

WHAT ARE OUR CAMERAS SAYING?

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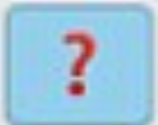




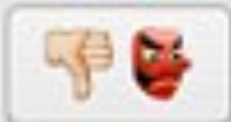
03/23/2014 5:30 PM



04/07/2014 8:04 PM



04/07/2014 8:27 PM

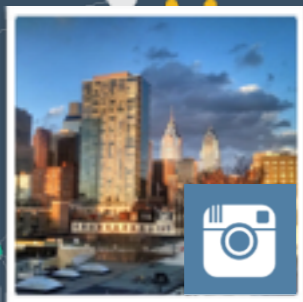


Alex Goldmark & Liza Stark

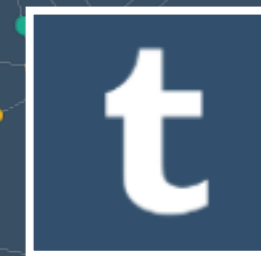
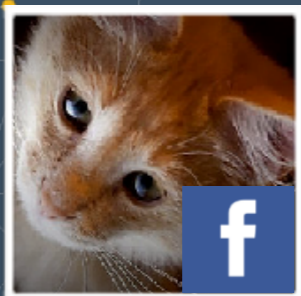
PEOPLE COMMUNICATE VISUALLY







A screenshot of a Facebook post. The top part shows a large image of a ginger and white kitten. Below it is the profile picture and name 'Funny Cat Pics' with the tagline 'Entertainment Website'. The post text says 'here you go guys some more pics from me-doglover' and includes a collage of various cat photos with captions like 'the Crazy Cat lady Starter Kit', 'that's just rude', 'Close enough', and 'Y U OUTBID ME'. The post has 181 likes and 5 comments. The Facebook interface elements like 'Like', 'Message', and 'Share' are visible.

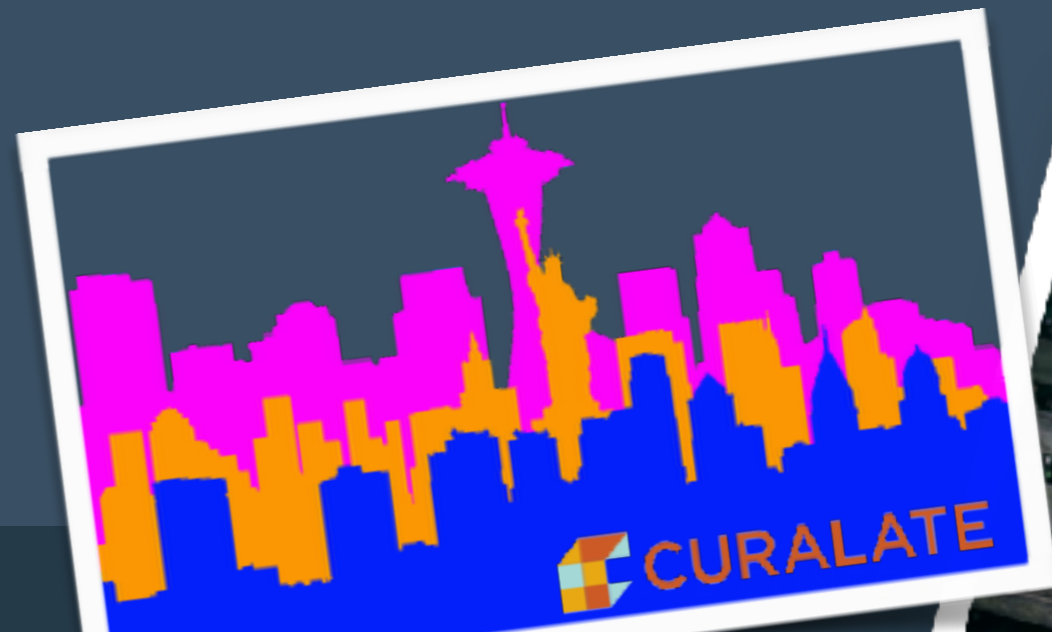
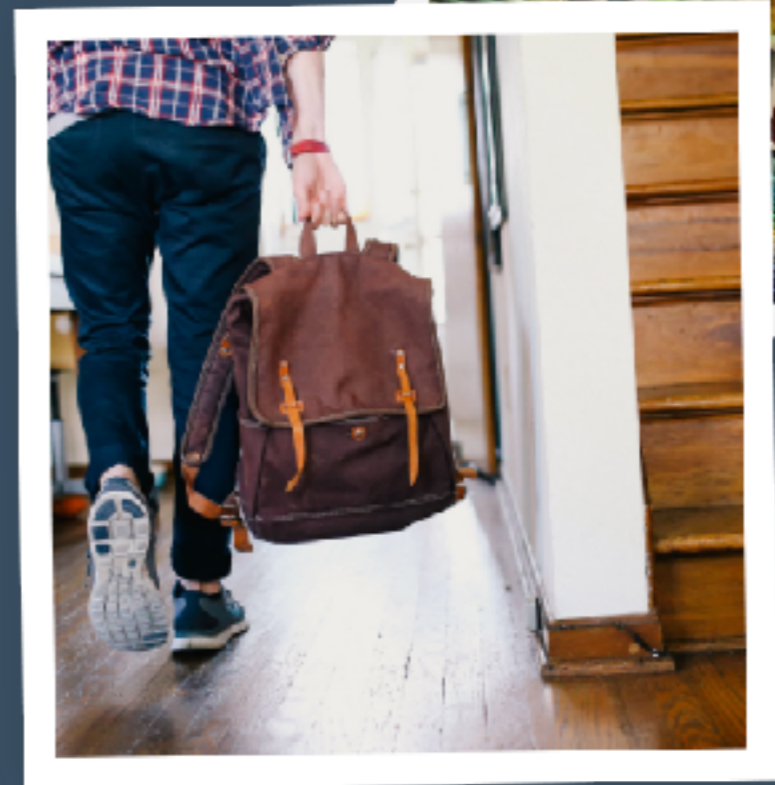


WHAT ARE PEOPLE SAYING?



CURALATE

- PHL/NYC/SEA
- VC Funded
- *We're Hiring!*



COMPUTER VISION






URBAN OUTFITTERS

Women's / Dresses + Rompers

Margot Crepe Floral Day Dress \$69



S M L

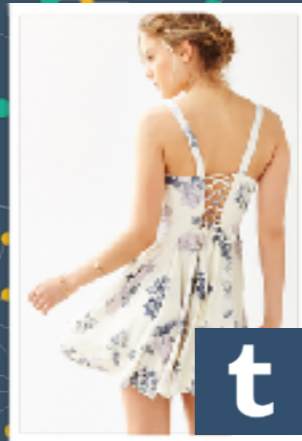

Add to Bag

Add to WishList

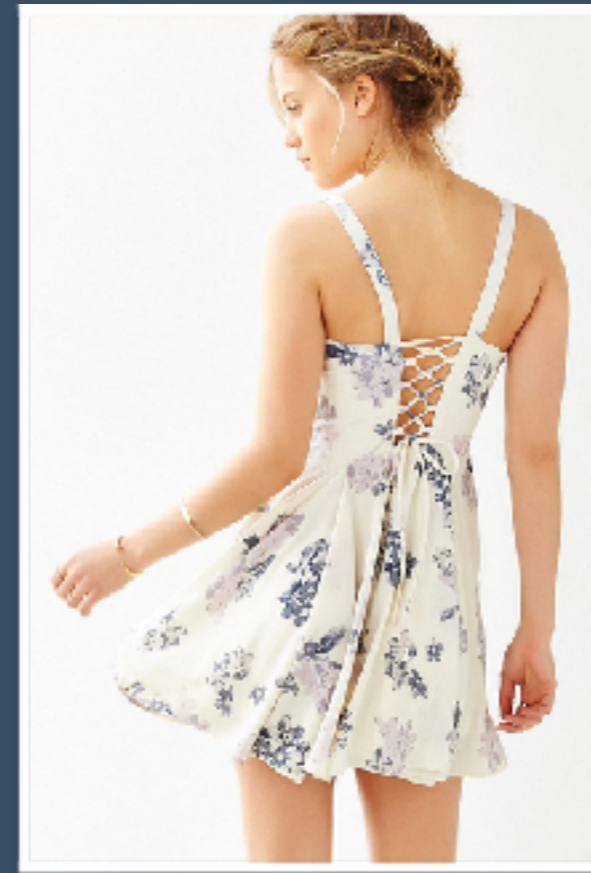
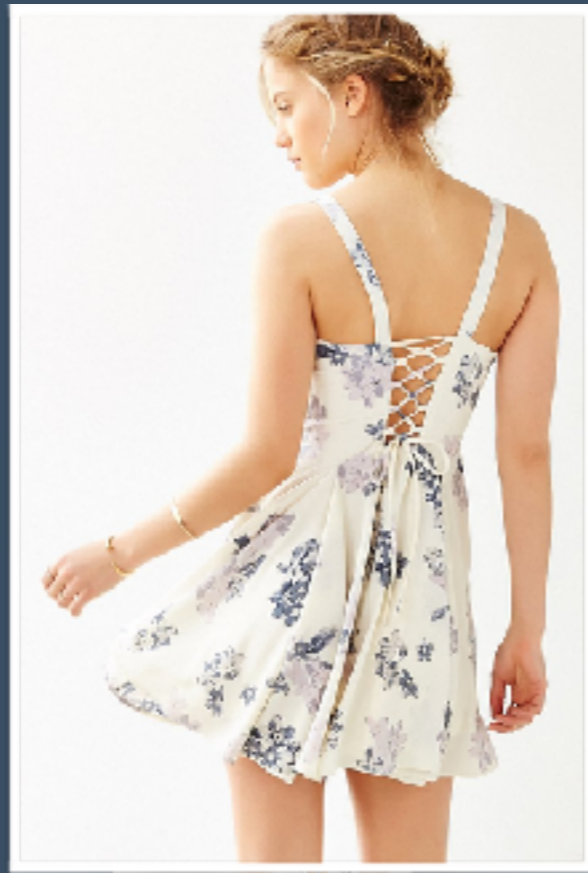
Details

Product Sku: 34885996; Color Code: 059

Sweetly feminine floral-printed day dress from Margot. Fit + flare silhouette featuring a fitted bodice, short + swingy skirt and thick shoulder straps complete with a lattice tie closure at the back.



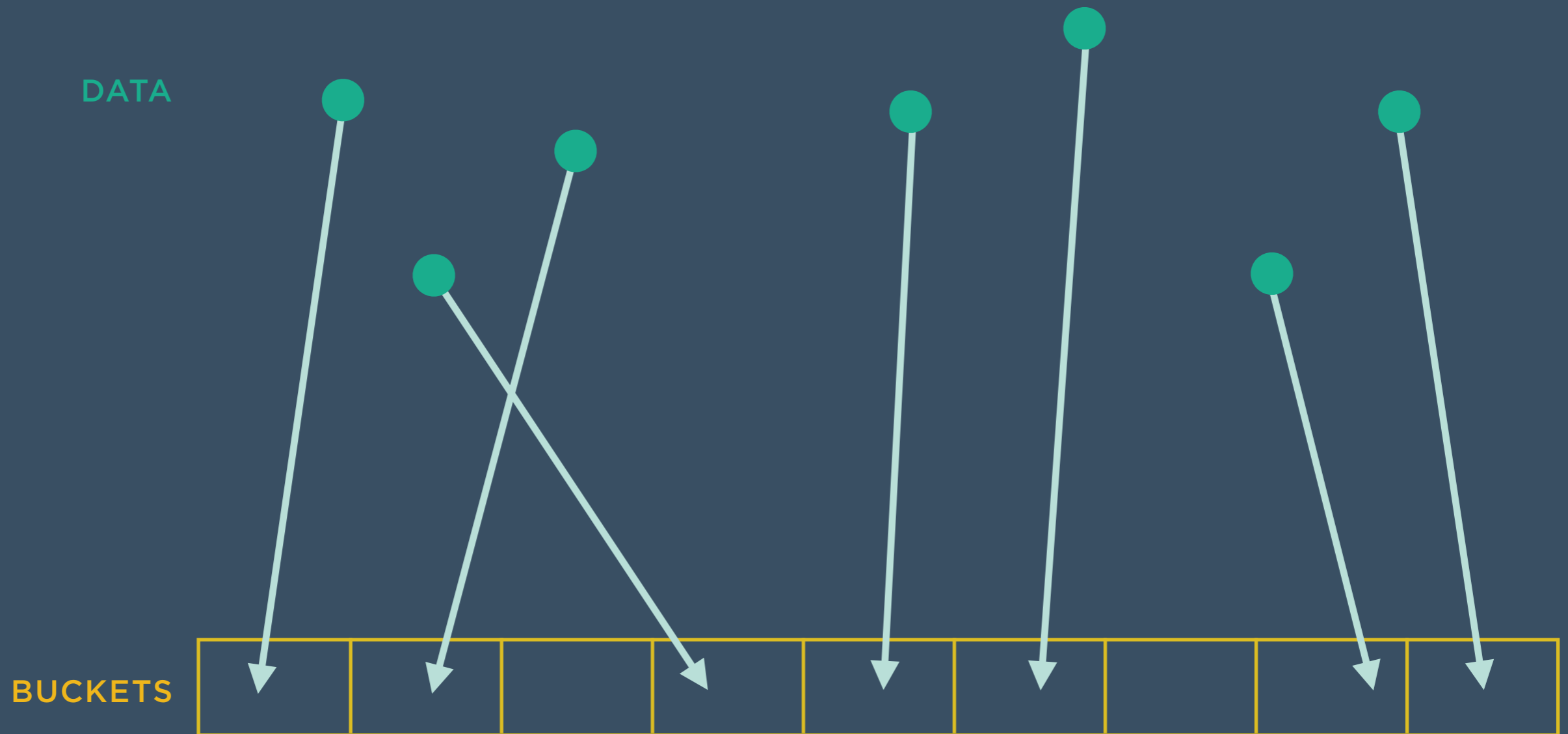
ARE THESE TWO PICTURES THE SAME?



$$|a - b| \leq r$$

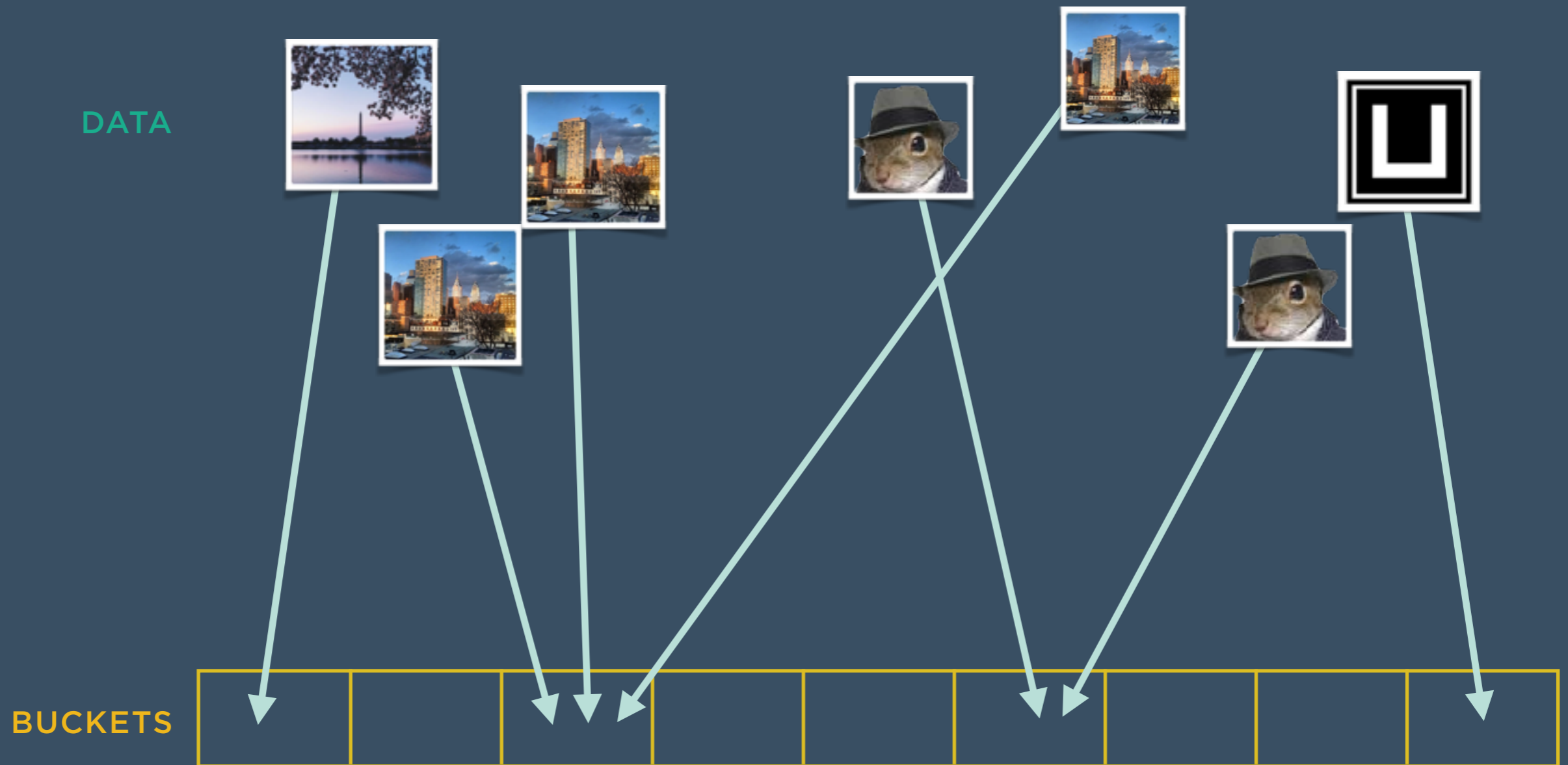
GOAL: MINIMIZE DATABASE QUERIES

HASHING



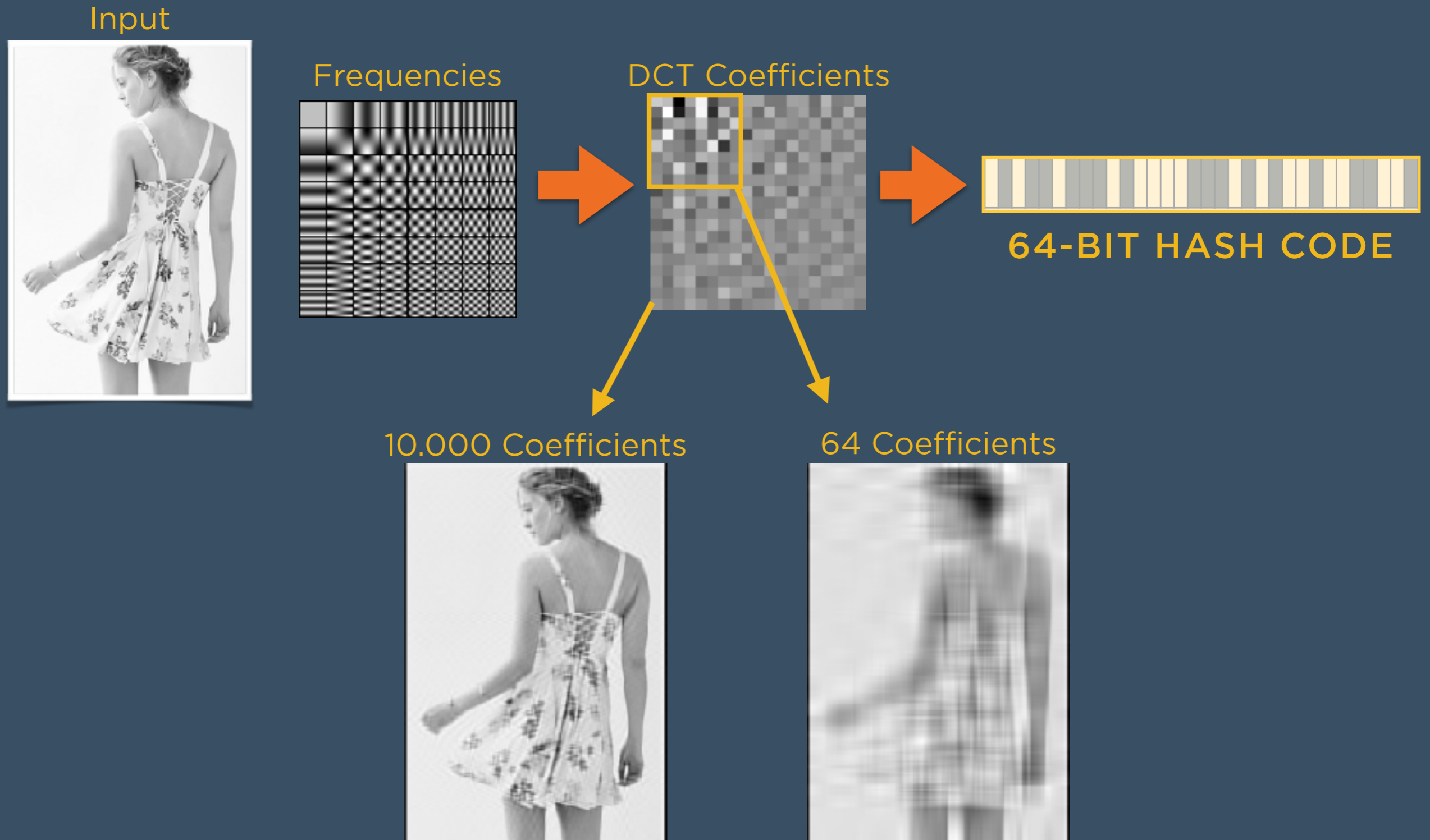
GOAL: AVOID COLLISIONS

PERCEPTUAL HASHING

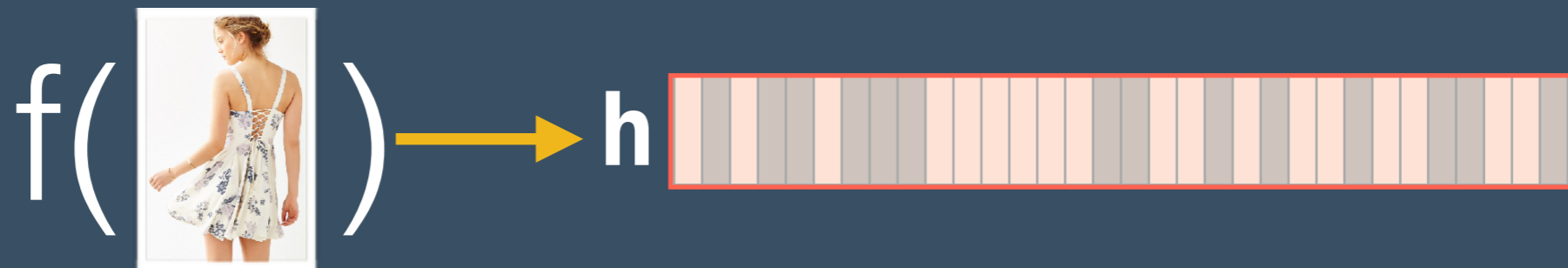
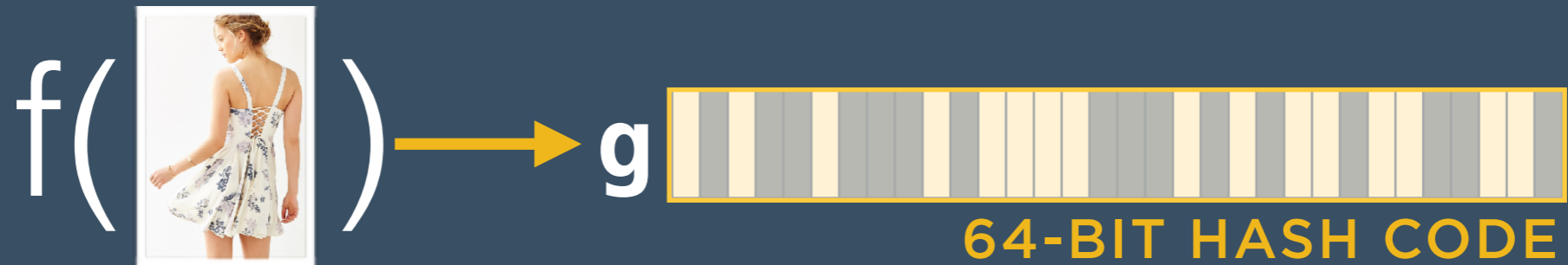


GOAL: COLLIDE SIMILAR IMAGES

DISCRETE COSINE TRANSFORM

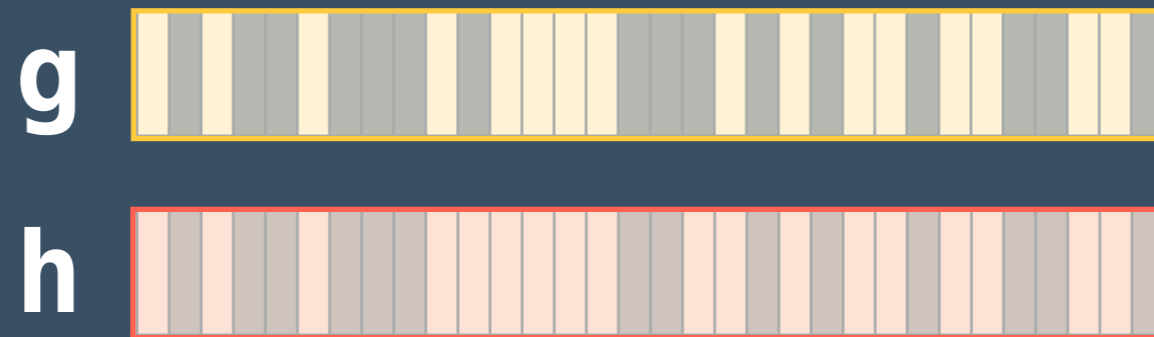


PERCEPTUAL HASHING



Same image iff: $\text{hamming-distance}(h, g) \leq r$

HASH QUERIES



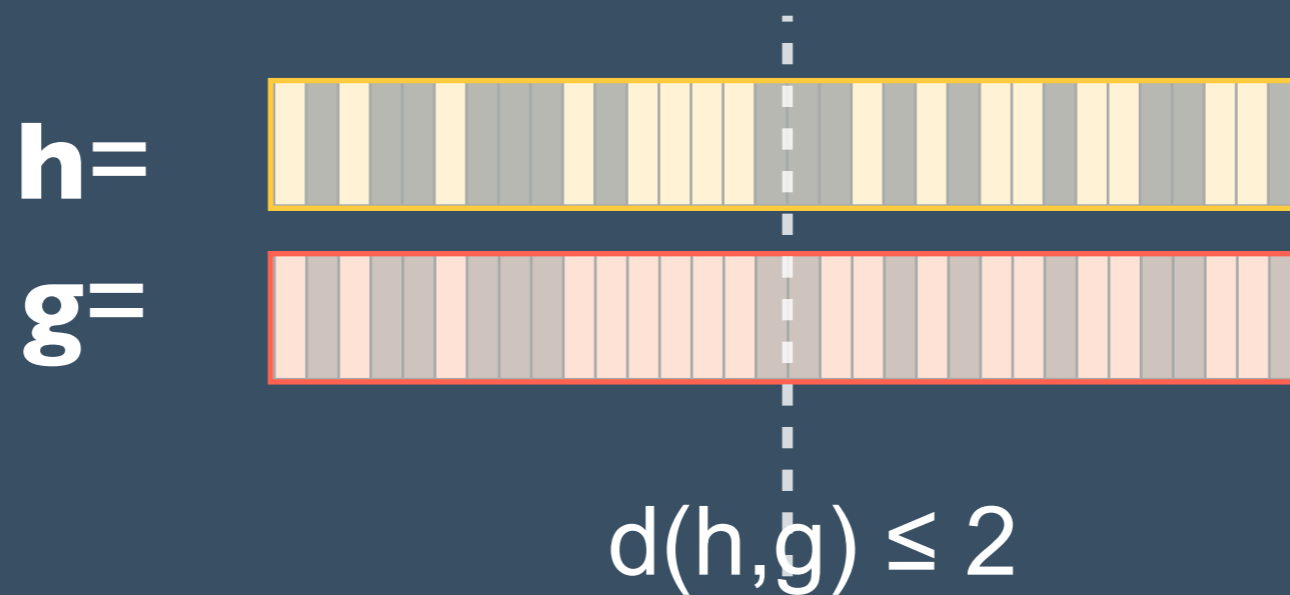
r	Queries
0	1
1	64
2	2016

Total Number of Queries = $\sum_{k=0}^r \binom{b}{k} = 2081$

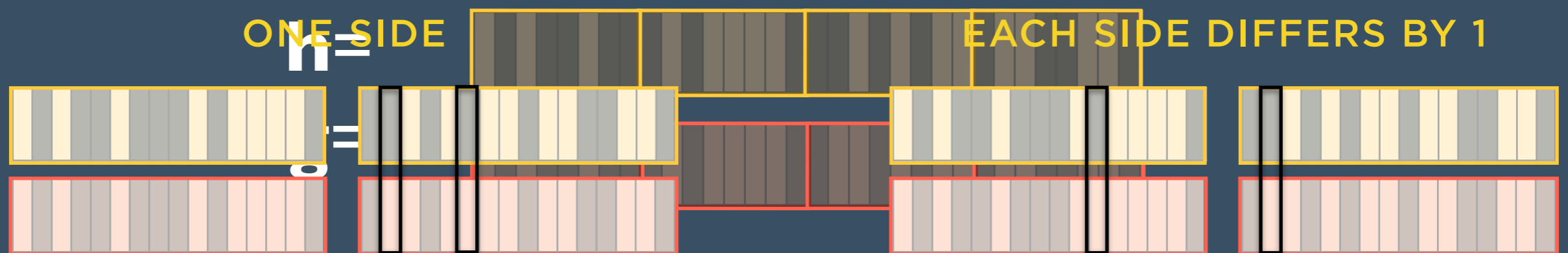
CAN
WE DO
BETTER?



MULTI-INDEX HASHING

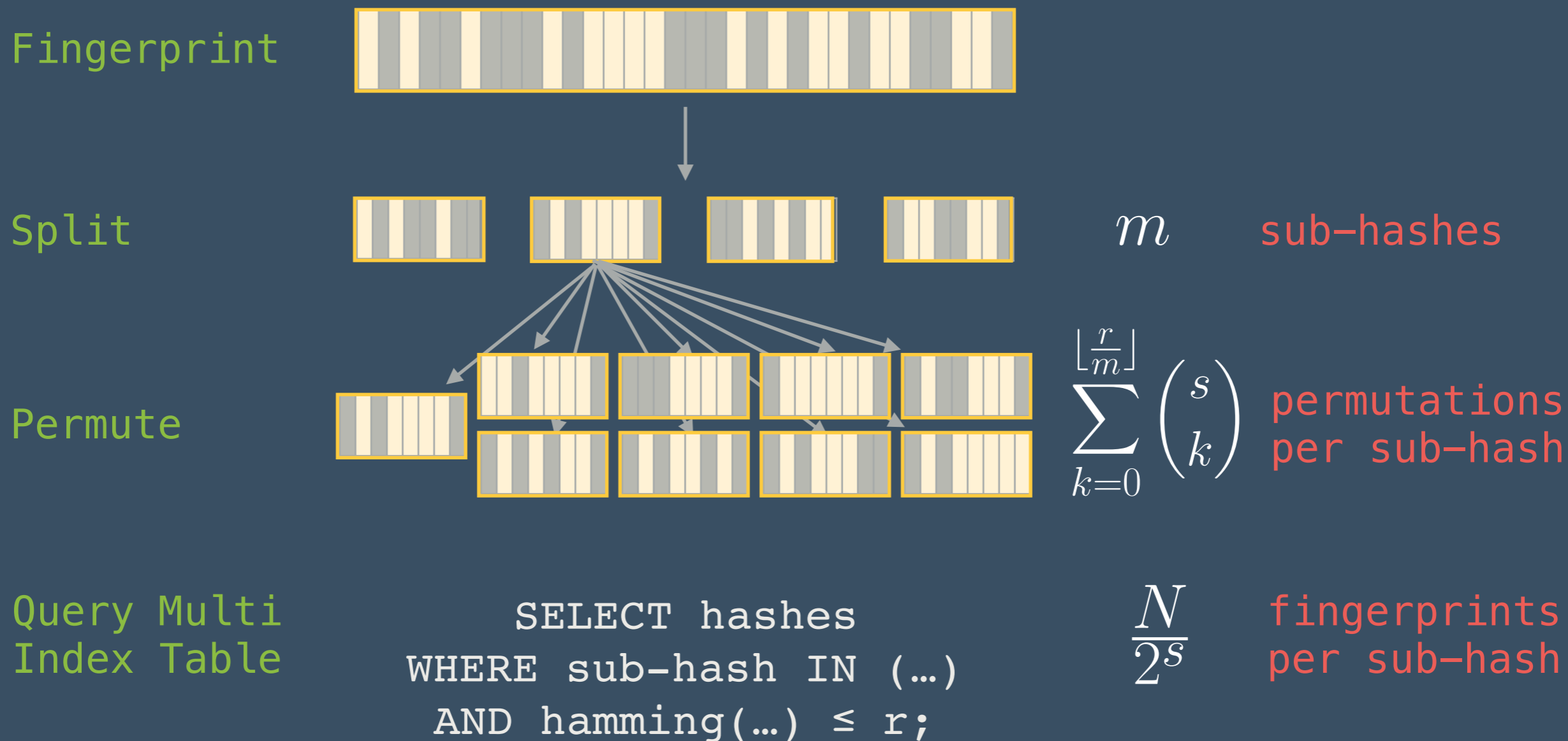


EITHER:
split into m sub-hashes of s bits each



$$\exists i : d(g^i, h^i) \leq \lfloor \frac{r}{m} \rfloor$$

MULTI-INDEX HASHING



ONLY **66** DATABASE QUERIES!

IMPLEMENTATION

- **Architecture:**
 - AWS Web Service
 - C++/Scala
 - NoSql Tables in Dynamodb
 - Scales *Linearly* with database queries!
- **Stats:**
 - Deployed since 2012
 - ~75 new images/second
 - 3.7 billion images

EMOJI: WHAT DO THEY MEAN?



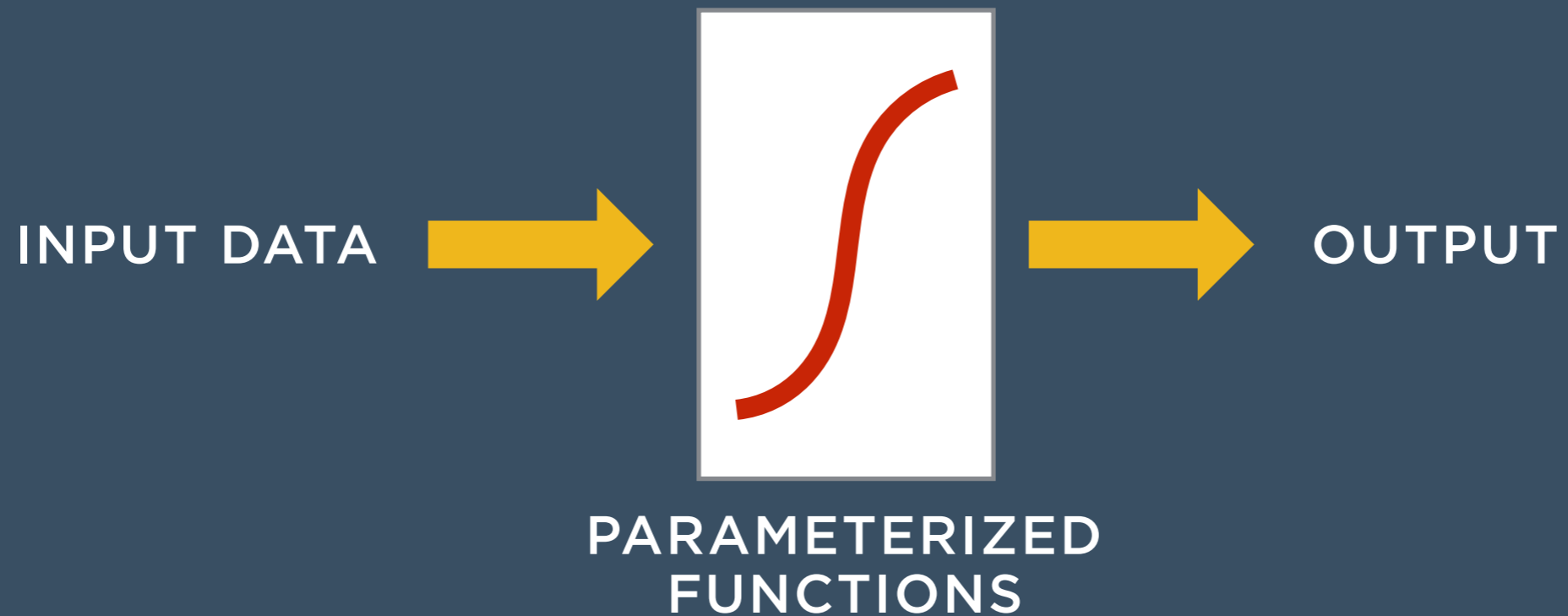
100



?

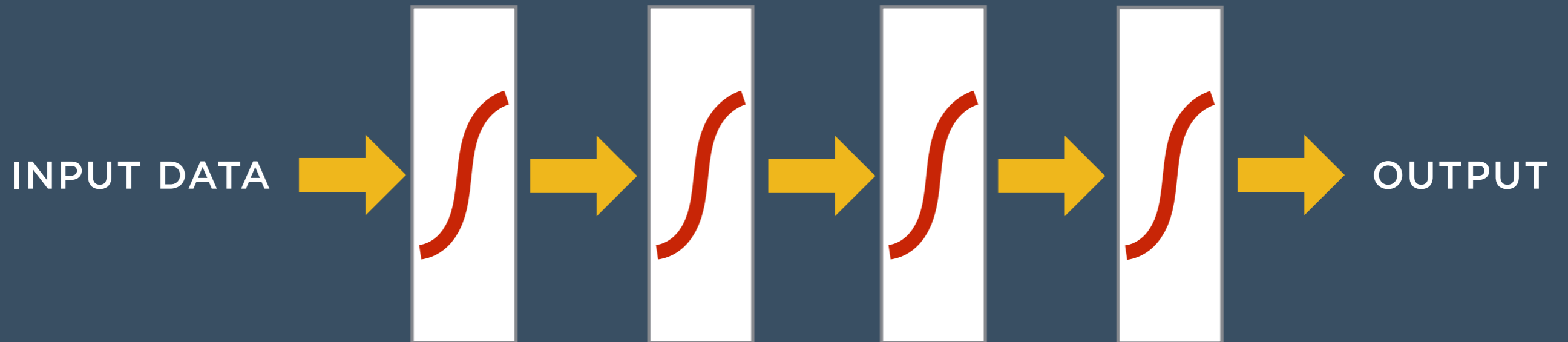


MACHINE LEARNING



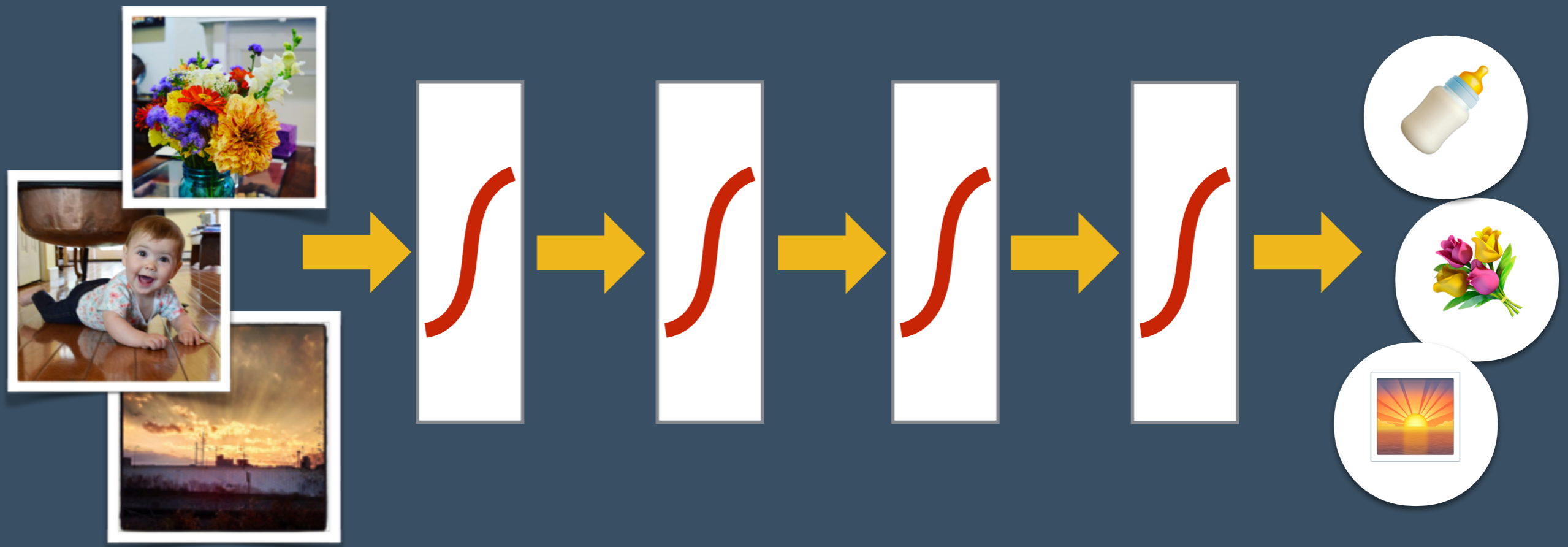
DEEP LEARNING

INTERMEDIATE REPRESENTATIONS



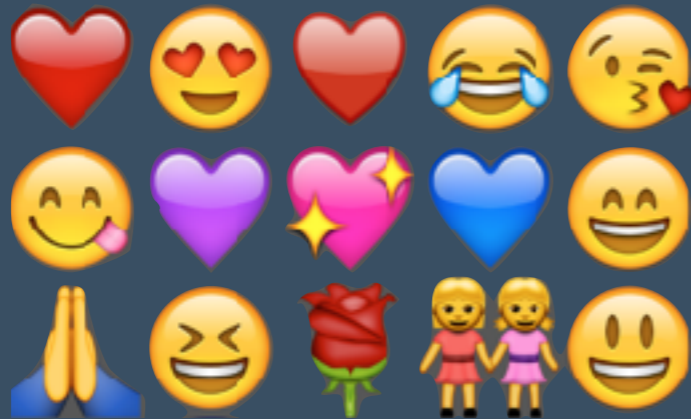
DEEP LEARNING

INTERMEDIATE REPRESENTATIONS

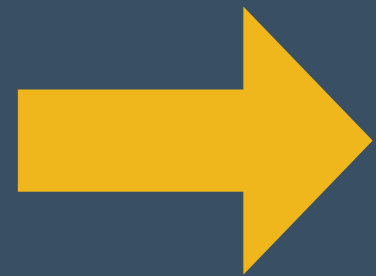
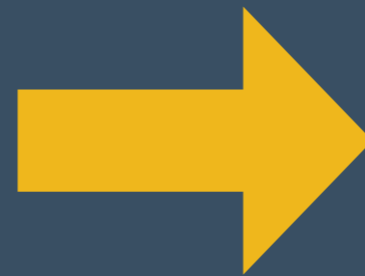


BREWING EMOJINET

Top 500 Emojis

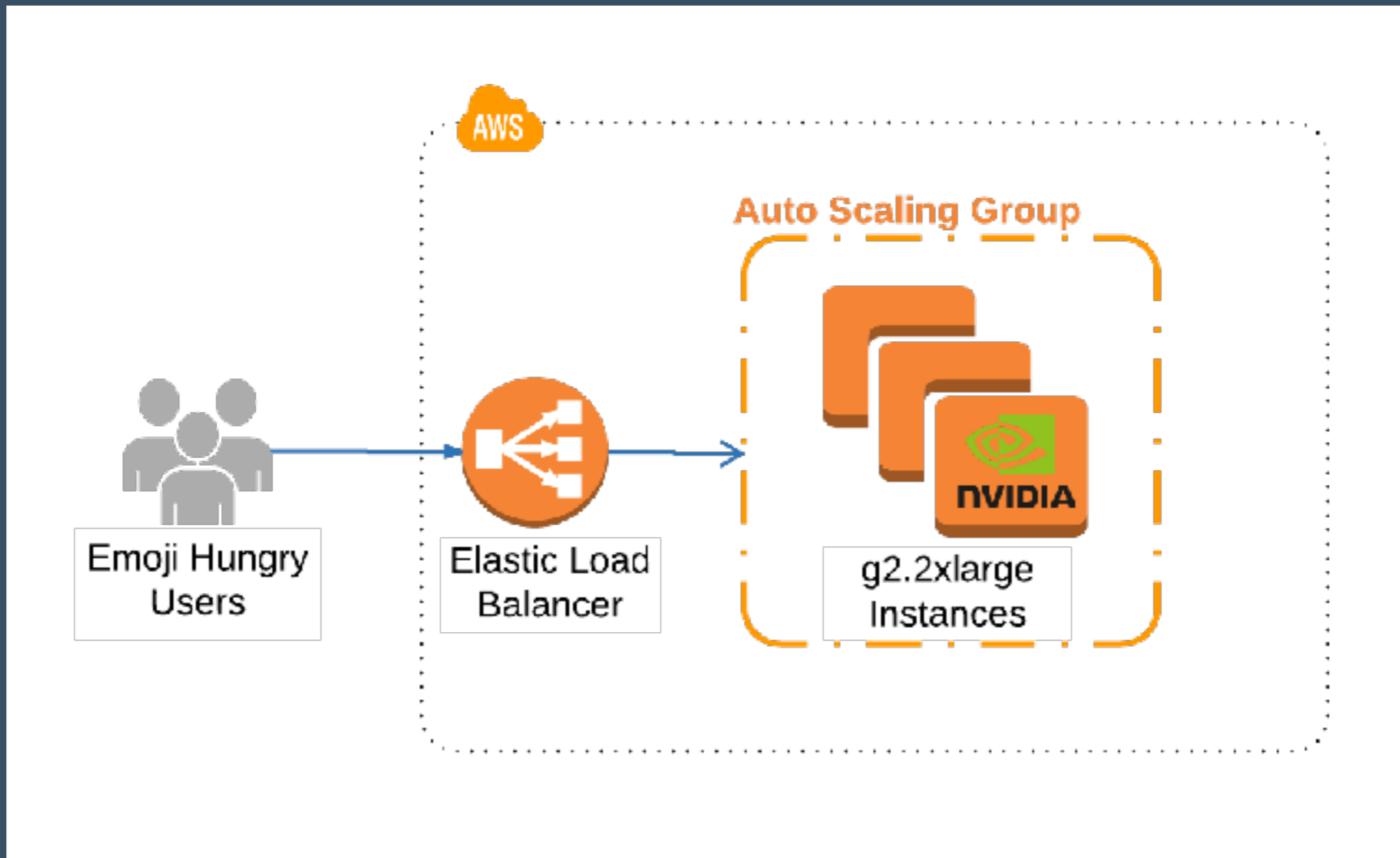


Instagram API



GET: /v1/tags/😊/media/recent

EMOJI WEB SERVICE



WHEN DO WE SCALE OUT?

EMOJI WEB SERVICE

- Lock GPU with actor singleton
- Akka ask pattern for async abstraction
- Publish wait time to Cloudwatch
- Scale ASG based on wait time

Actor

```
object EmojiNetActor {
  val instance = actorSystem.actorOf(Props(new EmojiNetActor))
}

private class EmojiNetActor() extends Actor {
  def receive: Receive = {
    case (image: BufferedImage, queueTime: Long) => {
      val waitTime = now() - queueTime
      cloudwatch.putMetricData(... waitTime ...)
      val emojis = emojiDeepNet.hitGPU(image)
      sender ! emojis
    }
  }
}
```

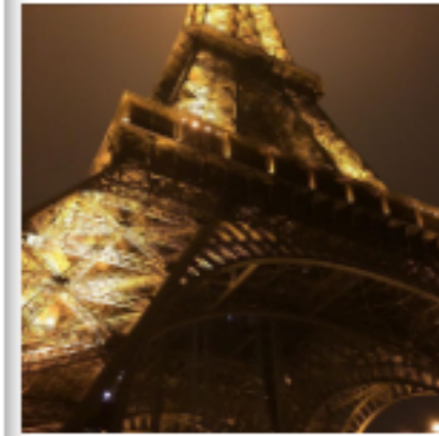
Consumer (Web Thread)

```
implicit val timeout = Duration(1, "second")
def getEmojis(image: BufferedImage):
Future[EmojiResult] = {
  val request = (image, now())
  EmojiNetActor.instance.ask(request).map {
    case x: EmojiResult => x
    case _ => throw ....
  }
}
```



THE EMOJINI 3000

The Internet's Premiere Emoji Granting Genie



 GRANT EMOJIS

Try Your Own Photo:

 CONNECT

OR

Enter Image URL **GO!**

OR

 UPLOAD

TOP RESULT FOR



TOP RESULT FOR 🤔



TOP RESULT FOR 🖐️



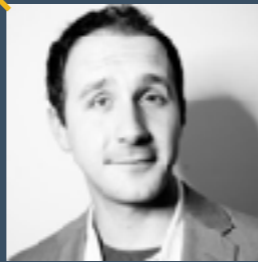
TOP RESULT FOR



TOP RESULT FOR 🙌🙌



The winking bunny goes a long way.



Alex Goldmark



THANK
YOU!

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