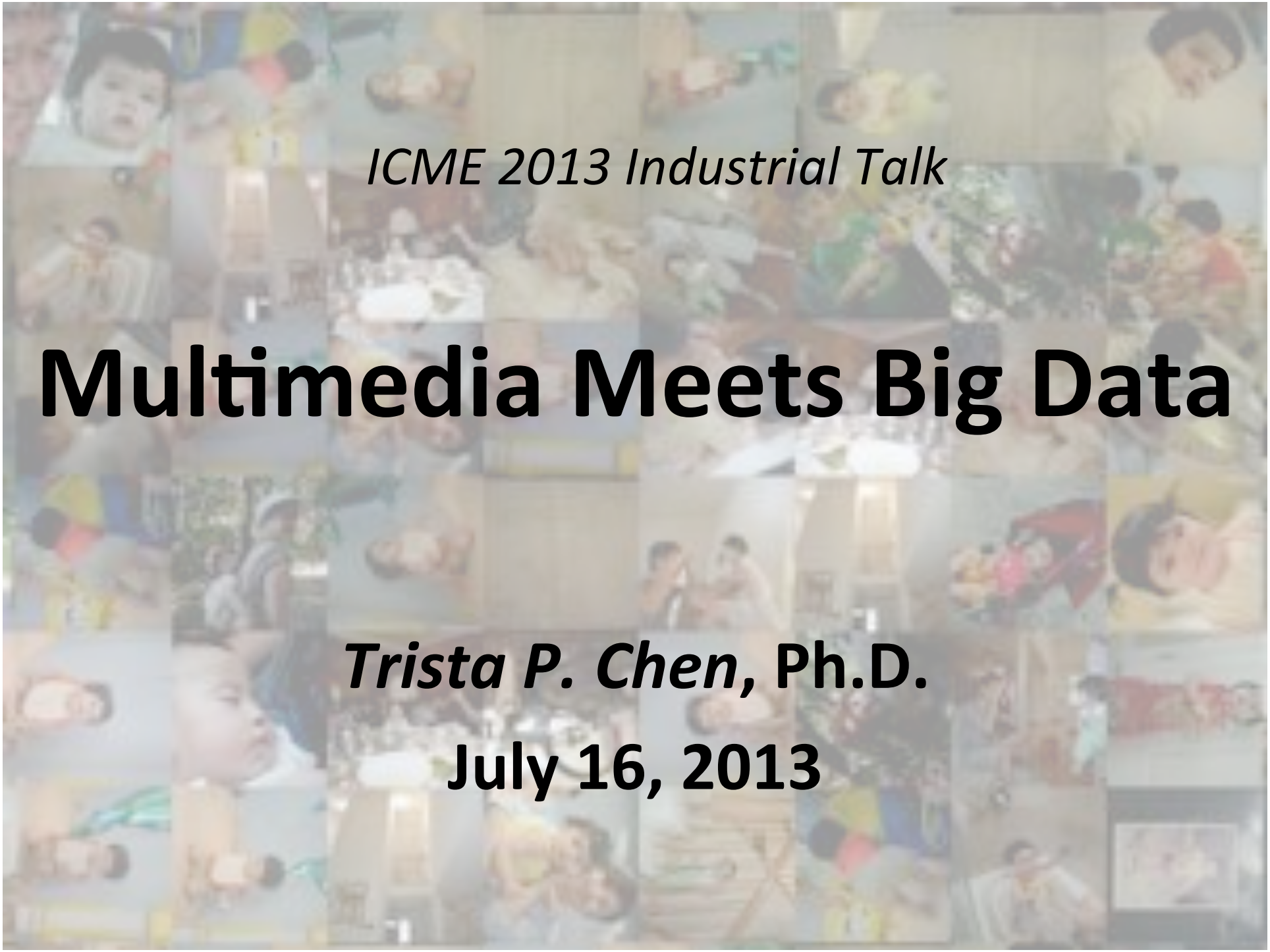
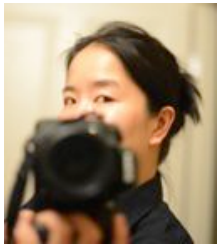


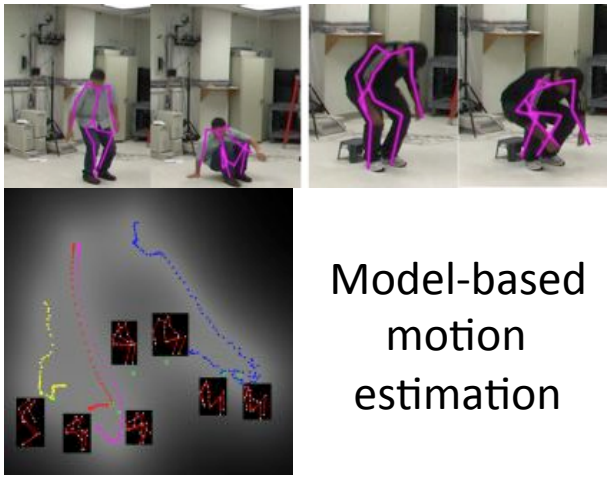
ICME 2013 Industrial Talk

Multimedia Meets Big Data

***Trista P. Chen*, Ph.D.**

July 16, 2013

Who is  ?



Model-based motion estimation

Near-similar image retrieval at large DB

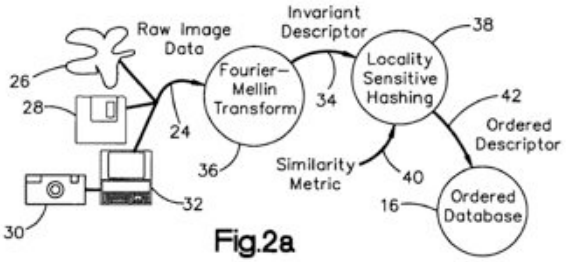
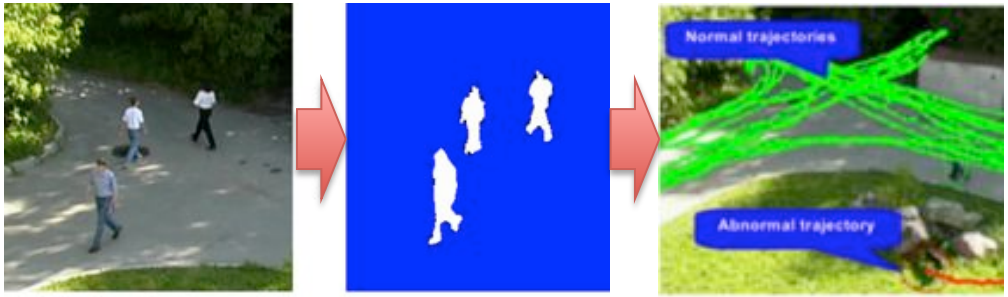


Fig.2a

VideoSense: Internet scale video semantics



Visual concept detection, tracking & reasoning


Real-time video big data

MULTIMEDIA DATA DELUGE

flickr

50M photos/month
6B+ images total

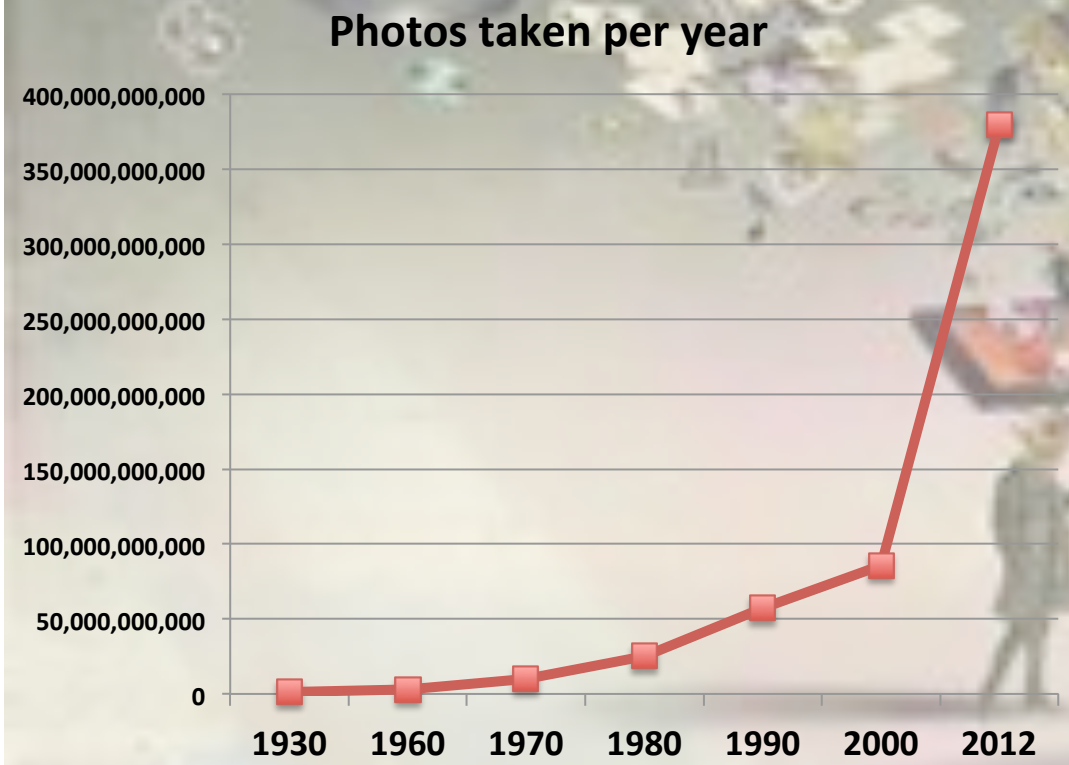
150M photos/month
5B+ images total

facebook

9B photos/month

YouTube

100 hours uploaded/minute
Content ID scans over
250 years of video/day



3.8 TRILLION PHOTOS TOTAL

"How Many Photos Have Been Taken Ever?", Hunter Schwarz, Buzzfeed

Premium TV Data

HD picture
1920x1080x3 bytes/frame

Video
30 frames/sec

1 month
30x24x3600 secs

500 stations

$2x10^{17}$ bytes
200 peta

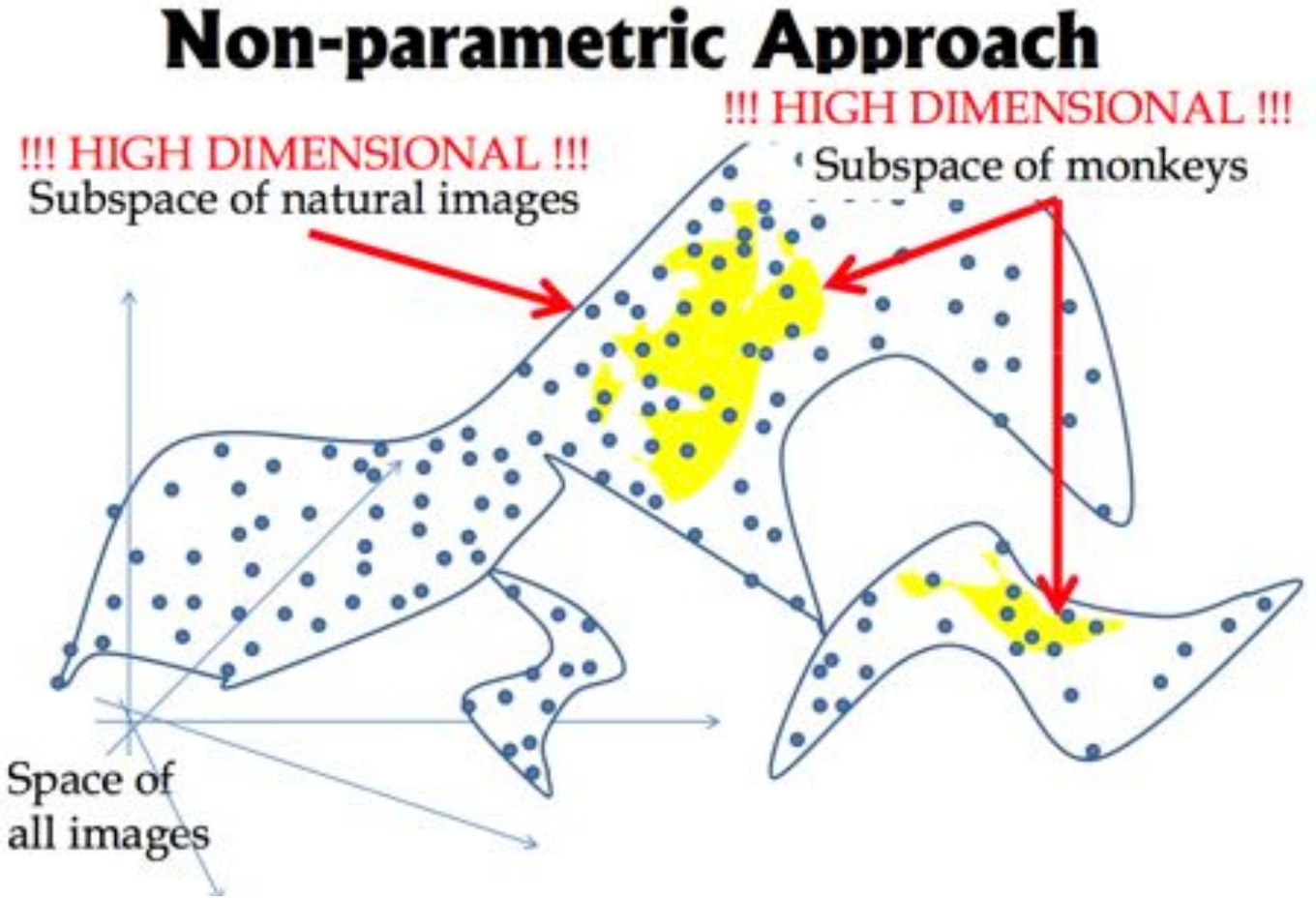
What Is Big Data

- Three V's:
  - Data Volume
  - Data Variety
  - Data Velocity

Conclusion

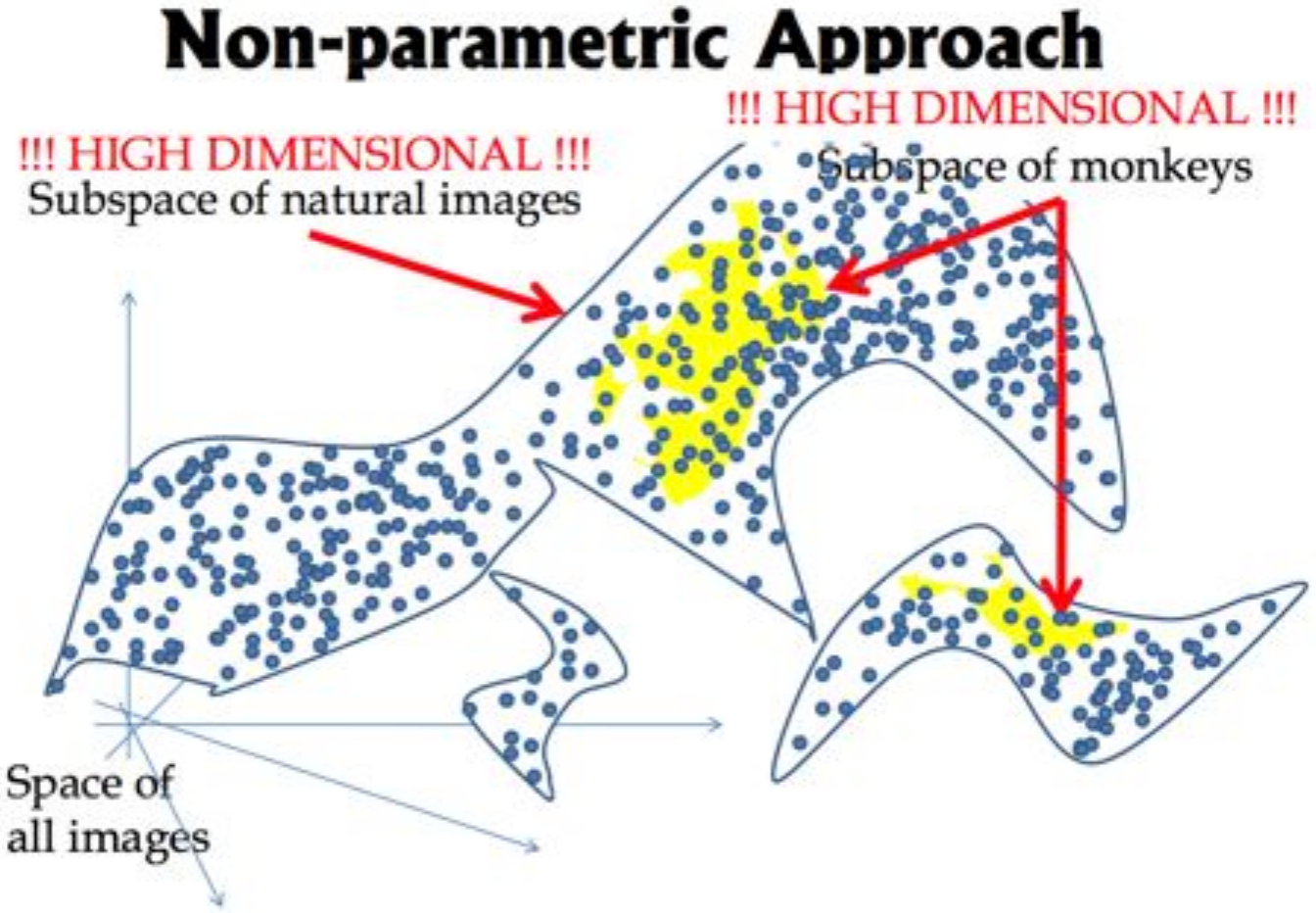
1. Simple algorithm big data, k-means/NN/ context based
2. New multimedia big data paradigm needed: 2D graph like
3. From passive retrieval to active media

Big Data To The Rescue



"80 Million Tiny Images", A,. Torralba, W. T. Freeman, IPAM Workshop on Numerical Tools and Fast Algorithms for Massive Data Mining, Search Engines and Applications, October 23rd 2007

Big Data To The Rescue



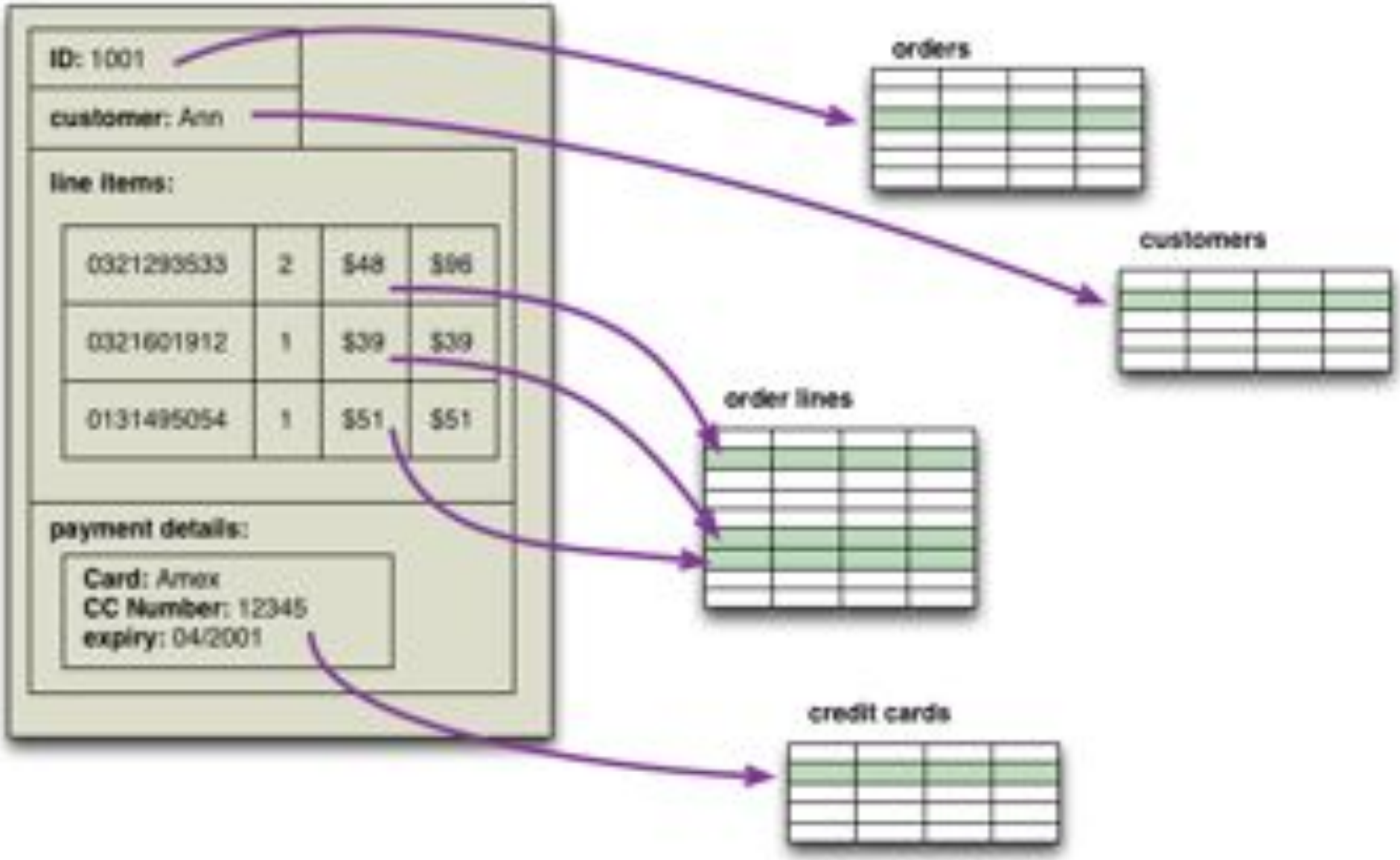
BIG DATA: 10,000 FOOT VIEW

Structured Data

	Last	First	Address	City	State	ZIP
1	Buffet	Jimmy	Somewhere on the Beach	Key West	FL	33040
2	Bush	George	1600 Pennsylvania Ave	Washington	DC	20500
3	Cartman	Eric	84 Bigboned Way	South Park	CO	84214
4	Crockett	Davey	The Alamo	San Antonio	TX	78210
5	Doe	Jane	821 Zimbabwe Ave	Washington	DC	20021
6	Gates	Bill	1 Microsoft Way	Redmond	WA	98052
7	Jefferson	George	194 Deelux Apartments	In the Sky	NY	10041
8	Kong	King	Empire State Building	New York	NY	10118
9	Munster	Herman	1313 Mockingbird Lane	Fargo	ND	58102
10	Rockne	Knute	146 Keenan Hall	Notre Dame	IN	46556
11	Simpson	Homer	742 Evergreen Terrace	Springfield	US	12345
12	Smith	Bob	12 Main Street	Anytown	IN	46001

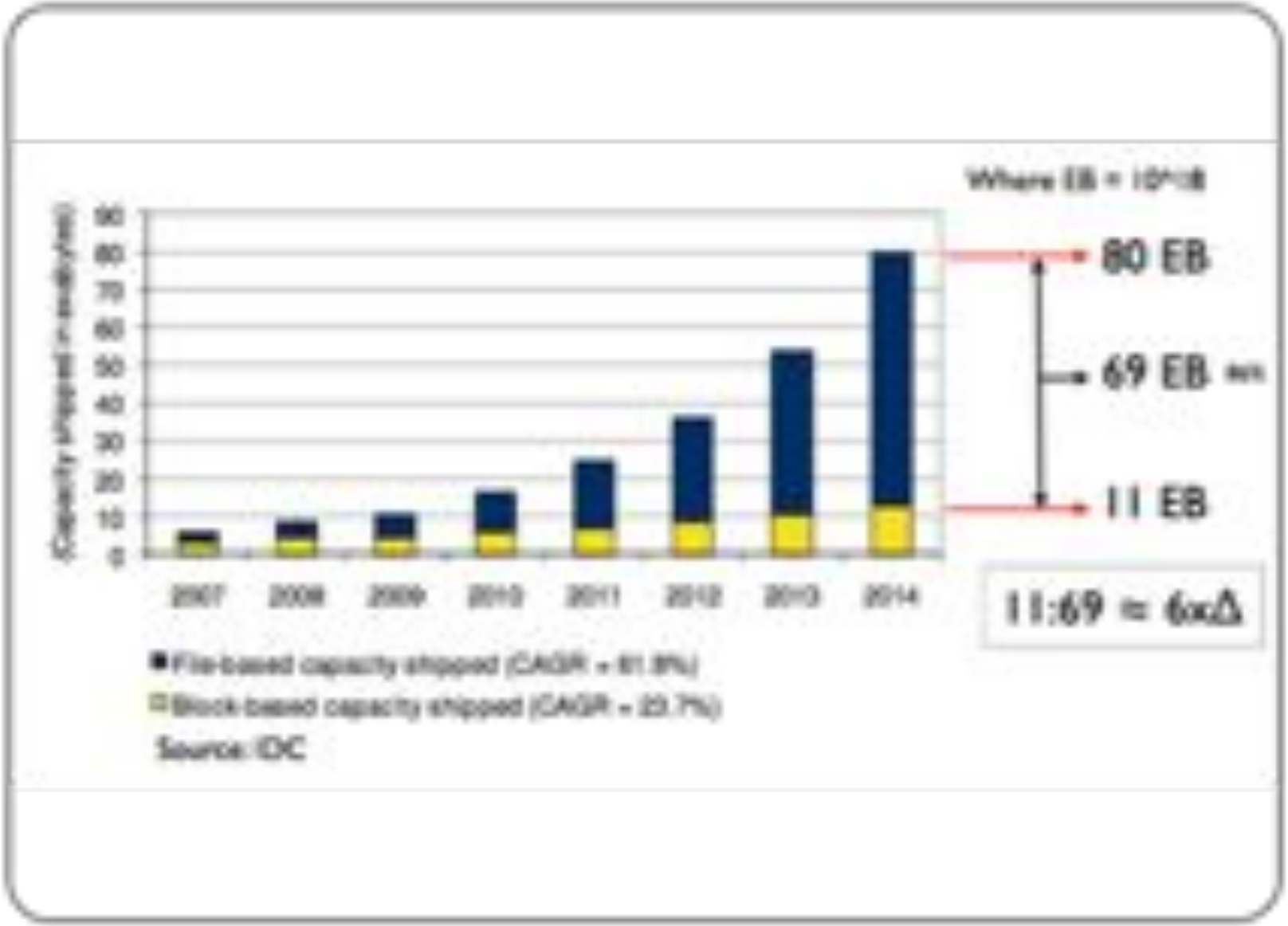
```
SELECT * FROM People
    WHERE State NOT IN ('AL', 'CA')
    ORDER BY Last;
```

Unstructured Data

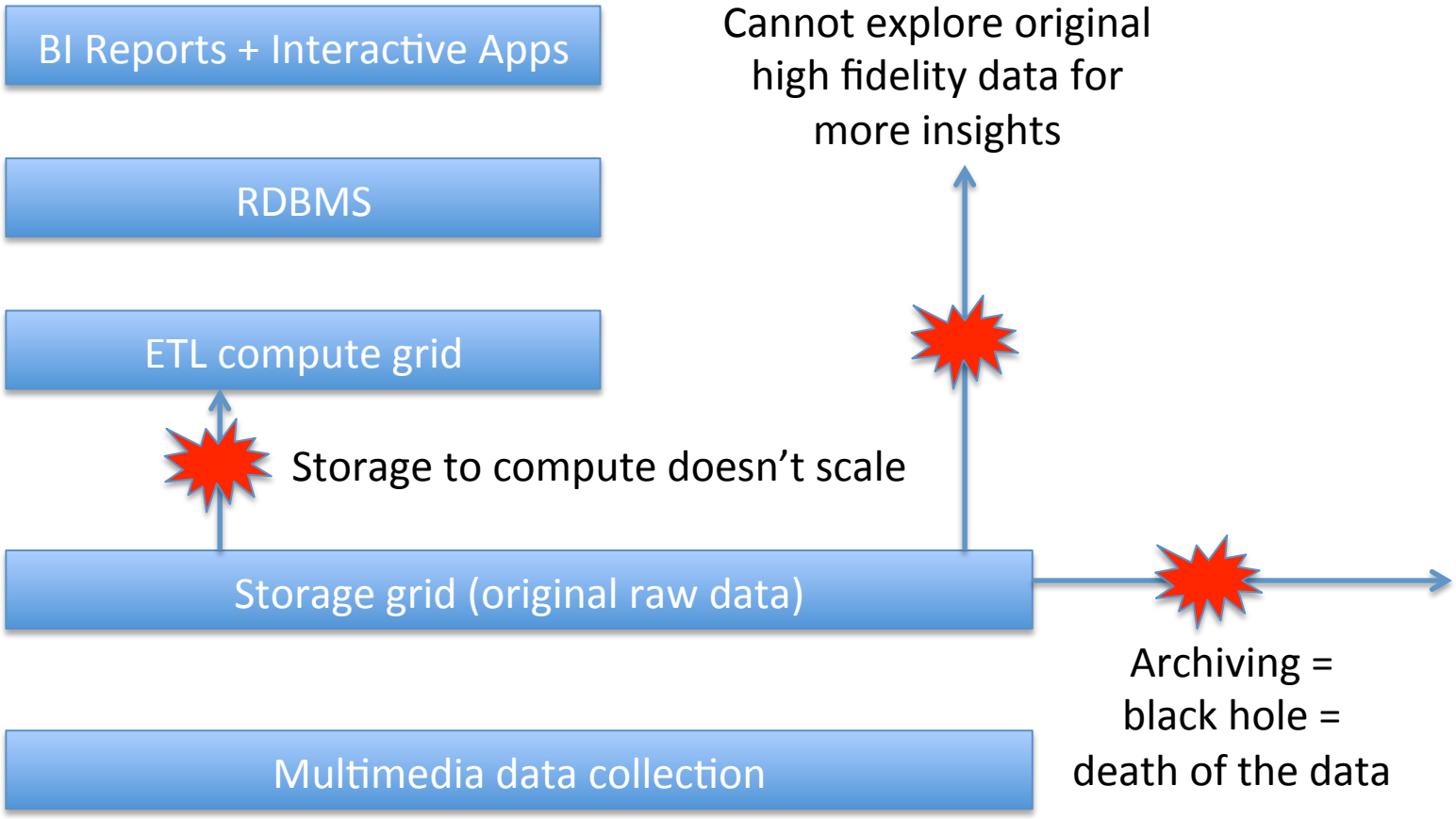


NoSQL Data Models

Structured vs. Unstructured



Limitation of Existing Multimedia Data Analysis Architecture

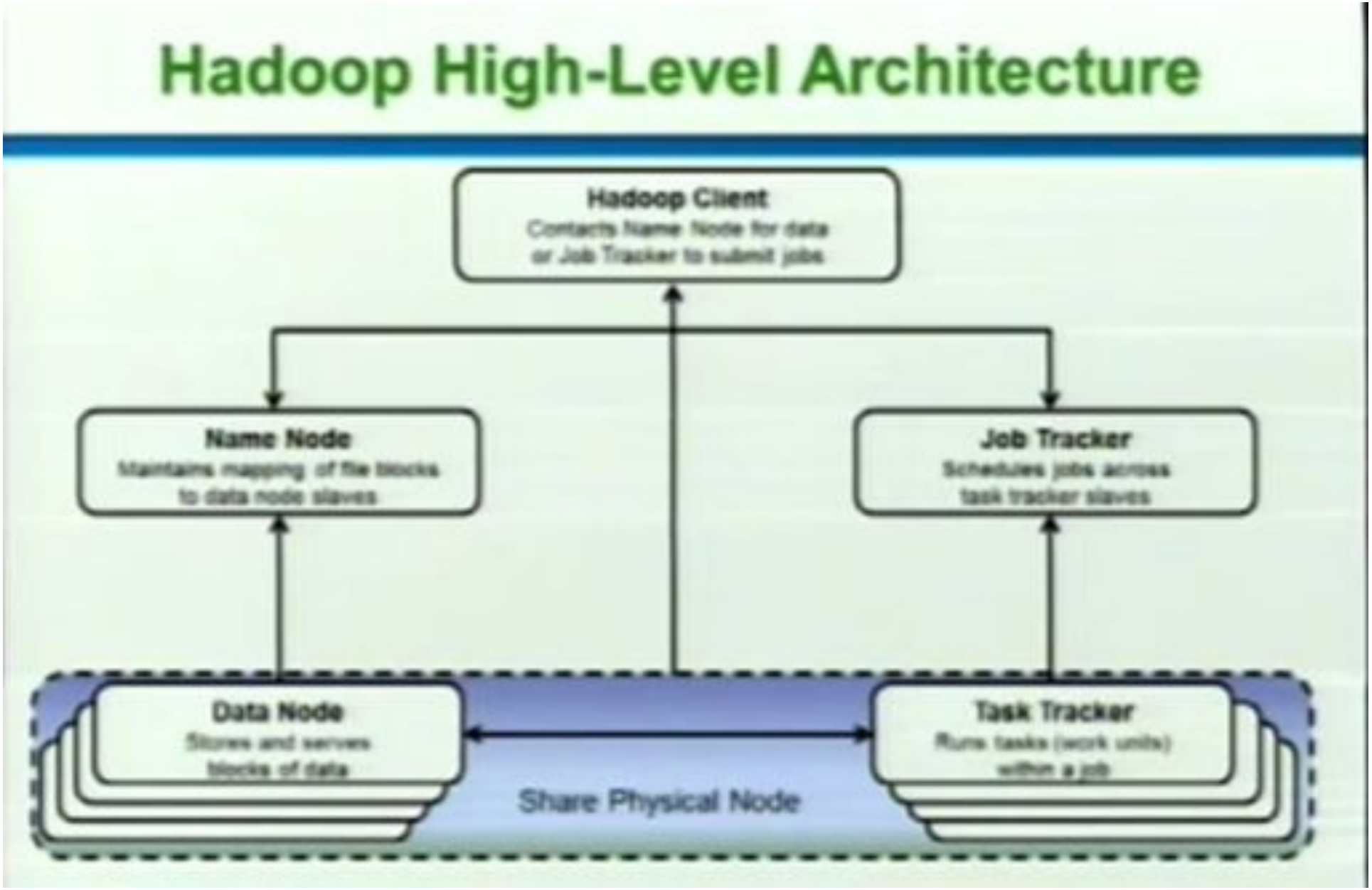


Relational Database v.s. NoSQL

- Fast
- ACID
- SQL Compliance

- Flexible (structured/not)
- Scalability
- Complex Data Processing


hadoop



"Introducing Apache Hadoop: The Modern Data Operating System", Amr A. Awadallah @ Stanford U.

HDFS: Hadoop Distributed File System

A given file is broken down into blocks (default=64MB), then blocks are replicated across cluster (default=3).

Optimized for:

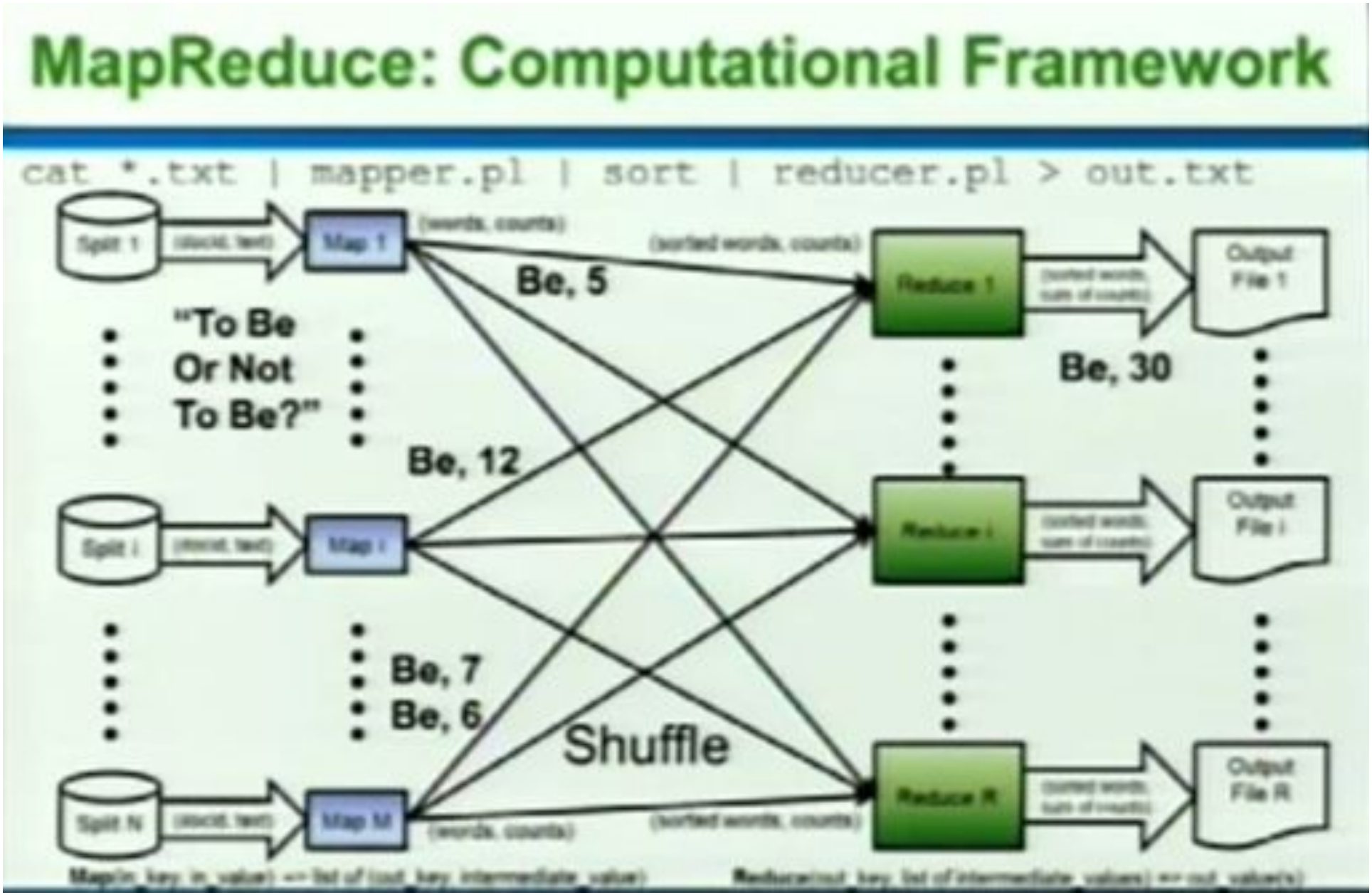
- Throughput
- Put/Get/Delete
- Appends

Block Replication for:

- Durability
- Availability
- Throughput

Block Replicas are distributed across servers and racks.

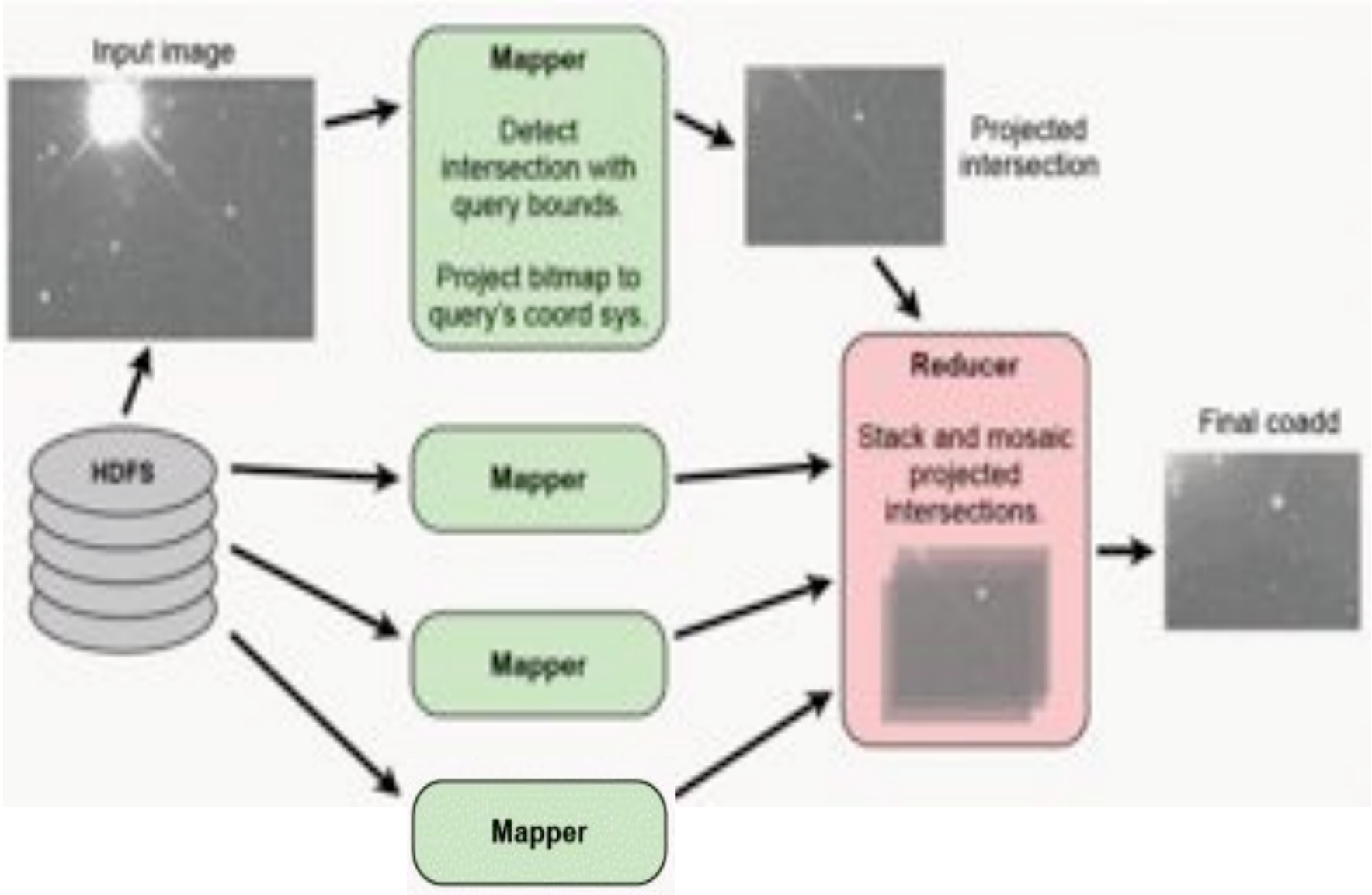
MapReduce: Computational Framework



Key Benefits of Hadoop

- Agility/Flexibility (Quickest Time to Insight)
- Scalability of Storage/Compute (Freedom to Grow)
- Complex Data Processing (Any Language, Any Problem)

Hadoop Image Processing Example



The Answer to All?

- Indexing images is HARD, 16,000 machines to learn “cat”; state-of-the-art recognition low
- Even if indexed 100%, concepts cannot be captured comprehensively

The meanings we attribute to an image are inherently a graph

SOLUTION: SKETCH BASED RETRIEVAL?

Google

medici_summer.jpg × luxembourg gardens

Search

About 2 results (0.29 seconds)

Everything
Images
Maps
Videos
News
Shopping
More

Image size:
1024 × 829

No other sizes of this image found.

Visually similar




Google

painting.png × describe image here

Search

About 2 results (0.29 seconds)

Everything
Images
Maps
Videos
News
Shopping
More

Image size:
319 × 482

No other sizes of this image found.

Visually similar





Google

medici_sketch.bmp × describe image here

Search

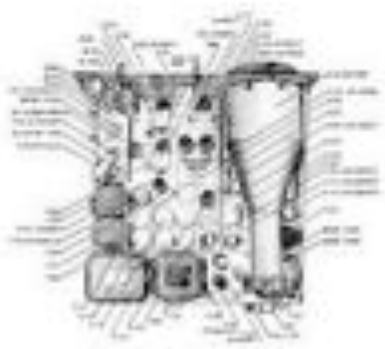
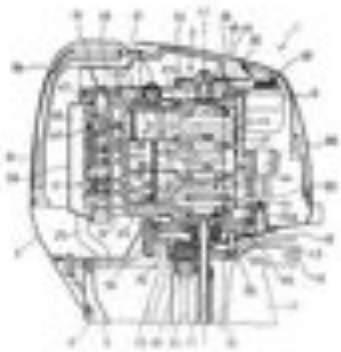
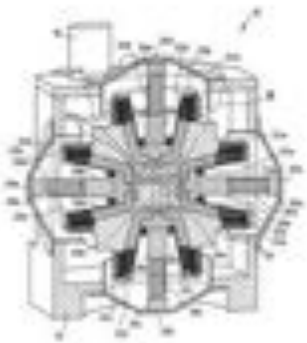
About 2 results (0.29 seconds)

Everything
Images
Maps
Videos
News
Shopping
More

Image size:
443 × 482

No other sizes of this image found.

Visually similar









Important Parts?

Input Query

Important Parts


“Data-driven Uniqueness”

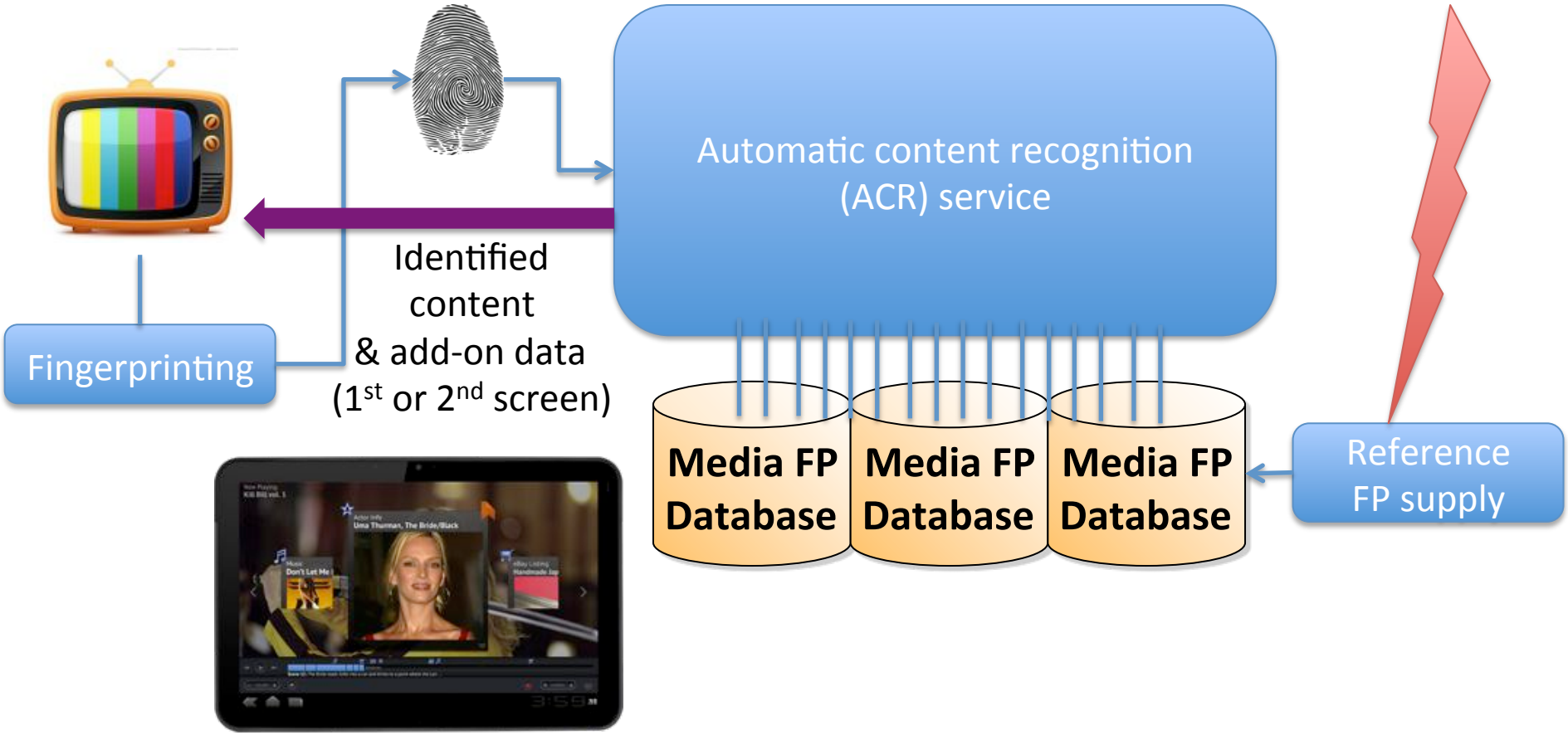

TOCKMORE STREET

Multimedia Big Data Opportunities

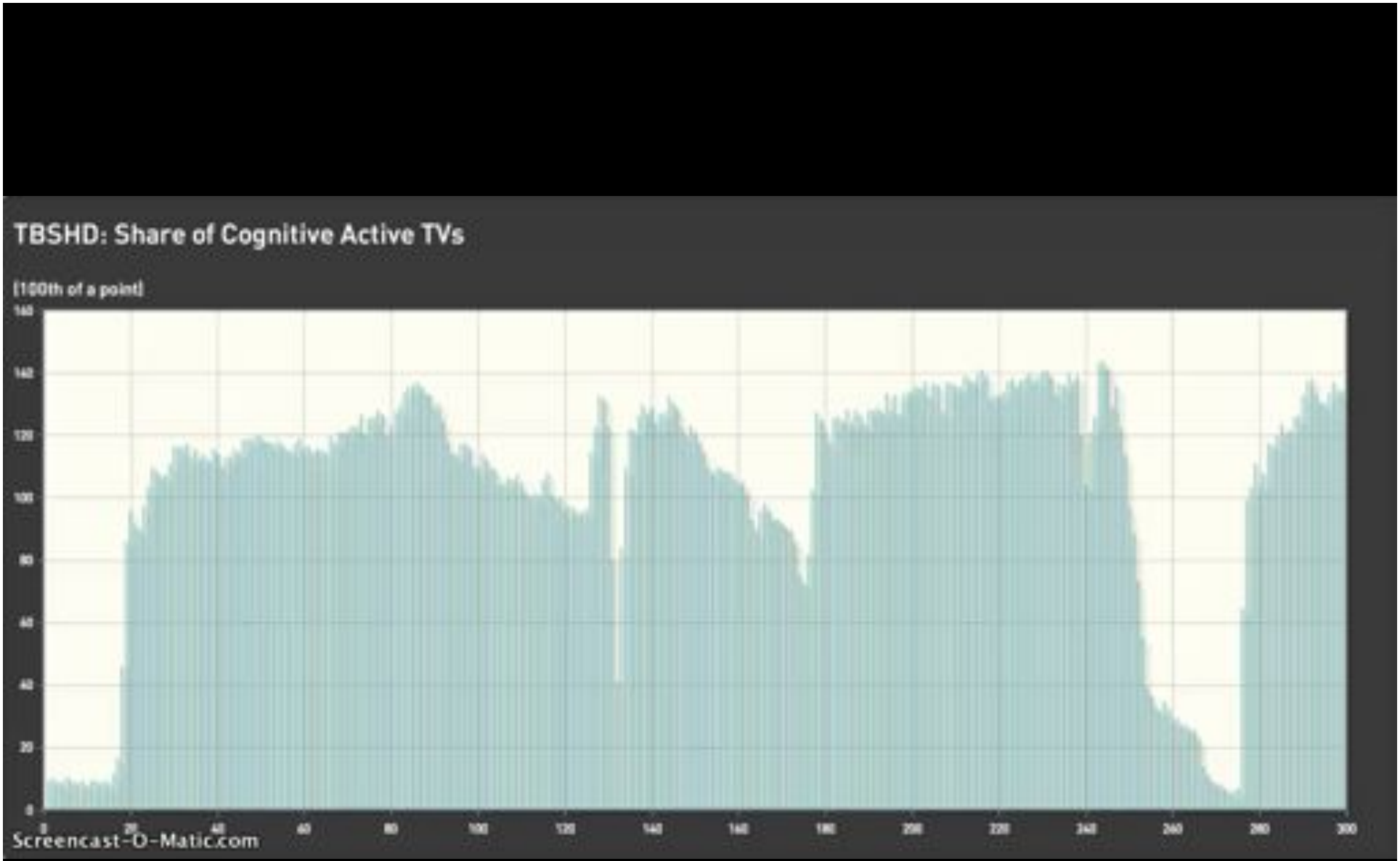
- Active media
- Crowd source computational photography
  - Photosynth, scene completion
- Tracking across many surveillance cameras
- Concept discovery
  - Fashion trend
  - Business intelligence

ACTIVE MEDIA

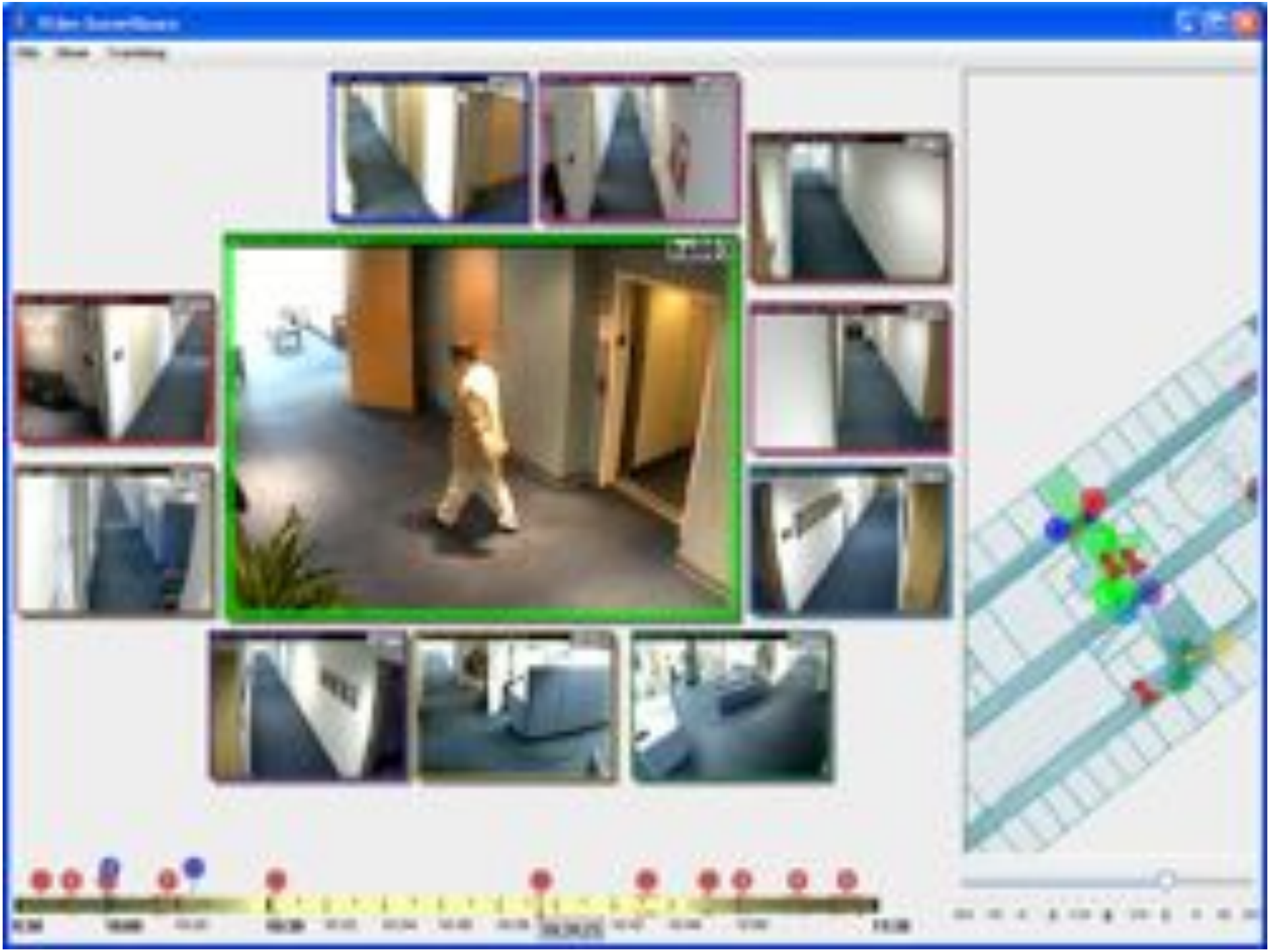
Automatic Content Recognition



Smart TV/Second Screen


TBSHD: Share of Cognitive Active TVs
(100th of a point)
Screencast-O-Matic.com

Photosynth



twitpic

Home Public Timeline Upload photo Settings Logout

Your image has been uploaded!

Where was this photo taken?

Use Exact Coordinates
Location on Map

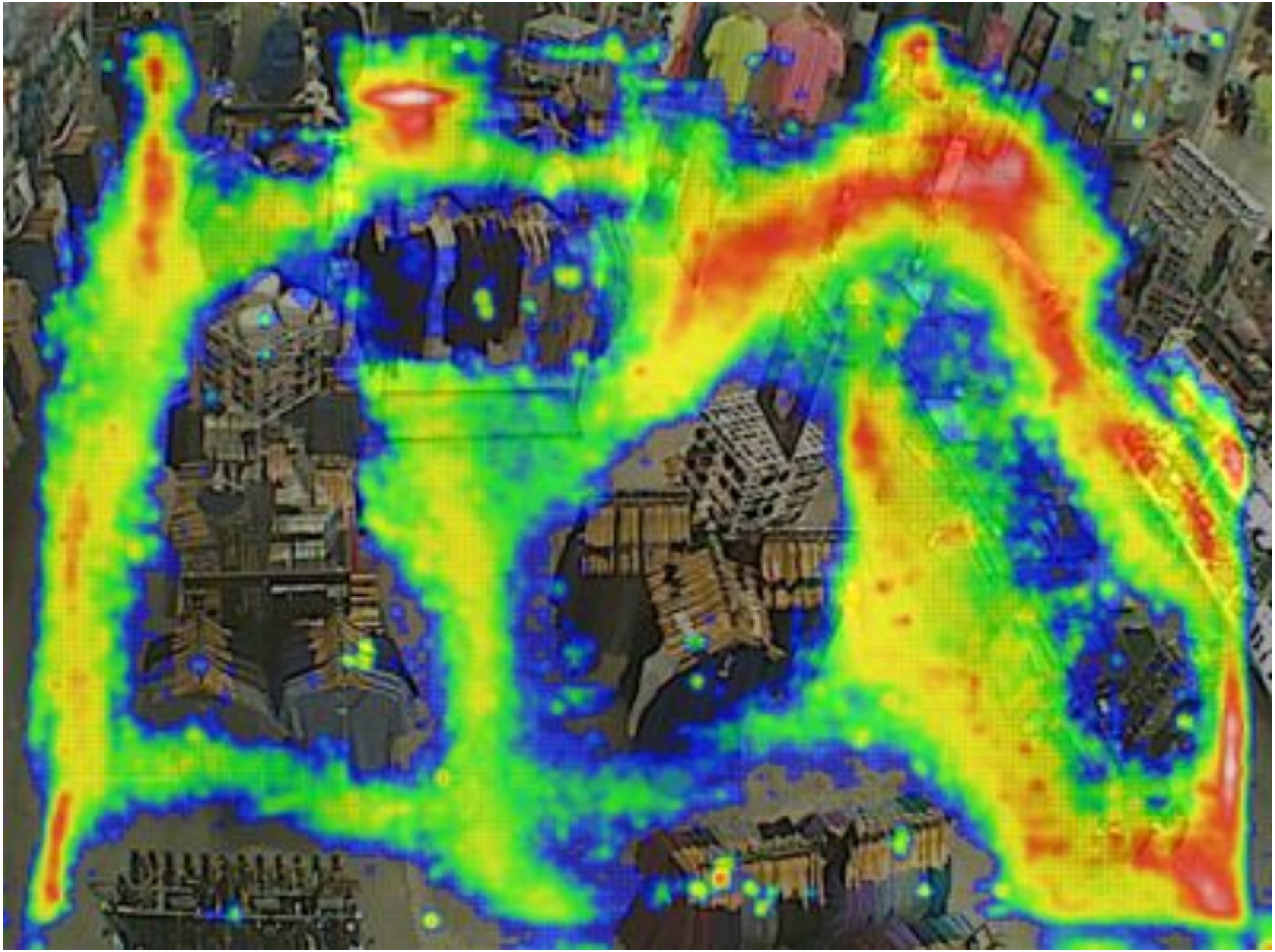
Sole Proprietor Seafood & Spirits
118 Highland St, 0.72 miles away

Don't see the right location? Search for it!

sole proprietor | Search | Clear Search

Save with Location | Save without Location


Event discovery:
Asiana plane crash



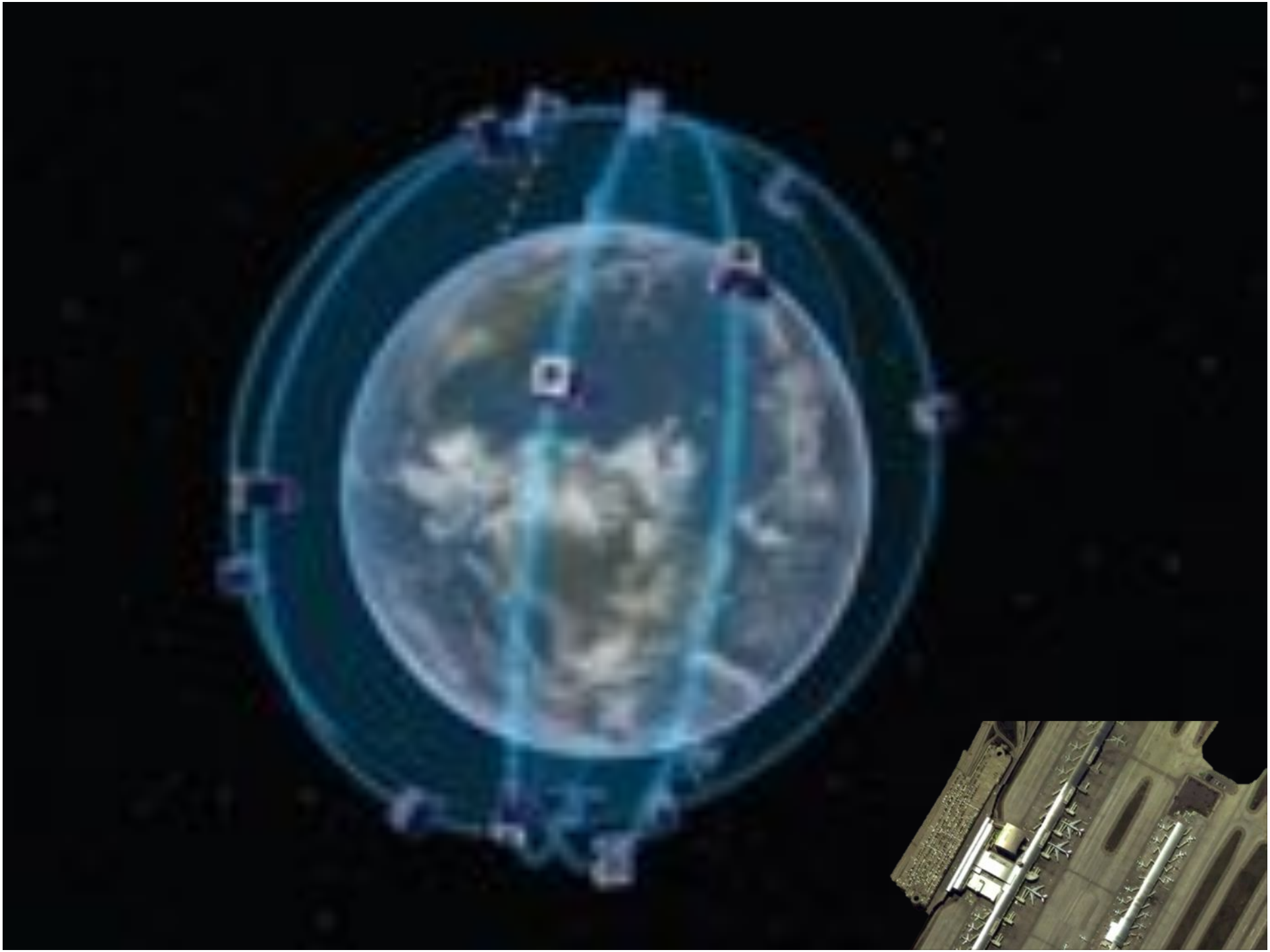
Initial observations without repositioning the sales team to a critical location.
(N=149)

After repositioning a sales clerk to a critical location for 16 or more seconds.
(N=155)

2013

2011

2012



Conclusion

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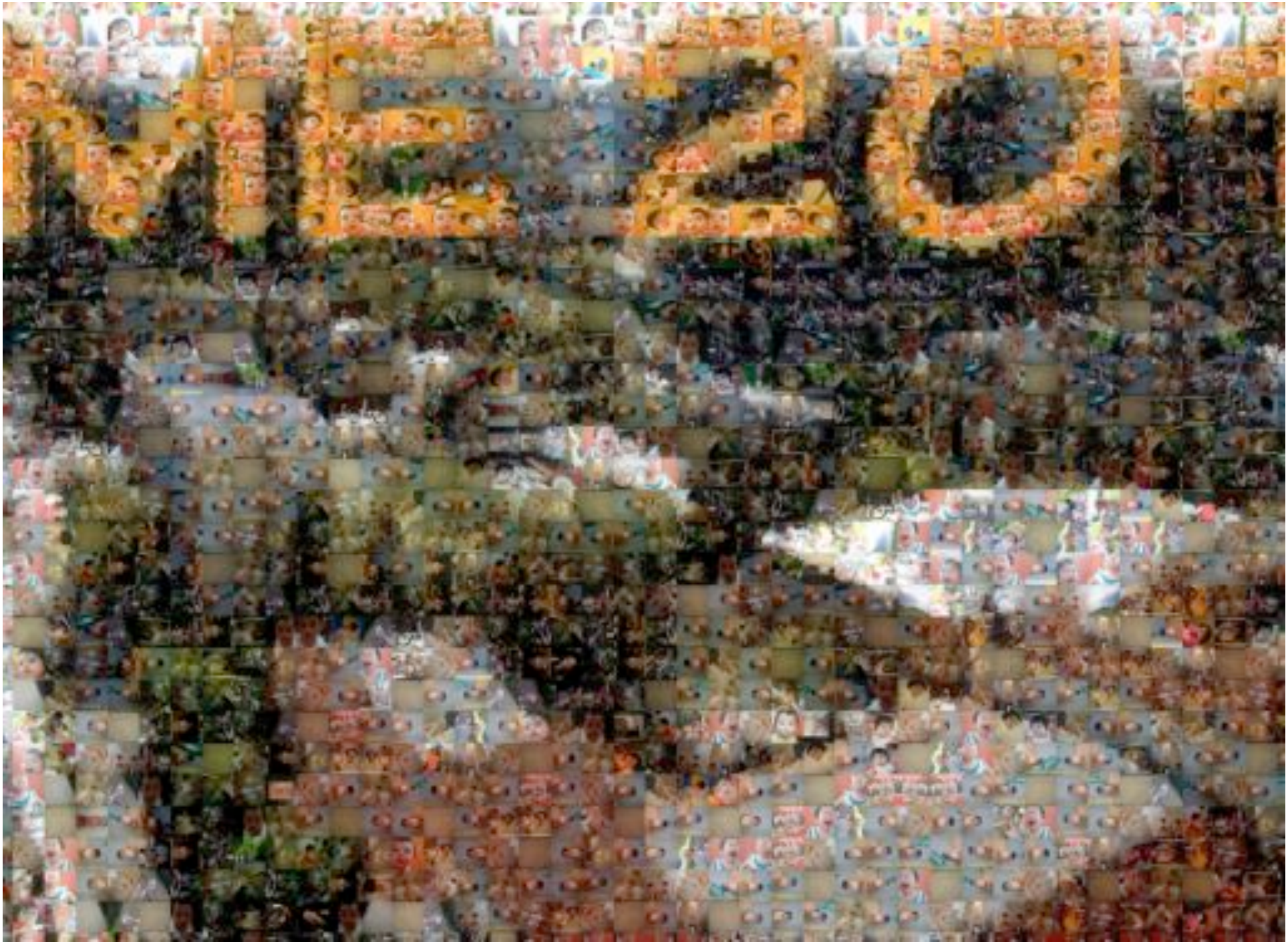

trista.chen@gmail.com