this HIT (Why?)   View a HIT in this group	
Requester: <a href="#">Crowdsurf Support</a>	HIT Expiration Date: Apr 17, 2015 (51 weeks 6 days)	Reward: \$0.07
	Time Allotted: 15 minutes	HITs Available: 75
<b>Retail Label 3D orientation of 30 heads</b>	Request Qualification (Why?)   View a HIT in this group	
Requester: <a href="#">Turk Experiment</a>	HIT Expiration Date: Apr 20, 2015 (59 minutes 52 seconds)	Reward: \$0.40
	Time Allotted: 45 minutes	HITs Available: 29
<b>Search: Keywords on Google.com (7.5) (US)</b>	View a HIT in this group	
Requester: <a href="#">CrowdSource</a>	HIT Expiration Date: May 3, 2015 (1 week 6 days)	Reward: \$0.06
	Time Allotted: 12 minutes	HITs Available: 188
<b>Does this receipt contain the following products?</b>	Request Qualification (Why?)   View a HIT in this group	
Requester: <a href="#">Zing</a>	HIT Expiration Date: Apr 21, 2015 (1 day 11 hours)	Reward: \$0.01
	Time Allotted: 60 minutes	HITs Available: 4230
<b>CTRP: Type name, date and total of a receipt</b>	Request Qualification (Why?)   View a HIT in this group	
Requester: <a href="#">CopyText Inc.</a>	HIT Expiration Date: Apr 19, 2015 (9 minutes 40 seconds)	Reward: \$0.01
	Time Allotted: 4 minutes	HITs Available: 12

# Problems too **hard** for one person

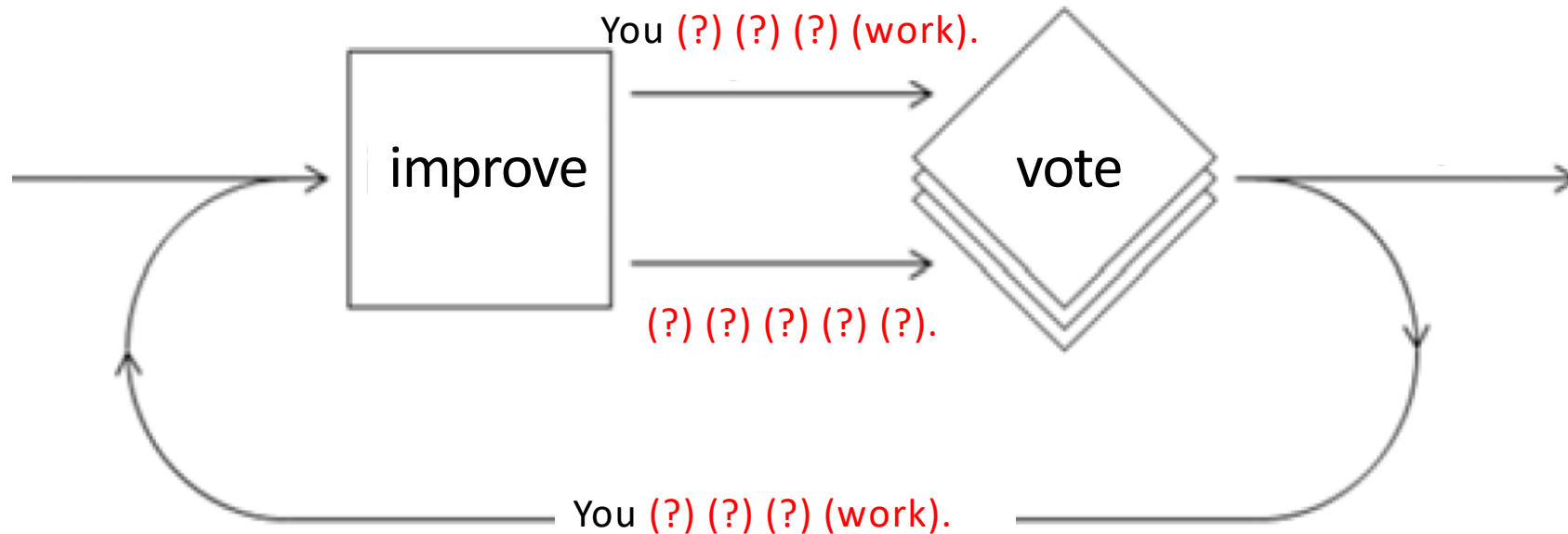


You (misspelled) (several) (words). Please spellcheck your work next time.  
I also notice a few grammatical mistakes. Overall your writing style is a bit too  
phoney. You do make some good (points), but they **get** lost amidst the (**writing**).  
(**signature**)

# Iteratively Improve the Transcription: Allow people to build on the clues from the last person



**You (misspelled) (several) (words).**



# Many iterations of TurKit

## version 1:

You (?) (?) (?) (work). (?) (?) (?) work (not) (time). I (?) (?) a few grammatical mistakes. Overall your writing style is a bit too (phoney). You do (?) have good (points), but they got lost amidst the (writing). (signature)

## version 2:

You (?) (?) (~~saved~~) (~~work~~). (?) (?) (?) ~~work~~ (~~not~~) (~~time~~). I (?) (?) a few ~~grammatical mistakes~~. Overall your writing style is a bit too (~~phoney~~). You do (?) ~~have good~~ (~~points~~), but they ~~got~~ lost amidst the (~~writing~~). (~~signature~~)

## version 4:

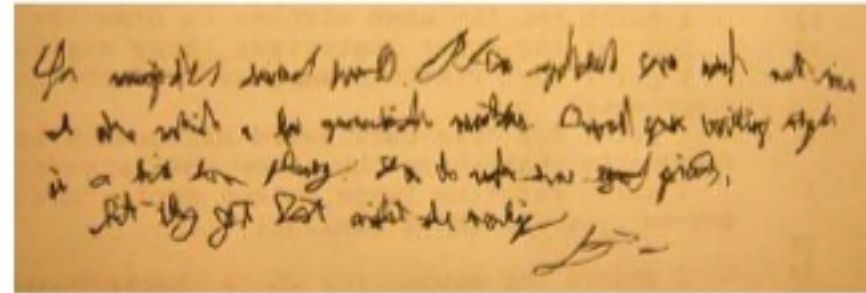
You (~~misspelled~~) (~~several~~) (~~words~~). (?) (?) (?) work ~~next~~ (time). I ~~also notice~~ a few grammatical mistakes. ...

## version 5:

You (misspelled) (several) (words). (~~Plan?~~) (~~spell-check~~) (~~your~~) work next time. I also notice a few grammatical mistakes. Overall your writing style is a bit too phoney. You do make some good (points), but they got lost amidst the (writing). (signature)

## version 6:

You (misspelled) (several) (words). Please ~~spell-check~~ ~~your~~ work next time. I also notice a few grammatical ...

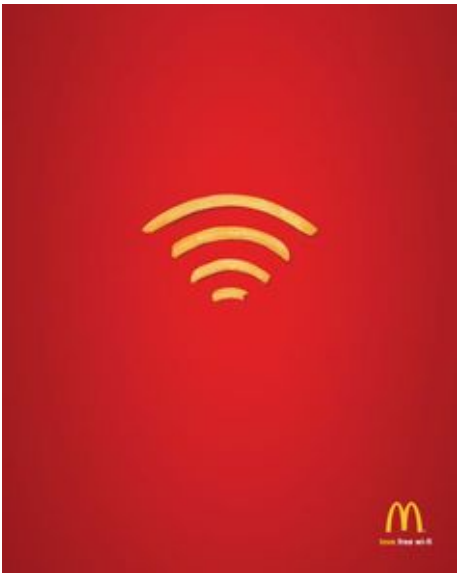


"You (misspelled) (several) (words). Please spellcheck your work next time. I also notice a few grammatical mistakes. Overall your writing style is a bit too **phoney**. You do make some good (points), but they **got** lost amidst the (**writing**). (**signature**)"

According to our ground truth, the highlighted words should be "flowery", "get", "verbiage" and "B-" respectively.

Can you decompose something  
“creative”?





# Outline

- **Define Visual Metaphors**
- Can viewers infer the message from a visual metaphor?
- Creating Visual Metaphors (with crowds and machines)
- Refining Visual Metaphors

## Brazil + Takes Off



## Brazil + Takes Off



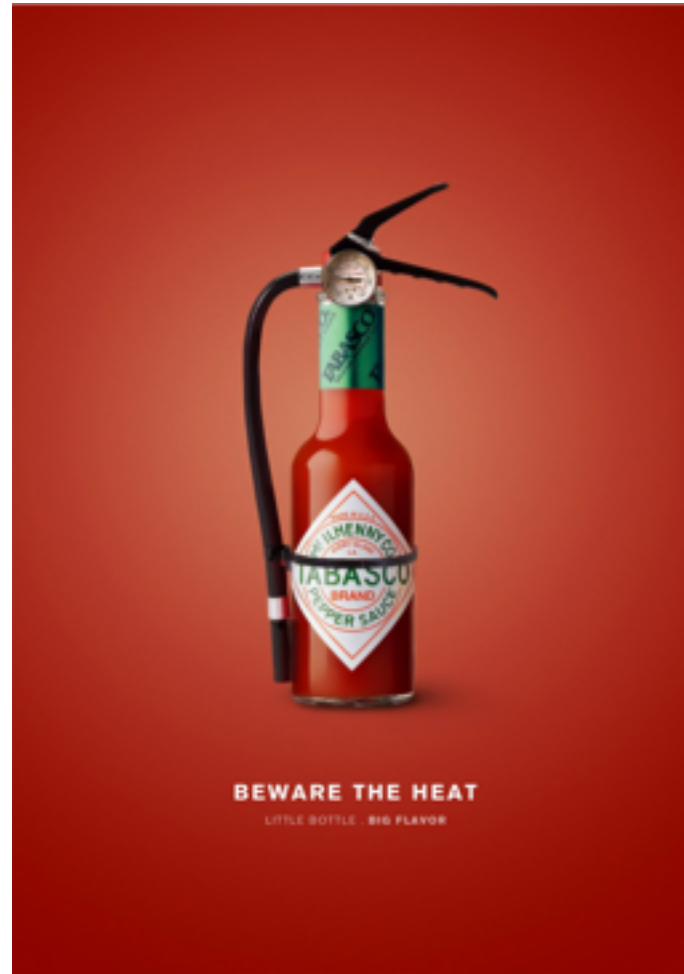
## Tabasco + Hot



Brazil + Takes Off



Tabasco + Hot



Earth + Melt



# Definition of Visual Metaphors

1. Two concepts:
  1. a concrete noun
  2. an abstract property.
2. Two objects: one representing each each concept
3. Two objects are integrated into one object
4. Both objects are individually recognizable.

Concrete: Starbucks  
Abstract: "summery"

Objects: Starbucks logo + sun



**Not** a visual blend.  
Objects not integrated



**Not** a visual blend  
Objects not integrated into one object



**A visual blend**  
Two objects integrated,  
both objects recognizable

# Connection to Literary Metaphors: Apply abstract properties to a concrete noun

“The **classroom** was a **zoo**.”

Zoo properties:

- Has wild animals
- Animals are in cages
- People can view them

*Message:* The **classroom** was **wild**.

The reader must infer:

\* what property of zoo applies to classroom.

**Tabasco + fire extinguisher.**



Fire extinguisher properties:

- For dangerous hot situations
- Puts out fires

*Message:* **Tabasco** is **dangerously hot**.

The viewer must infer:

- the direction of the metaphor and
- what property to apply.

Why not “**Fire Extinguishers** taste **spicy**”?

# Outline

- Define Visual Metaphors
- **Can viewers infer the message from a visual metaphor?**
- Creating Visual Blends (with crowds and machines)
- Refining Visual Blends



Most visual Metaphors have supporting text.

Do viewers need the supporting text to understand the metaphor?



Brazil + Takes Off

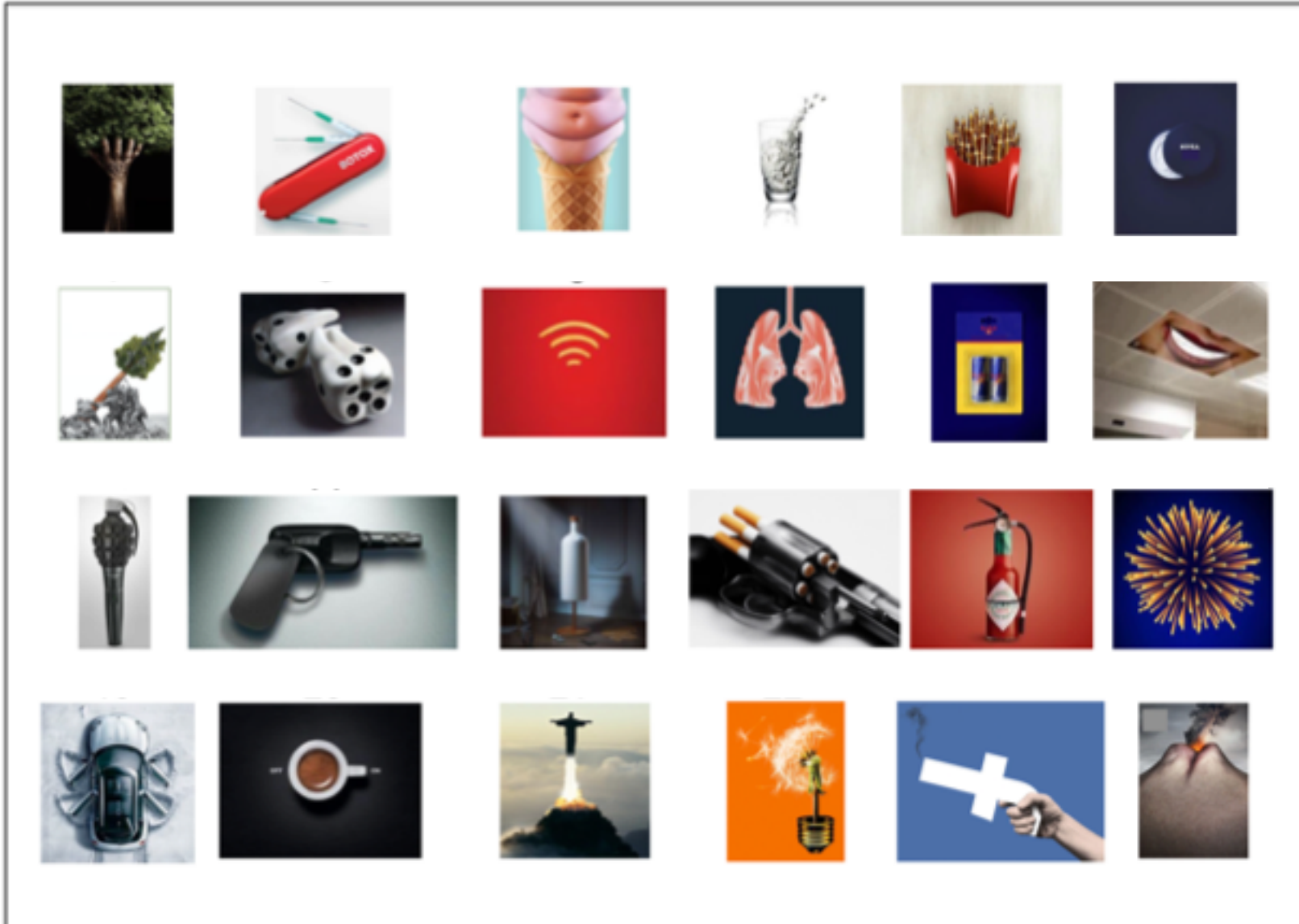


Tabasco + Hot



Earth + Melt

# Study: Can people infer the message from Visual Metaphors without the text?



Mturk study.

- 24 professional VMs
- 10 workers each
- Give them 4 examples of VMs
- Ask them:
  - What are the two objects?
  - What is the message?

People infer the two objects  
**85% of the time.**

People infer the message  
(without text)  
**49% of the time.**

# Open question: Why do people infer some messages and not others?



“Brazil is taking off”



“McDonald’s has WiFi”



“Nike makes you healthy”



“Coffee turns you on”

Objects:	6 / 10	4 / 10	10 / 10	9 / 10
Meaning:	0 / 10	2 / 10	6 / 10	8 / 10

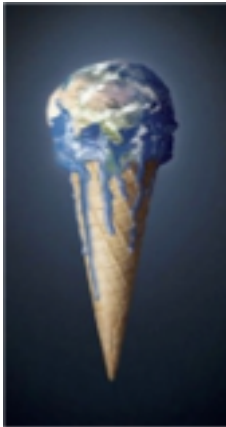
# Hypothesis: People are more likely to get the message if the message is already familiar

## Familiar Messages

“Tabasco  
is hot”



“Global  
warming”



“Nike is healthy”



“Cigarettes kill”



“Coffee turns you on”



*“The classroom was wild”*

## Unfamiliar Messages

“Brazil is taking off”



“McDonalds  
has Wifi”



# There are **valid alternate** interpretations



Objects:

- Christ statue
- Rocket

Meaning:

- “The ascension of Christ”
- “Christianity is taking off”
- “Jesus is a blast!”

# When interpreting symbols, first associations are better than logic.



Objects:

- Tabasco bottle
- Fire extinguisher

Association:

- Dangerous / Hot

*"But doesn't a fire extinguisher put out heat.  
So the meaning should really be that Tabasco is not hot."*

# Outline

- Define Visual Metaphors
- Can viewers infer the message from a visual metaphor?
- **Creating Visual Blends with crowds and machines**
- Refining Visual Blends

# Challenge: Blending Objects

1. Two concepts:
  1. a concrete noun
  2. an abstract property.
2. Two objects: one representing each each concept
3. **Two objects are integrated into one object**
4. **Both objects are individually recognizable.**

Concrete: Starbucks  
Abstract: “summery”

Objects: Starbucks logo + sun



**Not** a visual blend.  
Objects not integrated



**Not** a visual blend  
Objects not integrated into one object



**A visual blend**  
Two objects integrated,  
both objects recognizable



Superficially, these images have nothing in common.



Brazil + Takes Off

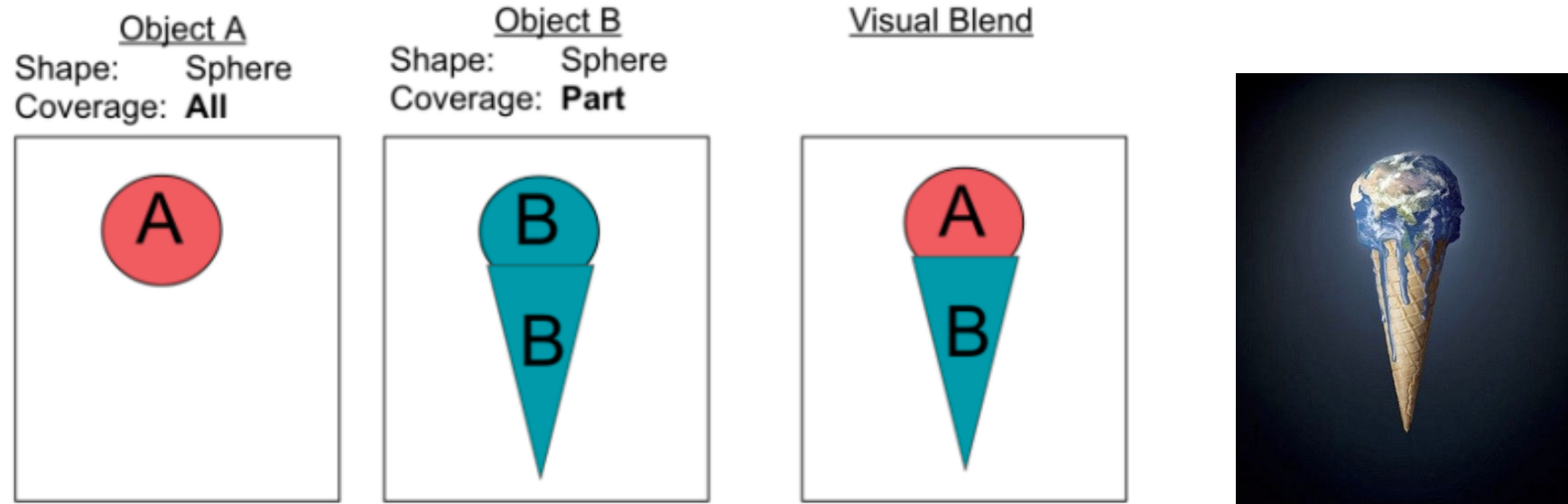


Tabasco + Hot



Earth + Melt

# Design Pattern: Single Shape Mapping



1. Two objects are integrated into one object
2. Both objects are individually identifiable

# Removed Video

Tabasco



Hot



Tabasco + Hot



# Removed Video

Turn off

Cell phone

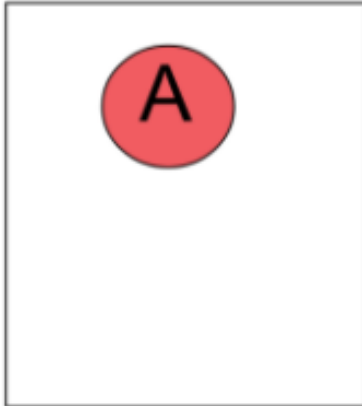
Turn off + Cell phone



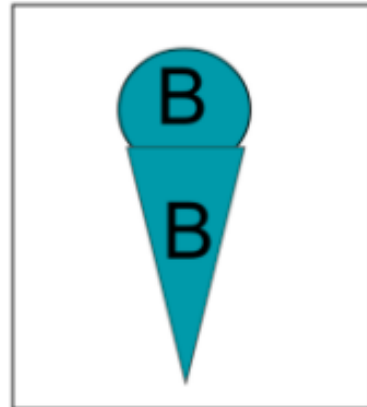
# Creating Visual Blends can be seen as a constraint based search problem.

For a pair of concepts, search for pairs that follow the single shape matching pattern.

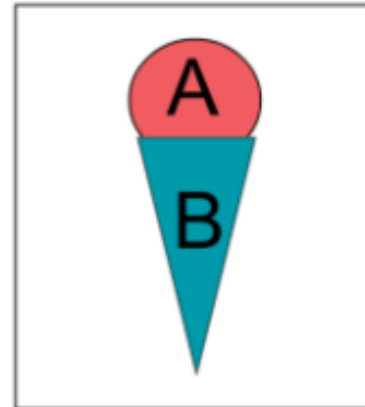
Object A  
Shape: Sphere  
Coverage: **All**



Object B  
Shape: Sphere  
Coverage: **Part**



Visual Blend



Starbucks + Summer

## **Inputs:** Two Concepts

Starbucks

---

Summer

---

## Inputs: Two Concepts

Starbucks

---

Summer

---

**Brainstorm**  
associations

store, frappuccino



## Inputs: Two Concepts

Starbucks

---

Summer

---

**Brainstorm**  
associations

store, frappuccino

**Find** images  
of objects



# Inputs: Two Concepts

Starbucks

---

Summer

---

**Brainstorm**  
associations

store, frappuccino

**Find** images  
of objects



**Annotate**  
shapes



# Inputs: Two Concepts

Starbucks

---

Summer

---

**Brainstorm**  
associations

store, frappuccino

**Find** images  
of objects



**Annotate**  
shapes



**Annotate**  
coverage

*All of*  
object

*Part of*  
object

## Inputs: Two Concepts

Starbucks

---

Summer

---

**Brainstorm**  
associations

beach, sun, swim

---

## Inputs: Two Concepts

Starbucks

---

Summer

---

**Brainstorm**  
associations

**Find** images  
of objects

beach, sun, swim



# Inputs: Two Concepts

Starbucks

Summer

**Brainstorm**  
associations

beach, sun, swim

**Find images**  
of objects



**Annotate**  
shapes



**Annotate**  
coverage

*Part of*  
object

*Part of*  
object

# Inputs: Two Concepts

Starbucks

Summer

**Brainstorm**  
associations

store, frappuccino

beach, sun, swim

**Find images**  
of objects



**Annotate**  
shapes



**Annotate**  
coverage

*All of*  
object

*Part of*  
object

*Part of*  
object

*Part of*  
object

# Inputs: Two Concepts

Starbucks

Summer

**Brainstorm**  
associations

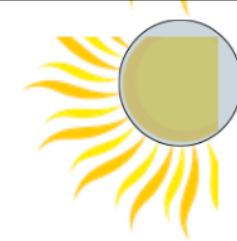
store, frappuccino

beach, sun, swim

**Find images**  
of objects



**Annotate**  
shapes



**Annotate**  
coverage

*All of*  
object

*Part of*  
object

*Part of*  
object

*Part of*  
object



# Inputs: Two Concepts

Starbucks

Summer

**Brainstorm**  
associations

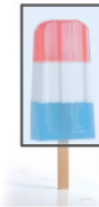
store, frappuccino

beach, sun, swim

**Find images**  
of objects



**Annotate**  
shapes



**Annotate**  
coverage

*All of*  
object

*Part of*  
object

*Part of*  
object

*Part of*  
object

**Prototype**  
blend



# Inputs: Two Concepts

Starbucks

Summer

**Brainstorm**  
associations

store, frappuccino

beach, sun, swim

**Find images**  
of objects



**Annotate**  
shapes



**Annotate**  
coverage

*All of*  
object

*Part of*  
object

*Part of*  
object

*Part of*  
object

**Prototype**  
blend

**Evaluate**  
prototype



- ✓ Two objects are integrated into one object
- ✓ Both objects are identifiable

# Inputs: Two Concepts

Starbucks

Summer

**Brainstorm**  
associations

store, frappuccino

beach, sun, swim

**Find images**  
of objects



**Annotate**  
shapes



**Annotate**  
coverage

*All of*  
object

*Part of*  
object

*Part of*  
object

*Part of*  
object

**Output:**  
A visual blend

**Prototype**  
blend



**Evaluate**  
prototype

- ✓ Two objects are integrated into one object
- ✓ Both objects are identifiable

# Inputs: Two Concepts

Starbucks

Summer

**Brainstorm**  
associations

store, frappuccino

beach, sun, swim

**Find images**  
of objects



**Annotate**  
shapes



**Annotate**  
coverage

*All of*  
object

*Part of*  
object

*Part of*  
object

*Part of*  
object

**Prototype**  
blend

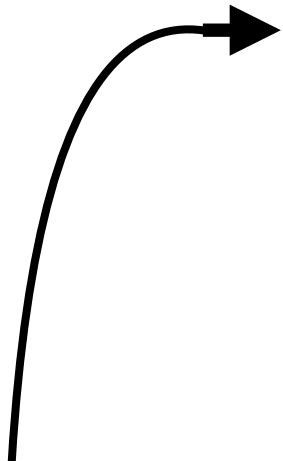


**Evaluate**  
prototype

**Output:**  
A visual blend



Iterate



- ✓ Two objects are integrated into one object
- ✓ Both objects are identifiable

# Complications with finding images

There are many restrictions on what images we pick.

Objects...



Not scenes



Simple objects...



Not fancy objects



Object with one main shape...



Not objects with multiple main shapes



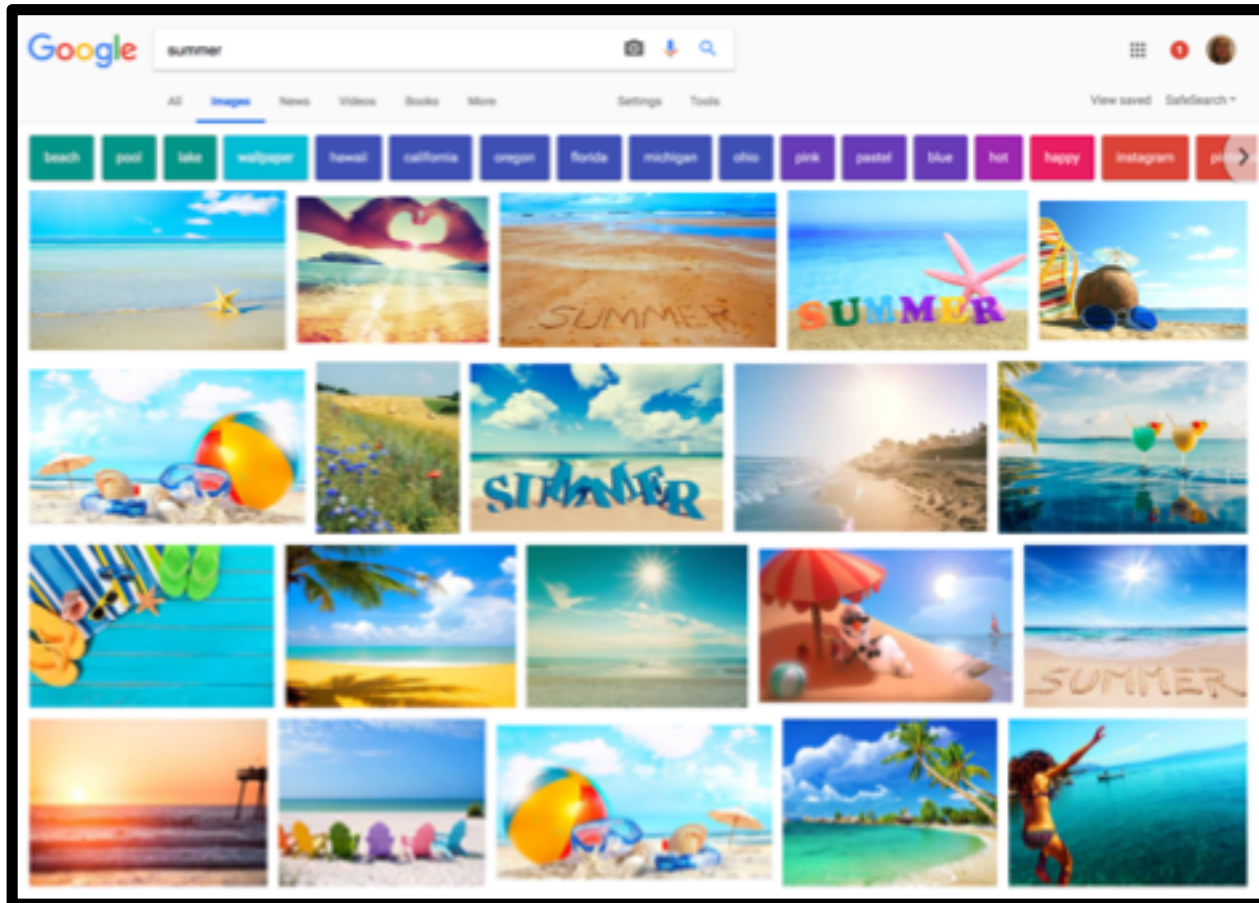
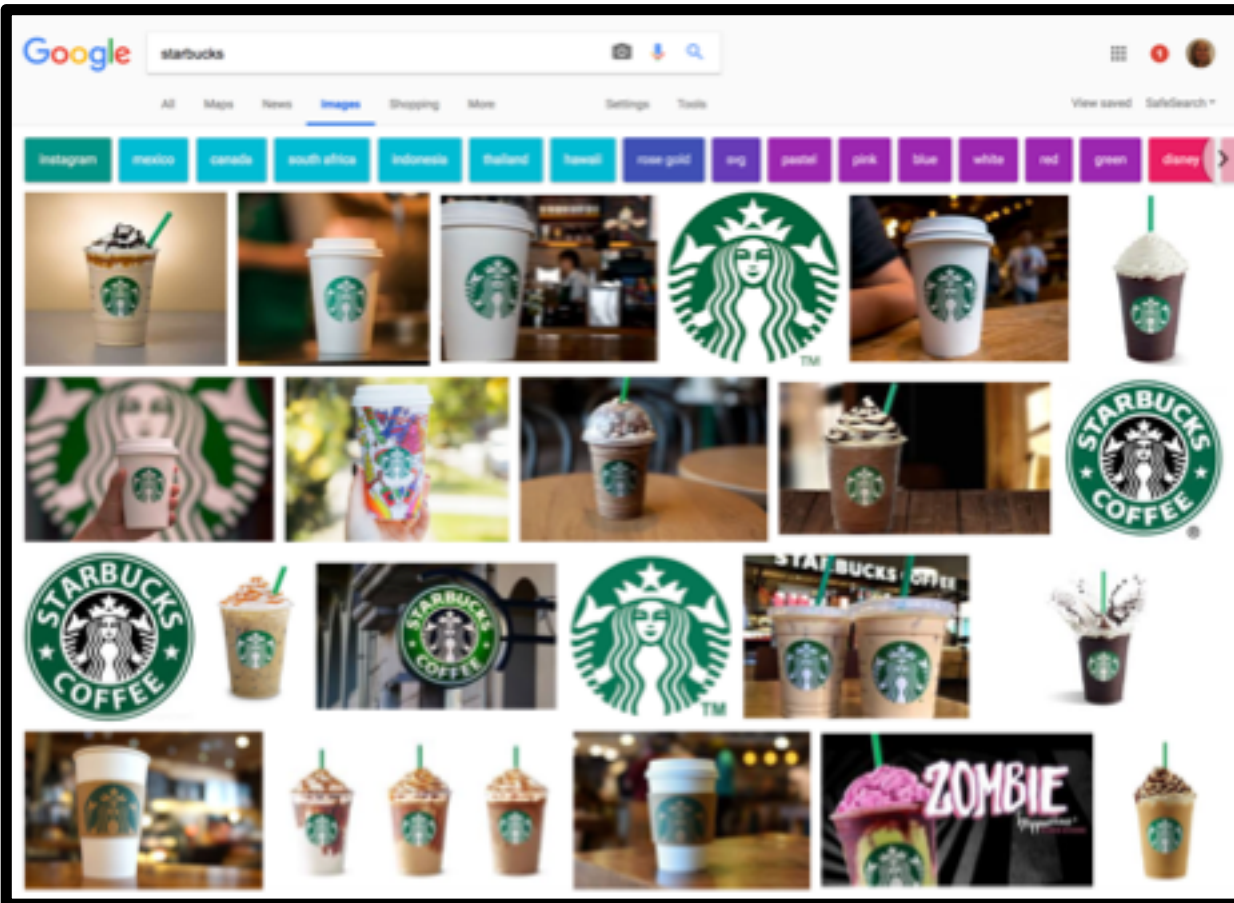
Objects...



Not people or animals



# Could you just use Google image search?



# Complications with annotating shapes

Is the object “flat” or “deep”?

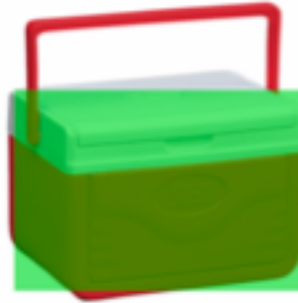
● Sphere (deep)



● Circle (flat)



■ Box (deep)



■ Rectangle (flat)



■ Cylinder (deep)



Other shapes



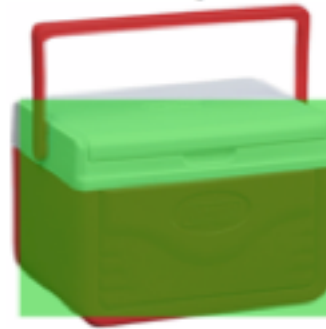
# Complications with annotating shapes

Are the parts outside the object important enough to identify it.

All of the object



Part of the object





# Two studies

- Can people independently do these tasks and find blends for random concept pairs?
  - How many iterations does it take?
- Can people create visual metaphors for their own messages?

# Study 1: Independent Microtasks

Bicycle + Fall



McDonald's + Energy



McDonald's + Healthy



NYC + Fashion



First iteration: 11 of 16 blends

# Study 1: Independent Microtasks

Bicycle + Fall



McDonald's + Energy



McDonald's + Healthy



NYC + Fashion



First iteration: 11 of 16 blends

Second iteration: 16 of 16 blends

# Study 2: Blends for Messages

## Public Service Announcement

“Wash your hands.  
It’s the smart move.”

## Concept Pair:

Hand-washing + Smart



# Study 2: Blends for Messages

## Advertisement

“Joe’s Coffee: Open Late”

## Concept Pair:

Joe’s Coffee + Night



# Study 2: Blends for Messages

## Advertisement

“Panel Discussion: Women in Computer Science”

## Concept Pair:

Women + Computer Science



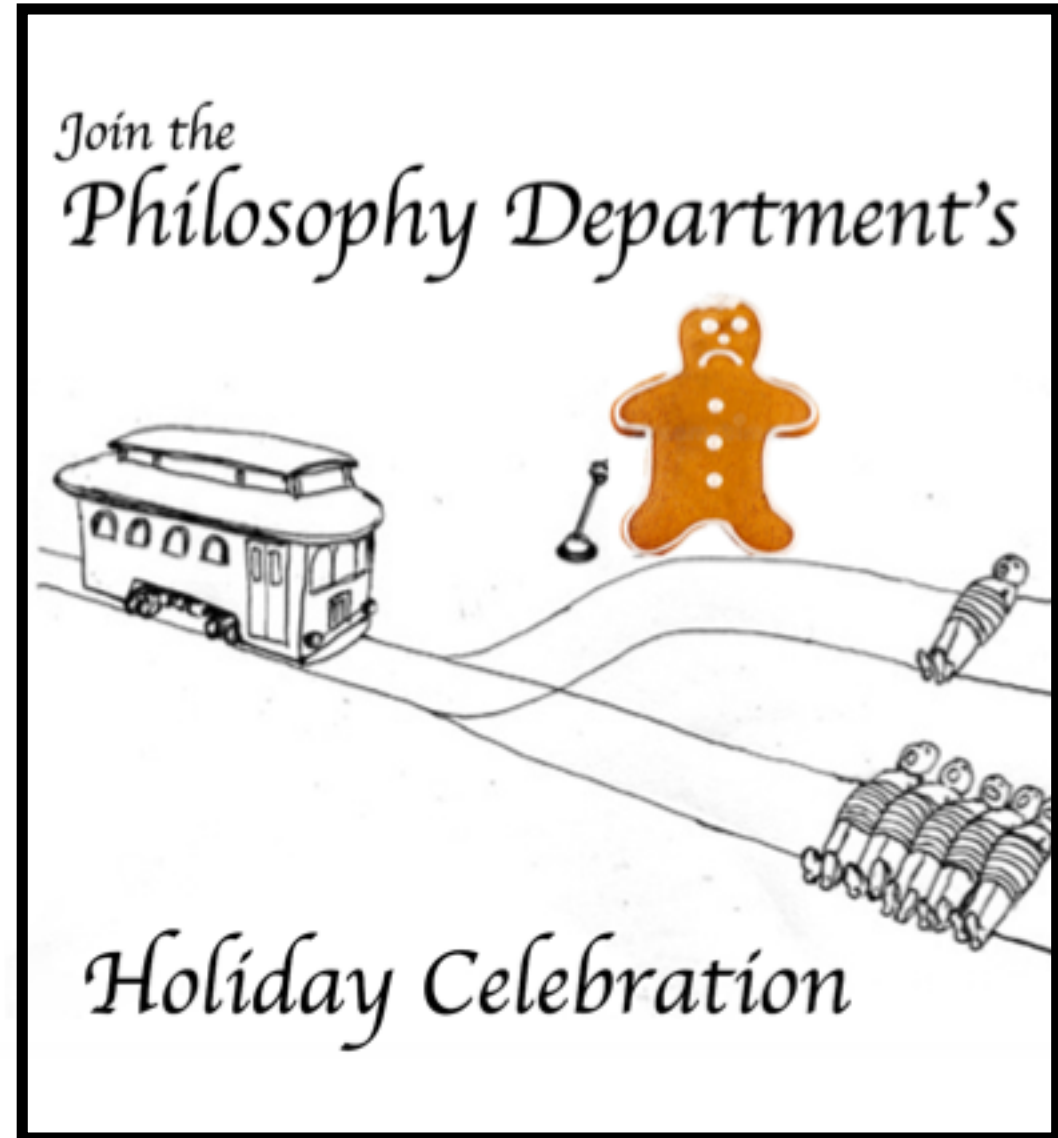
# Study 2: Blends for Messages

## Advertisement

“Join the Philosophy  
Dept’s Holiday Celebration”

## Concept Pair:

Philosophy + Christmas



# Study 2: Blends for Messages

## News

“Football linked to lasting brain damage.”

## Concept Pair:

Football + Dangerous



## Football Linked to Lasting Brain Damage

DALLAS, Tex. – Reports show an increasing number of retired NFL players who have suffered concussions have developed cognitive issues



What goes wrong in the process?  
(And how we iterate to fix it.)

Lego + Valentine's Day

Lego

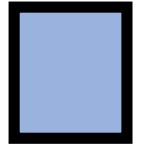
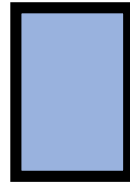
Valentine's Day

Brainstorm associations



Find Images of objects

Annotate shapes



Annotate shape coverage

Shape covers All of object

Shape covers Part of object

Blend



Evaluate



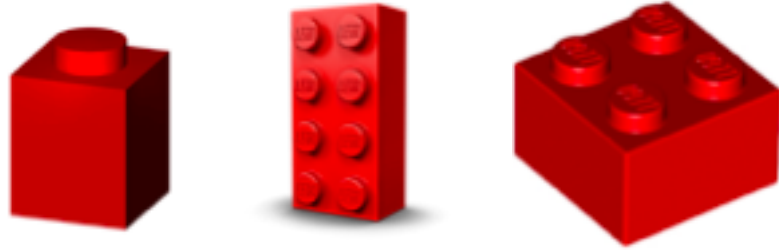
Are both objects identifiable?

Are two objects integrated into one object?

Lego

Valentine's Day

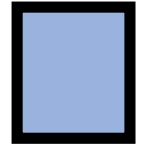
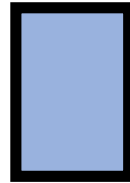
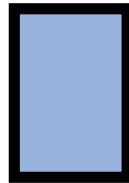
Brainstorm associations



Find Images of objects



Annotate shapes



Annotate shape coverage

Shape covers All of object

Shape covers Part of object

Blend



Evaluate



- Are both objects identifiable?
- Are two objects integrated into one object?

Football + Dangerous

Football

Dangerous

Brainstorm associations

Find Images of objects

Annotate shapes

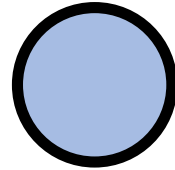
Annotate shape coverage

Blend

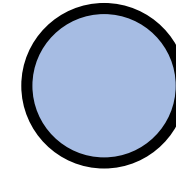
Evaluate



Are both objects identifiable?  
Are two objects integrated into one object?



Shape covers All of object



Shape covers Part of object



Football

Dangerous

Brainstorm associations

Find Images of objects

Annotate shapes

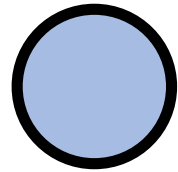
Annotate shape coverage

Blend

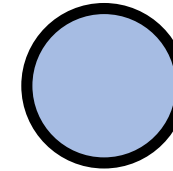
Evaluate



- Are both objects identifiable?
- Are two objects integrated into one object?



Shape covers All of object



Shape covers Part of object



NYC + Healthy



NYC

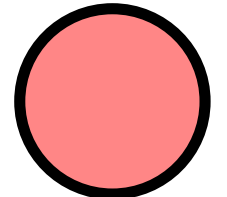
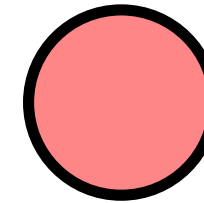
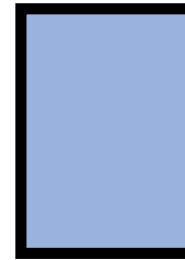
Healthy

Brainstorm associations

Find Images of objects



Annotate shapes



Annotate shape coverage

Blend

No shape matches

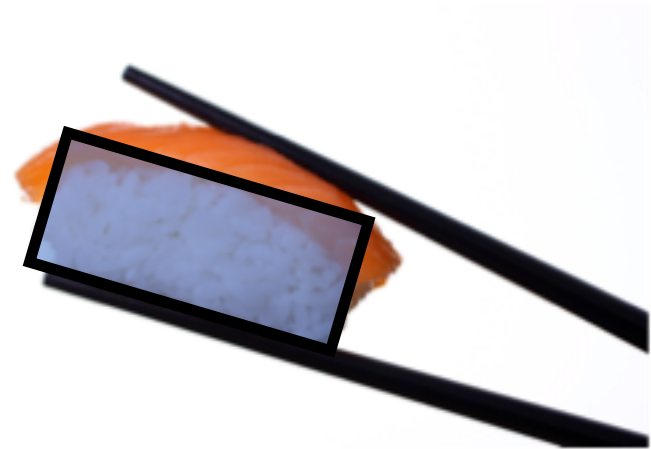
Evaluate

NYC

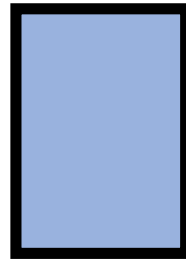
Healthy

Brainstorm associations

Find Images of objects



Annotate shapes



Annotate shape coverage

Blend



Evaluate



Are both objects identifiable?

Are two objects integrated into one object?

Orange + Healthy

Orange

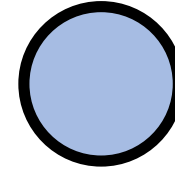
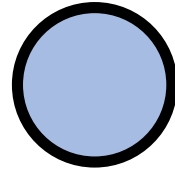
Healthy

**Brainstorm**  
associations



**Find Images**  
of objects

**Annotate**  
shapes



**Annotate**  
shape coverage

Shape covers  
**Part** of object

Shape covers  
**All** of object

**Blend**



**Evaluate**



Are both objects identifiable?  
Are two objects integrated into one object?

Orange

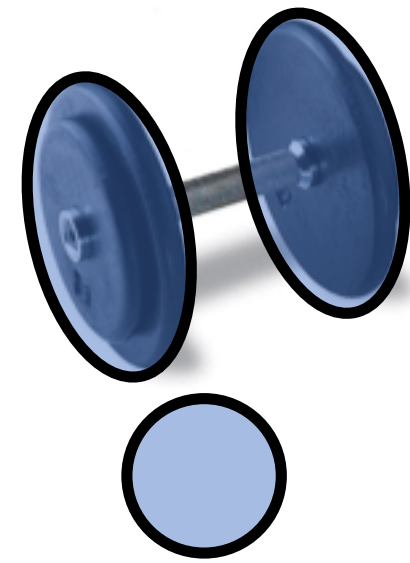
---



Shape covers  
**All** of object

Healthy

---



Exercise equipment

Shape covers  
**Part** of object

**Brainstorm**  
associations

**Find Images**  
of objects

**Annotate**  
shapes

**Annotate**  
shape coverage

**Blend**

**Evaluate**

Orange



Brainstorm associations

Find Images of objects

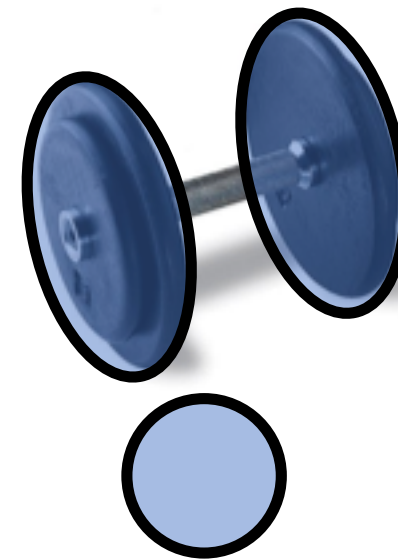
Annotate shapes

Annotate shape coverage

Shape covers All of object

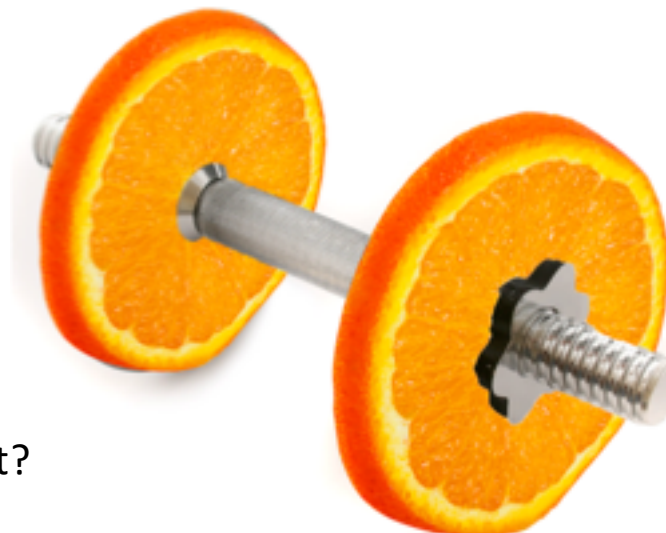
Healthy

Exercise equipment



Shape covers Part of object

Blend



Evaluate



- Are both objects identifiable?
- Are two objects integrated into one object?

# When do we need to iterate?

Improve object fit



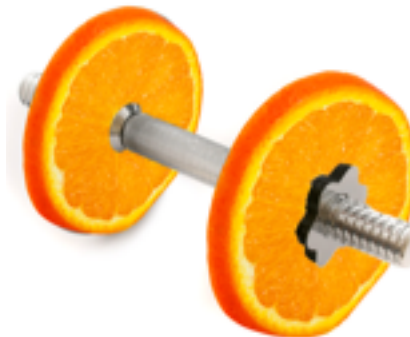
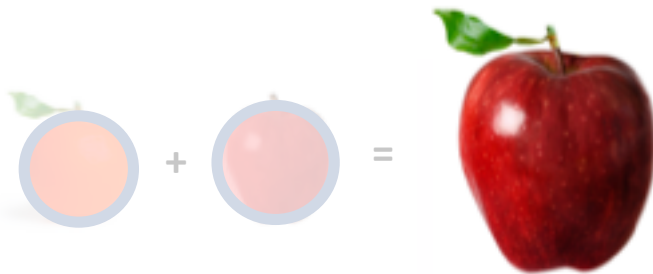
**Within same search space, meet other constraints.**  
Find versions of an object with different color, style, aspect ratio

No matches



**Focus on meeting a specific constraint:**  
Find symbols with a different shape

Objects are not identifiable



**Search in a new subspace**  
Find symbols with a different shape

# Outline

- Define Visual Metaphors
- Can viewers infer the message from a visual metaphor?
- Creating Visual Blends with crowds and machines
- **Refining Visual Blends**

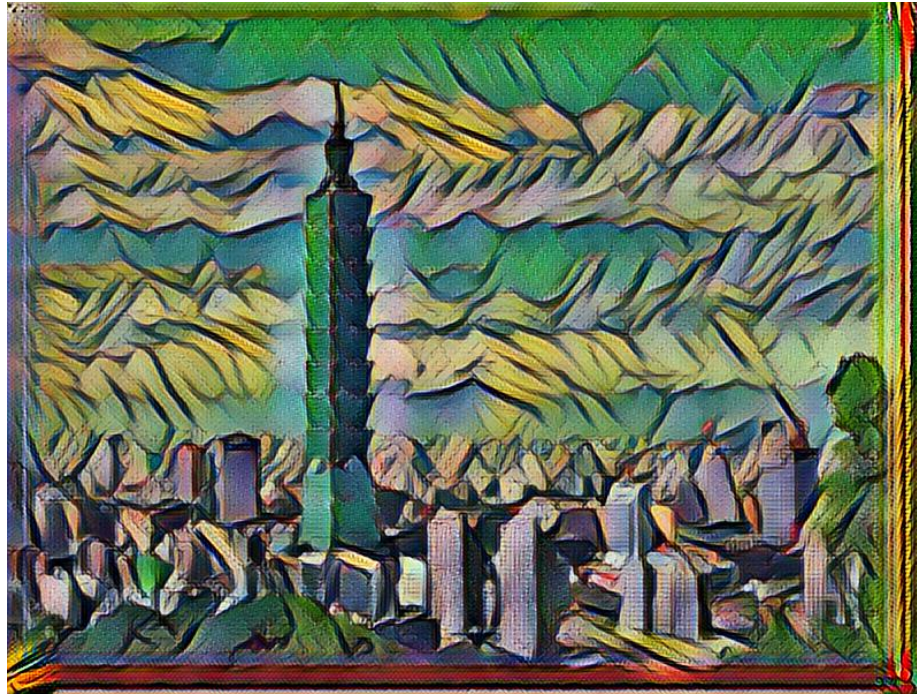
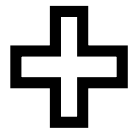


# Could you just use deep learning?

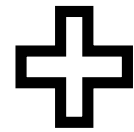


# Could you just use deep learning?

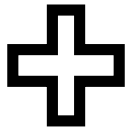
Fast Style Transfer



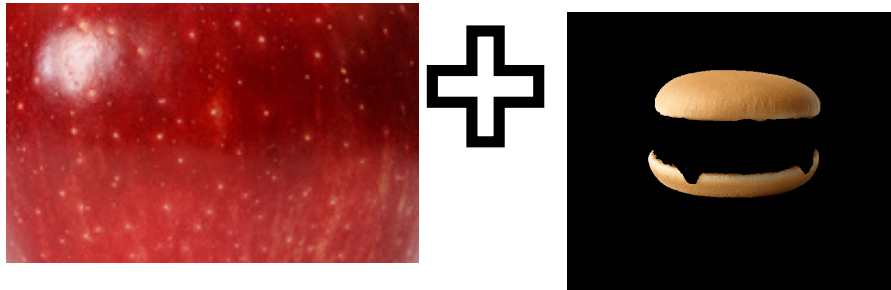
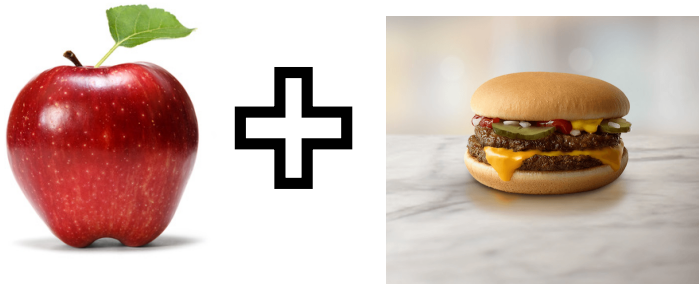
# Fast Style Transfer: Lego + Popsicle



# Fast Style Transfer: Apple + Burger



# Fast Style Transfer: Apple + Burger *Parts*



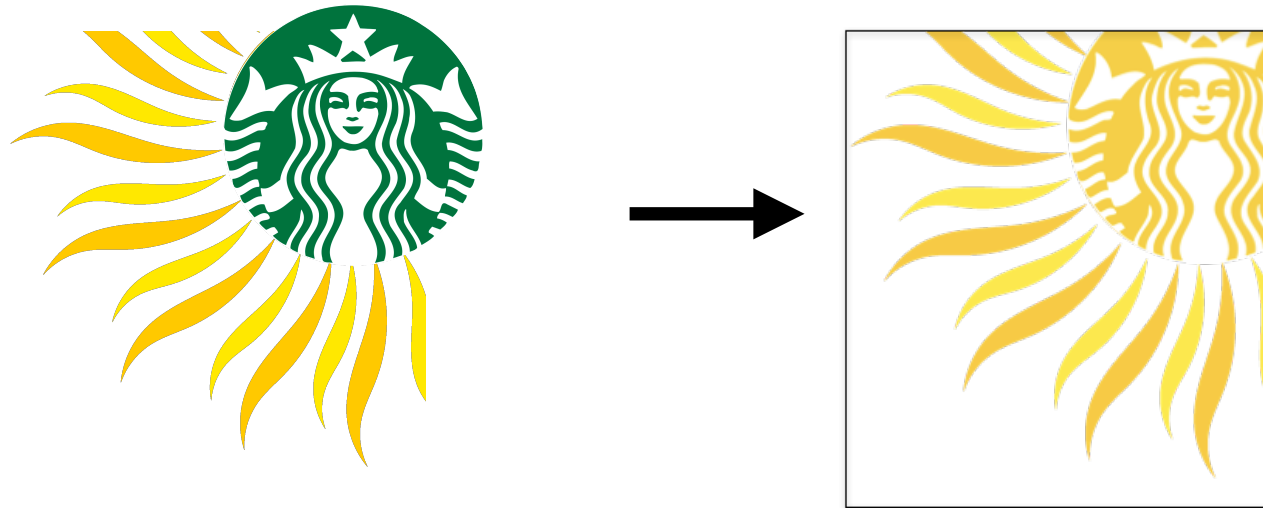
We can't just blend objects by applying the "style" of one to the other.



Instead, we can transfer visual properties individually:

- \* Color
- \* Internal details
- \* Shape mask
- \* Luminosity

# Why is this blend better when the Starbucks logo is yellow?



**Yellow is a highly identifying visual feature of the sun.**

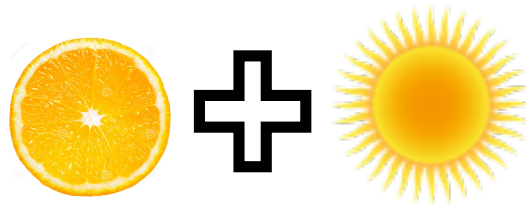
Although green is highly identifying of Starbucks, the internal details of the logo are identifying “enough” in any color.

# Some blends don't need refinement

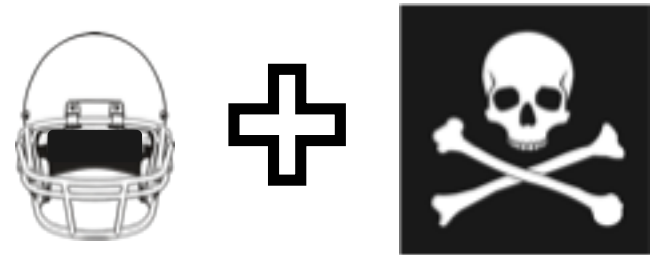
iPhone + Turn off



Orange + Summer



Football + Dangerous





Apply **color** of one object to the other



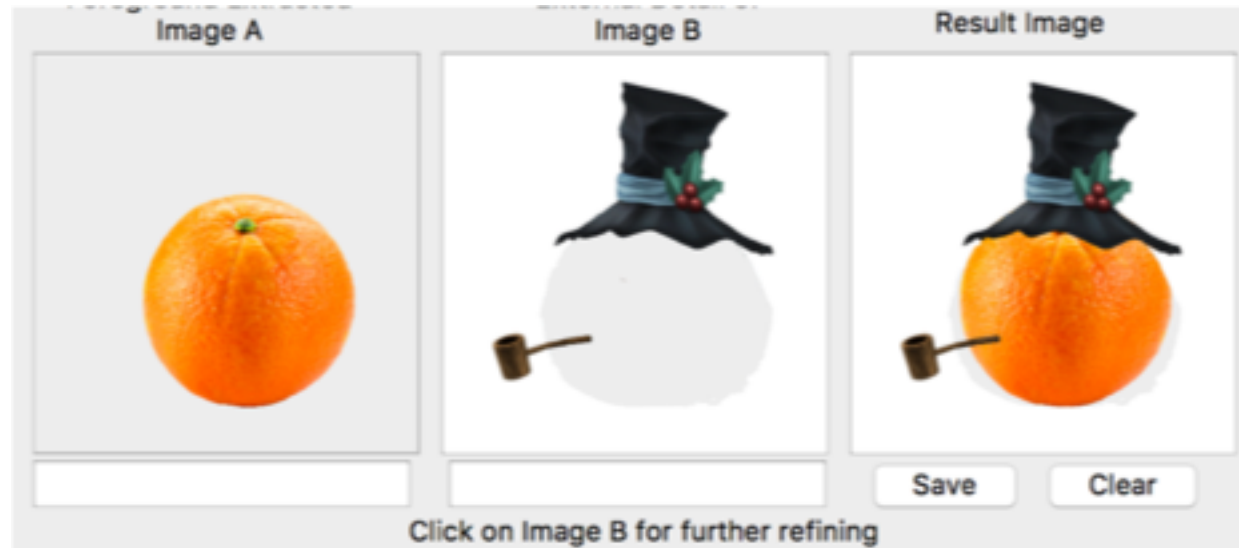
# Apply internal details of one object to the other



# Apply shape mask of one object to the other


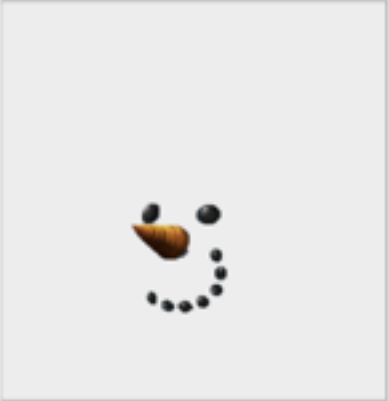



# Apply multiple visual features of one object to another



# Use Internal details of Snowman



Internal Detail Extraction		
Foreground Extracted Image A + External Detail of Image B	Internal Detail of Image B	Result Image
		

# Use shape mask of snowman

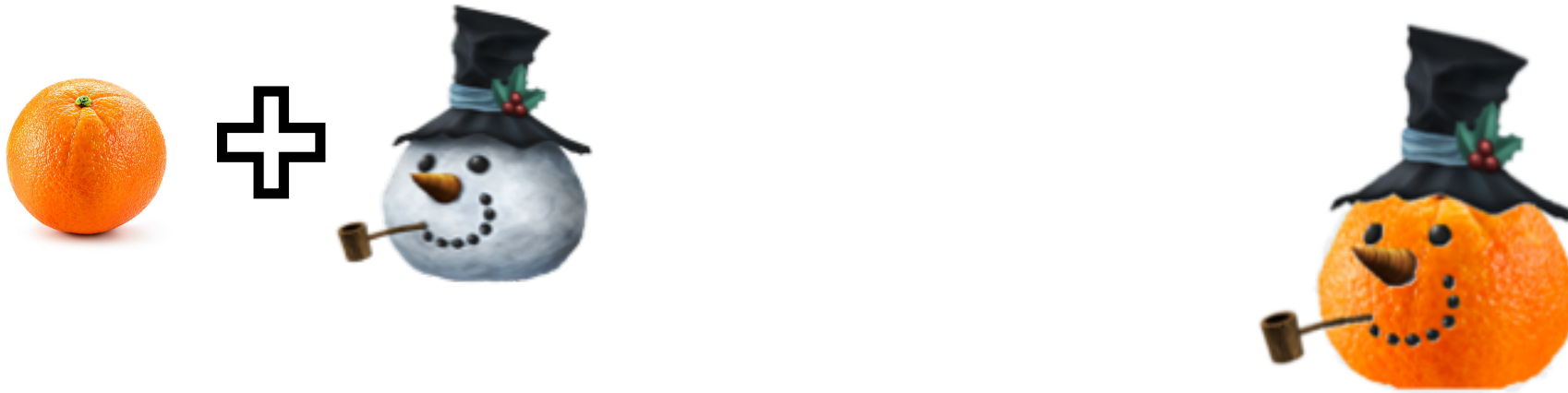


**Mask Clipping**





Image A	Image B	Mask Image	Result Image
			

Click on Image B for further refining

# Use **luminosity** channel of snowman



**Luminance Adjustment / Transparency Adjustment**

Mask	Mask Clipped Image	Luminance Adjusted Image A	Result image
			

# The Evolution of *Orange + Snowman*

Original:  
Shape replacement



Use **internal details**  
of snowman



Use **shape mask**  
of snowman



Use **luminosity**  
Of snowman





# Summary

# Visual Metaphors blend two symbols into one object

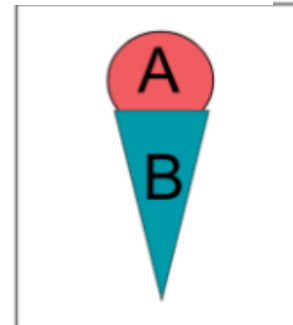
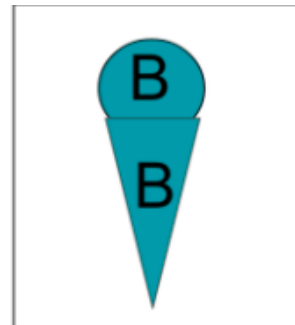
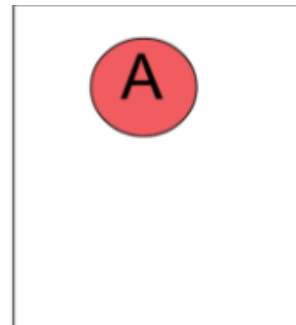


Starbucks is “summer-y”

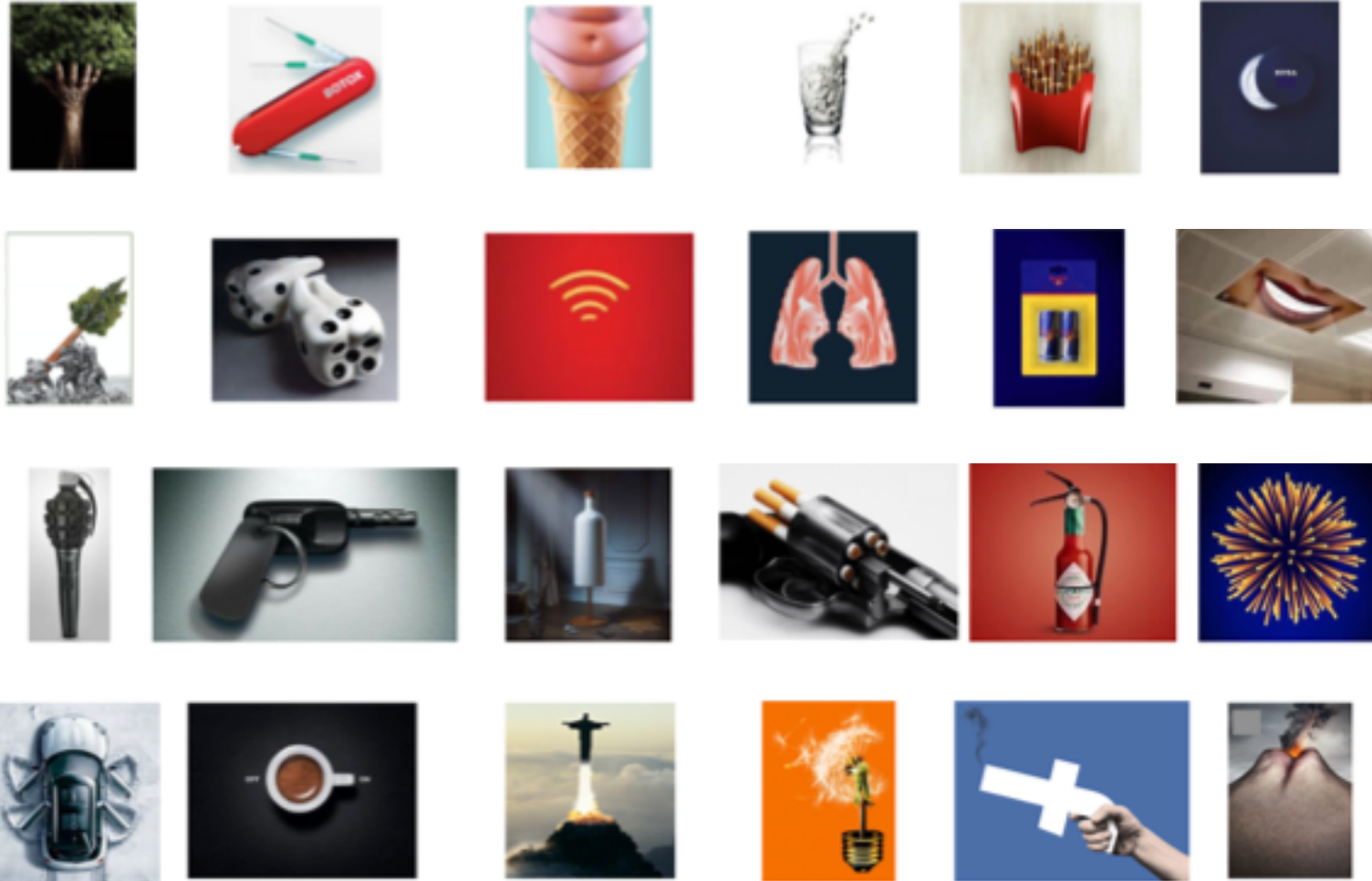
1. Two concepts:
  1. a concrete noun
  2. an abstract property.
2. Two objects: one representing each each concept
3. Two objects are integrated into one object
4. Both objects are individually recognizable.

## Single Shape matching

one design pattern for creating visual blends



# People infer the message from Visual Metaphors **49% of the time**

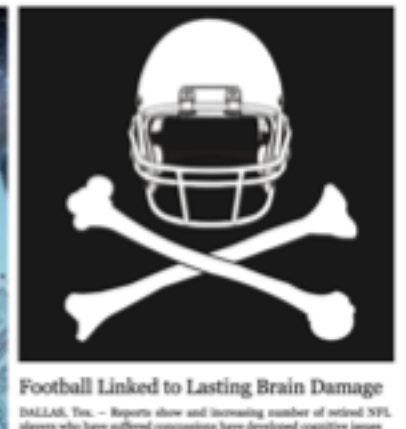
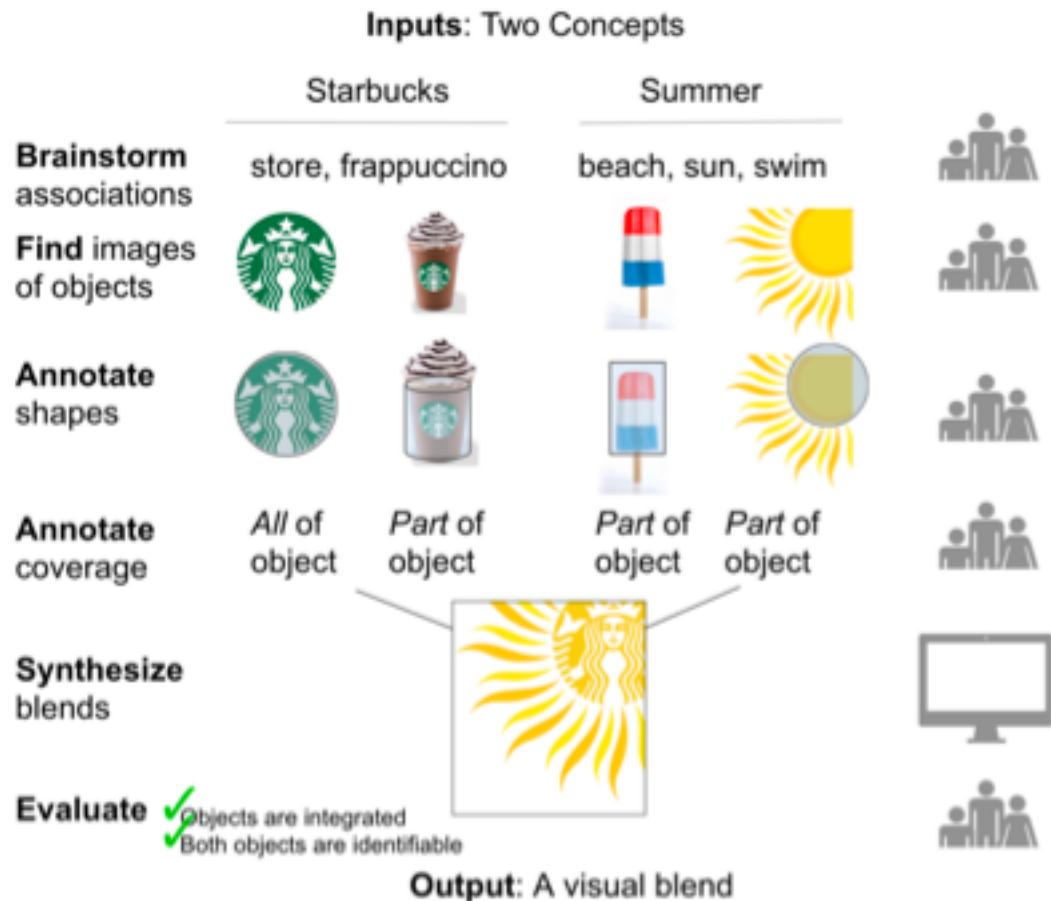


People infer the two objects  
**85% of the time.**

People infer the message  
without text  
**49% of the time.**

# Creating Visual Metaphors can be seen as a constraint-based search problem

(currently we need people to help with the search)



# To refine blends, transfer visual features from one object to another individually

Original:  
Shape replacement



Use **internal details**  
of snowman



Use **shape mask**  
of snowman

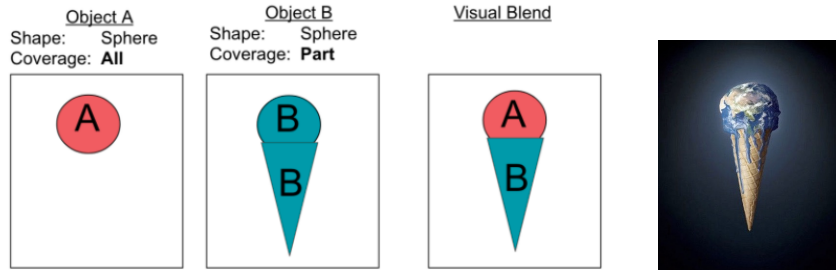


Use **luminosity**  
Of snowman



# Creating **VisuaMetaphors** with Crowds and Machines

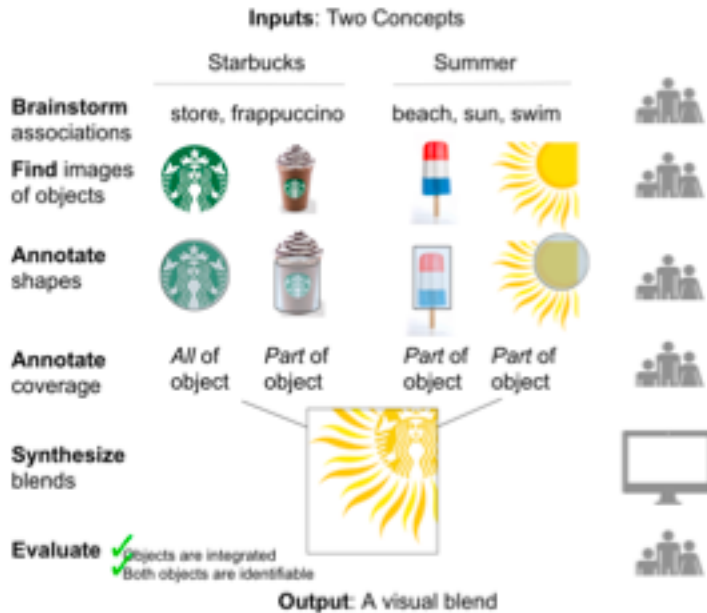
## Design Pattern



## Blends for Messages



## Interactive Pipeline



## Tool for refining blends

