Faces, Places and Kin: Applying Computer Vision to Family History
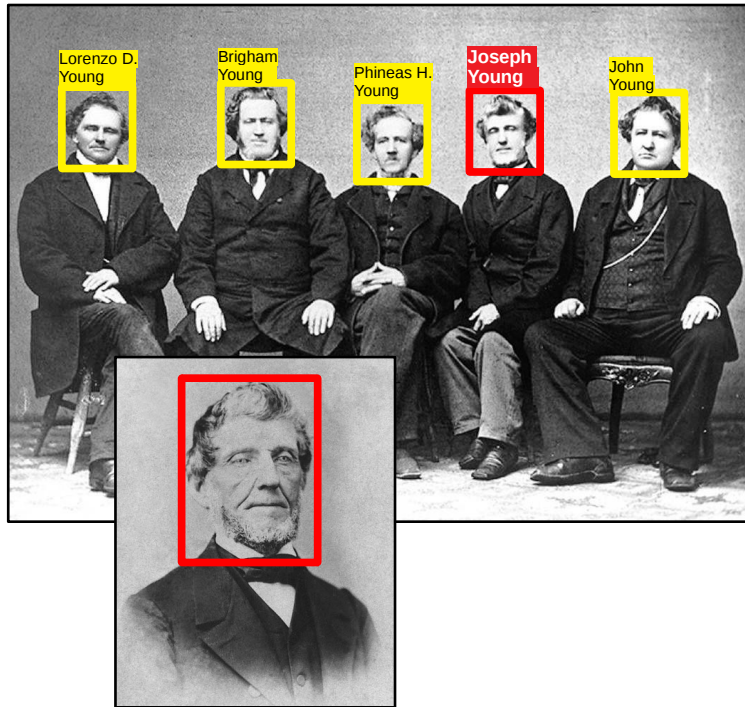

Douglas J. Kennard

Databases

Genealogies, Links,
Historical Social Networks

Records and
Documents

Images, Media
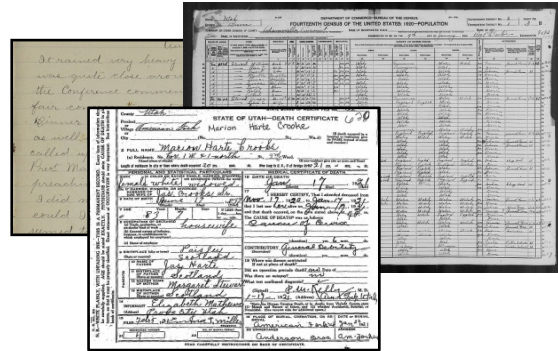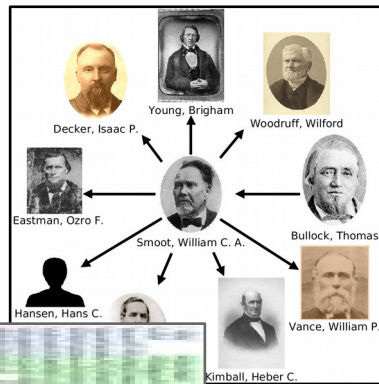(People, Places, Events)
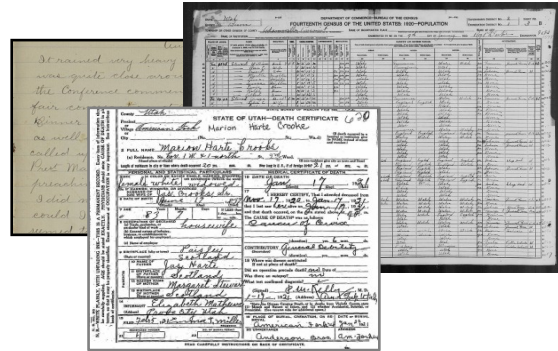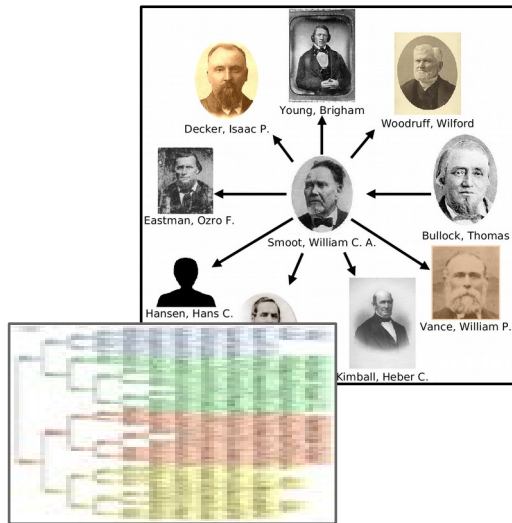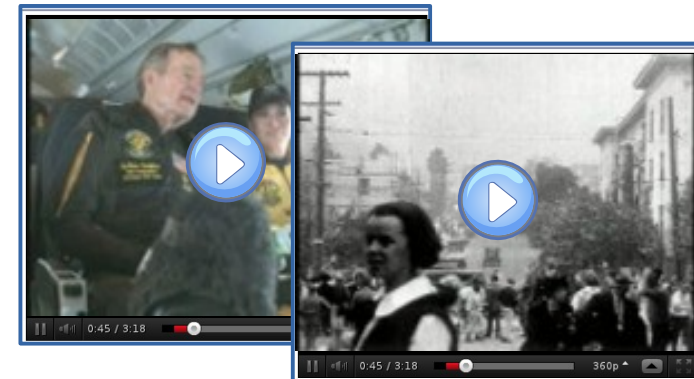
Databases

Records and Documents

Images, Media
(People, Places, Events)

Genealogies, Links,
Historical Social Netwo...

Images from Documents
(Books, News, Obituaries,
yearbooks, Histories, etc.)

Video

Who? When? Where?

George Crothers Dies at 86

George Edward Crothers, distinguished San Francisco attorney, former Superior Court Judge and Stanford University benefactor, died yesterday of a stroke at Stanford Hospital here. He was 86.

GEORGE E. CROTHERS
Distinguished S. F. lawyer

- Context (captions, labels, titles, text)

- Metadata (image or collection-level)

- Tags

Computer Vision, Machine Learning

www.cityscapes-dataset.com
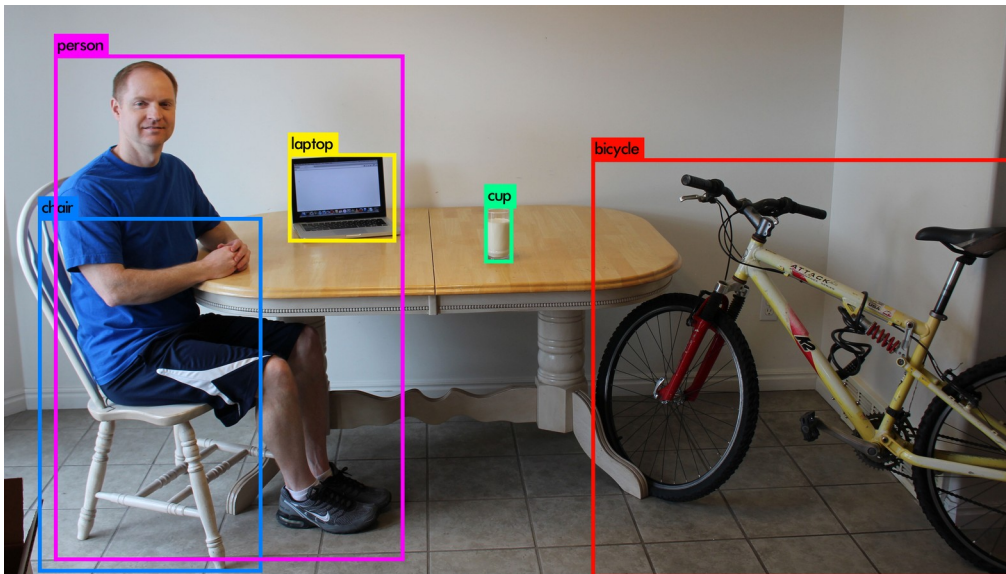
Redmon, et al. 2018 "YOLOv3: An Incremental Improvement"

Image Classification, Object Recognition
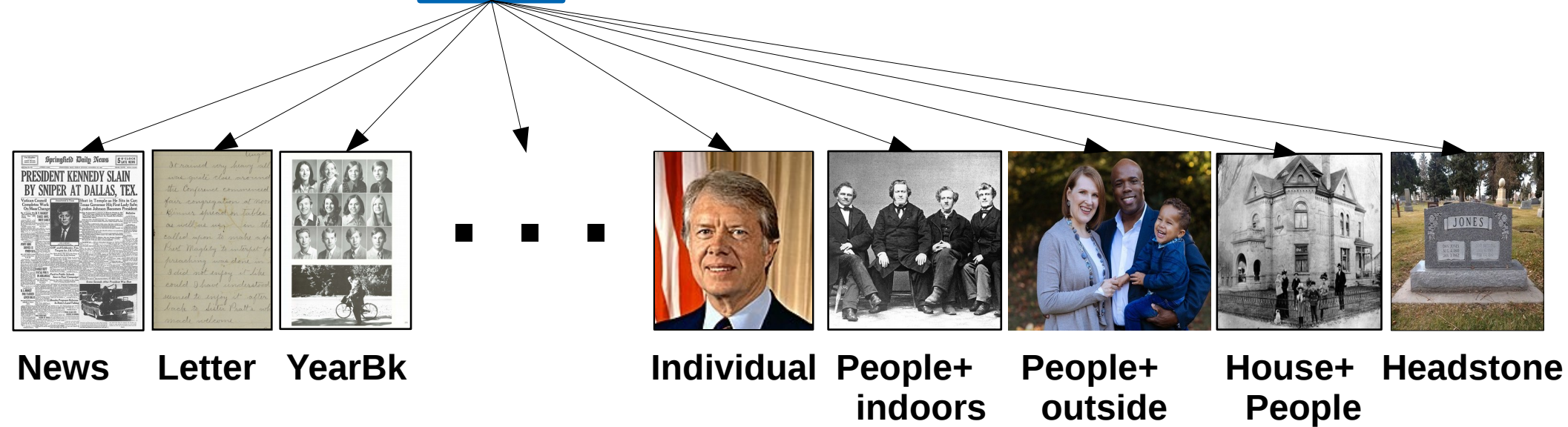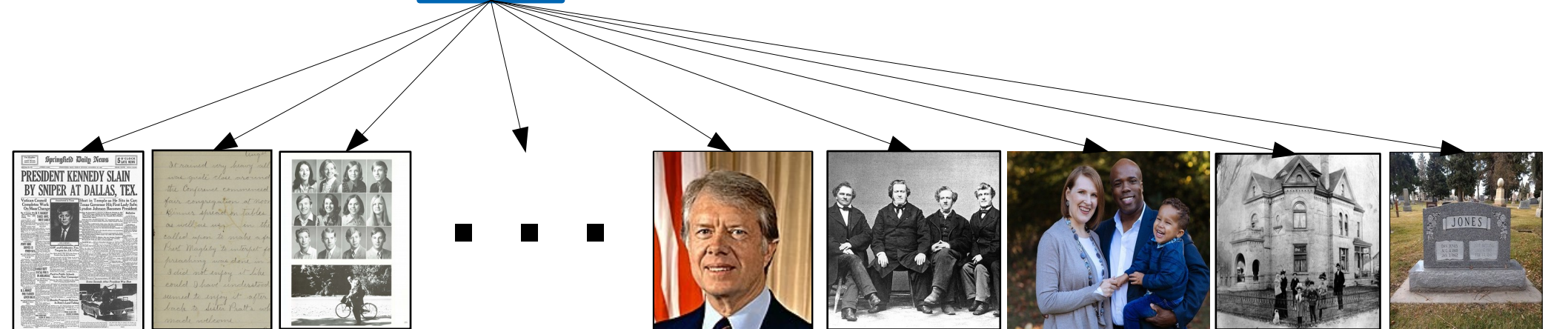

?

What?

| News | Letter | YearBk | · · · | Individual | People+ indoors | People+ outside | House+ People | Headstone |

Image Classification, Object Recognition

?

What?

News
Layout
OCR
Articles
NLP
Entities
Images
Links

Letter
HR
NLP
Entities
HSNs
Links

YearBk
Layout
Faces
OCR
Names
HSNs
Links

Individual
Face
Age
HSN
Links

People+ indoors
Faces
Ages
HSNs
Links

People+ outside
Faces
Ages
HSNs
Links

People+ House
Faces
Ages
HSNs
House #
Street
Location
Links

Headstone
Locate text
OCR
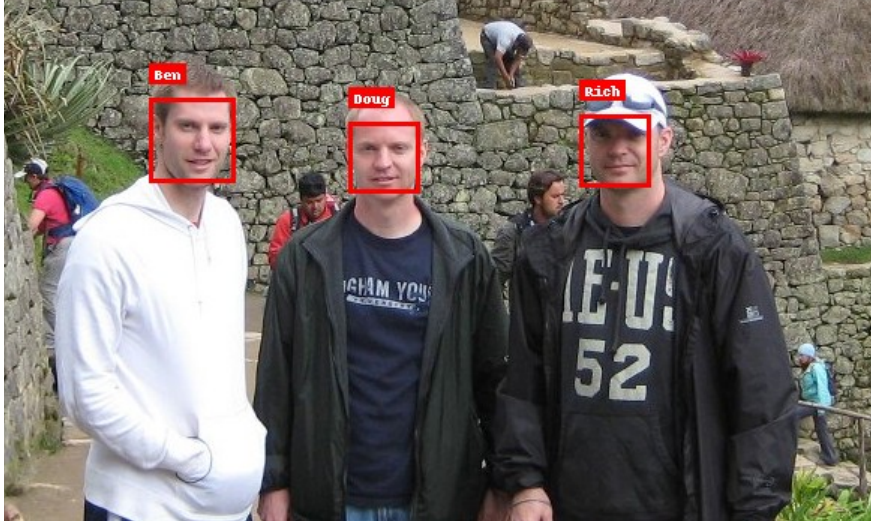Metadata
Cem Record
Tree
HSNs
Links

How?

Face Recognition
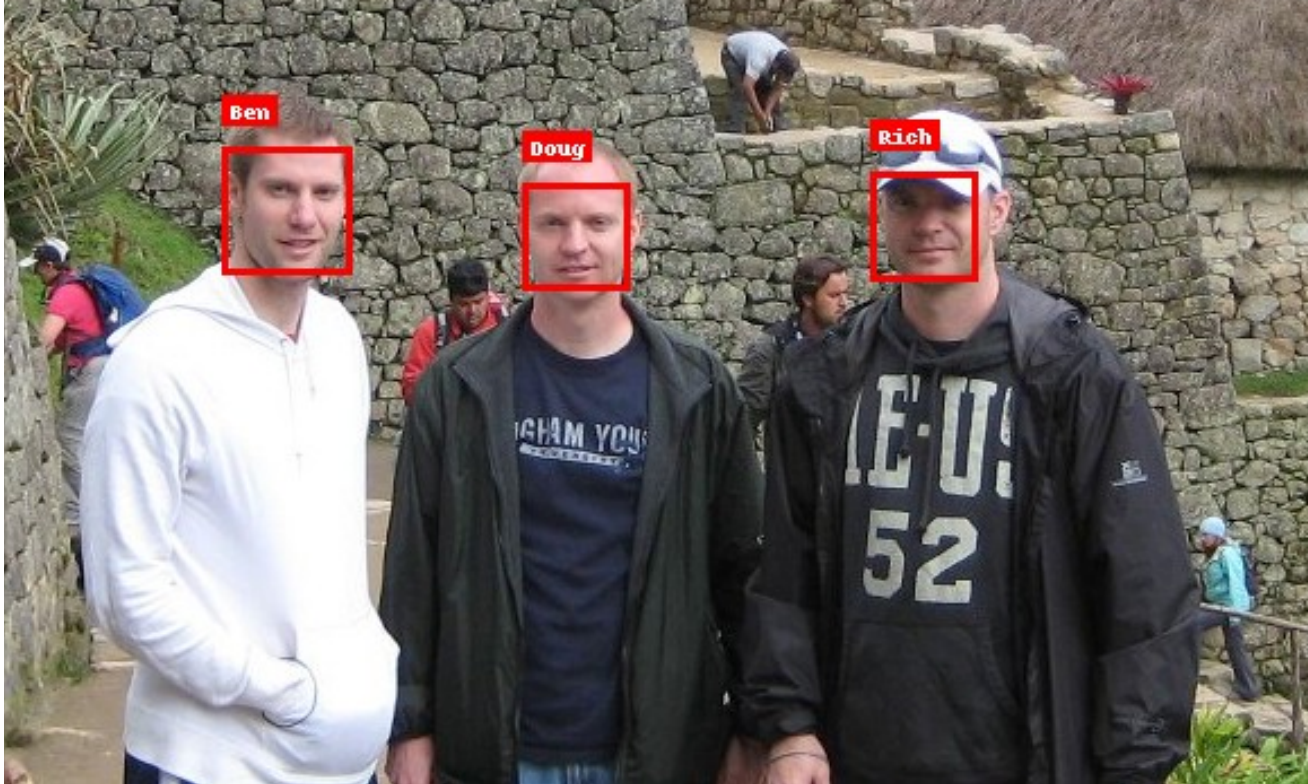
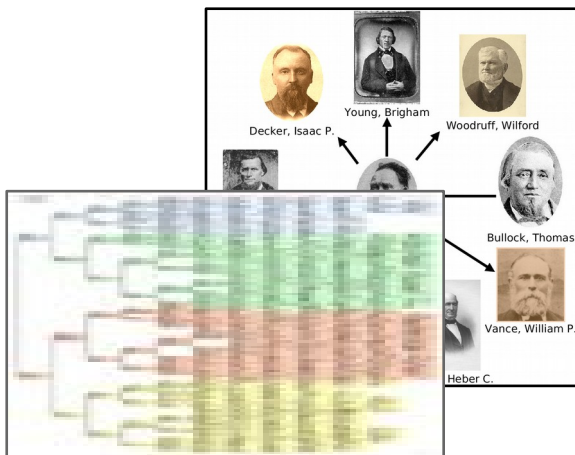**Who?**

Face Analysis (<u>age</u>, gender, etc.)
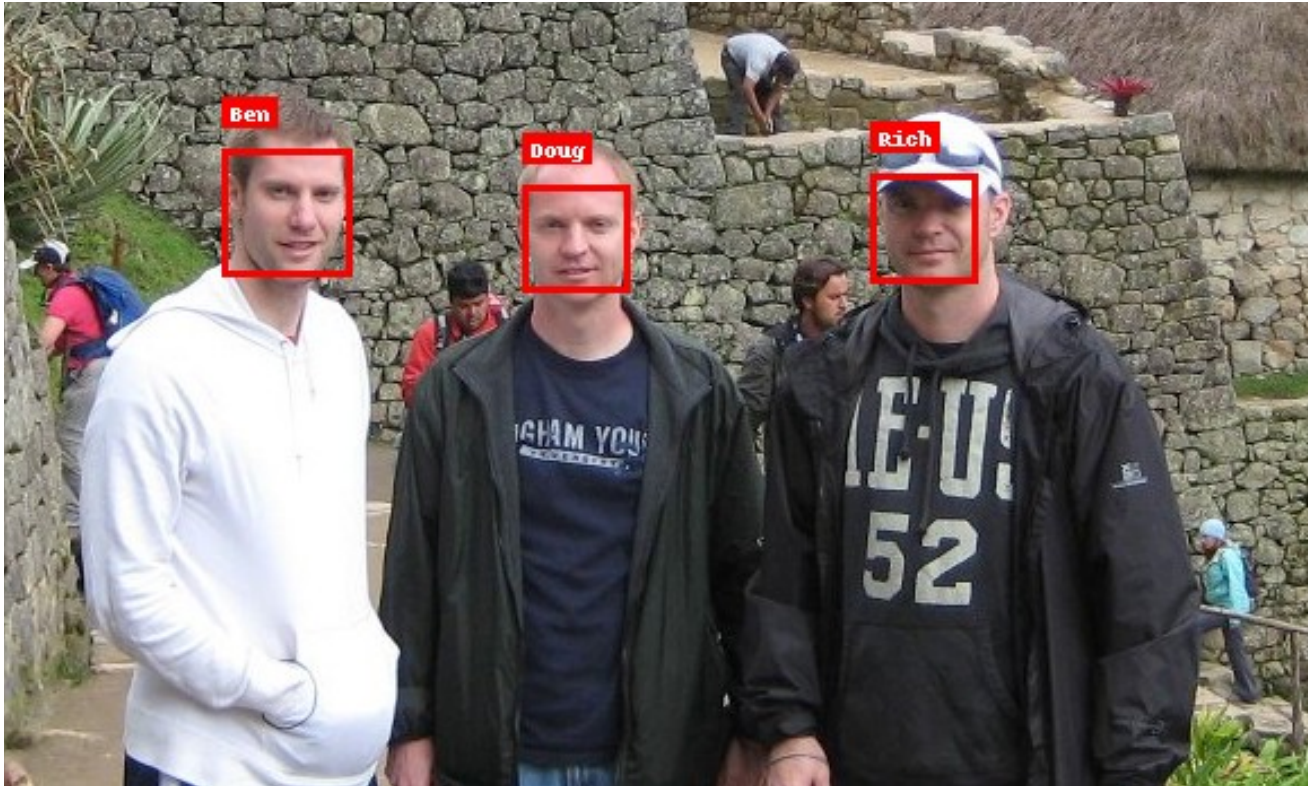

When?

2007-2021
1993-2007
2005-2021

estimate=2009
error≈1.5 years

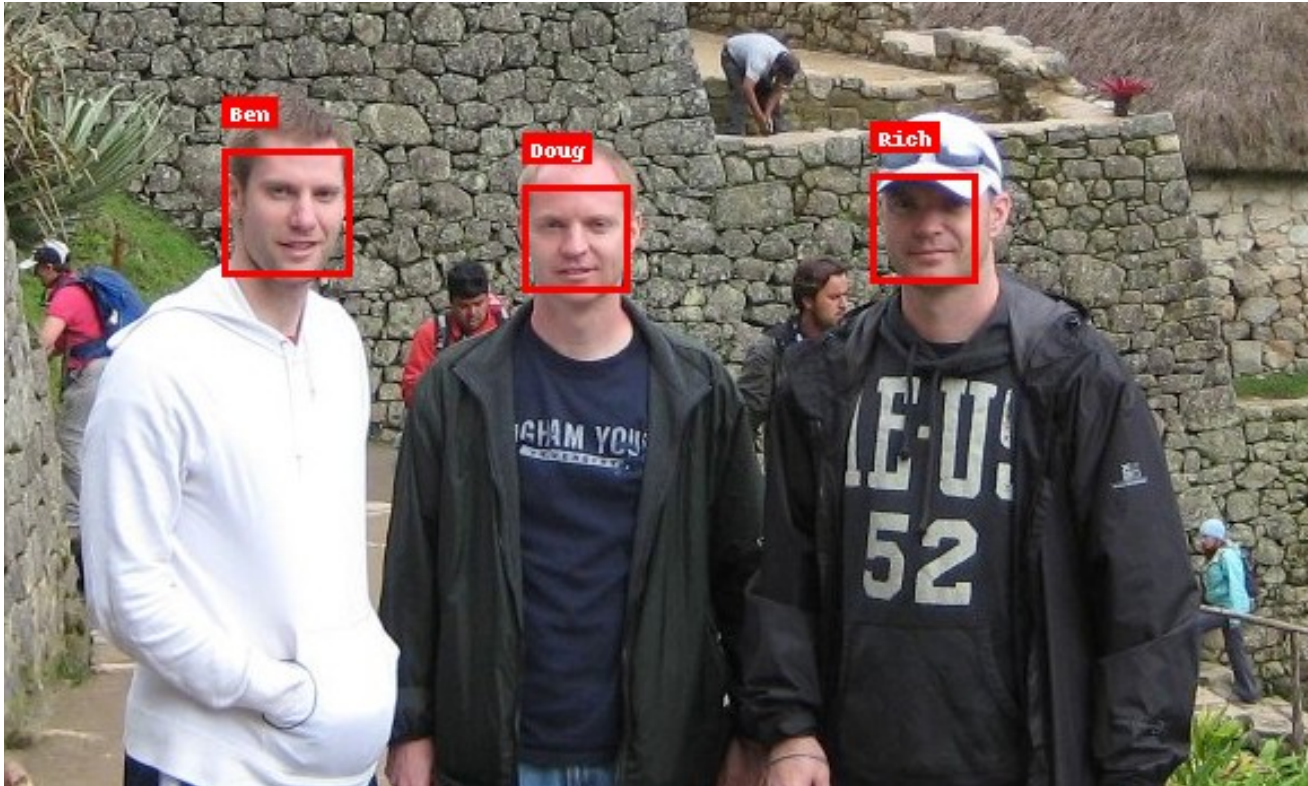(individual errors ≈ 3 to 11 years)

Face Recognition

Who?

Comparing to all faces rarely necessary

- Face clusters
- Constrain by degrees of separation (Tree / HSN)
- Other constraints (location, time period, etc.)

Face Recognition

Photos can Inform Tree / HSNs

- Together in Photos → family, friends, groups (school, church, work, etc.)
- Higher probability of links

Example

"Mormon farmer and his family. Cache County, Utah."
August 1940

Example

"Mormon farmer and his family. Cache County, Utah."
August 1940

1940 Census: **132,164,569**

Utah: **550,310**

Cache: **29,797**

Head (20-40) ≈ farmer*
Wife (19-35)
Daughter (1-4)

36 families

* Includes "farmer," "farming," "farm partner," "livestock farmer," "share cropper"
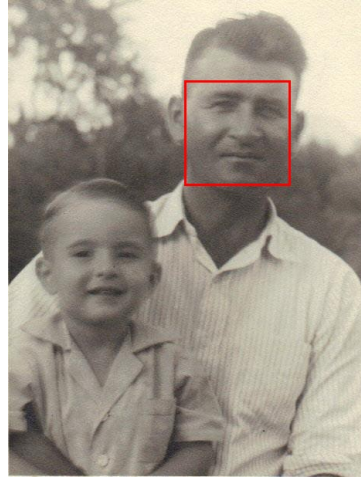
Example

36 candidate families
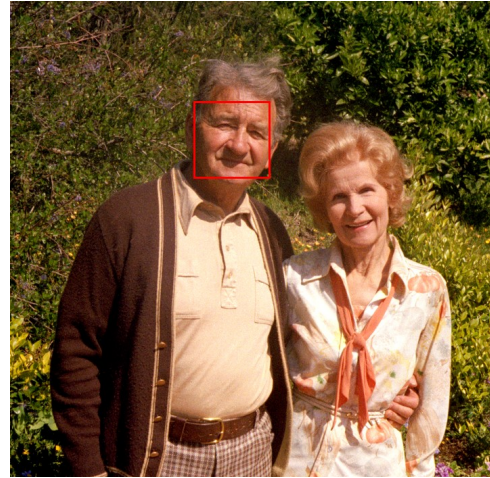
35: photo of husband or wife in FS*

31: a photo of both

9: no "good" photo of either
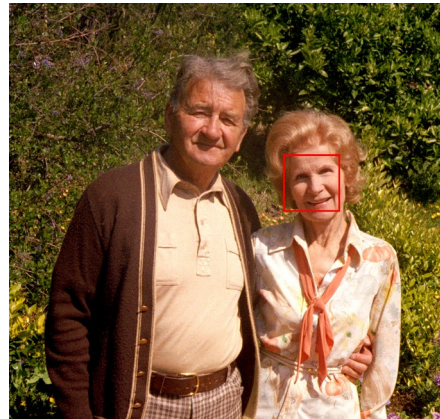
(decent quality, close in age)

Top 3 Matches

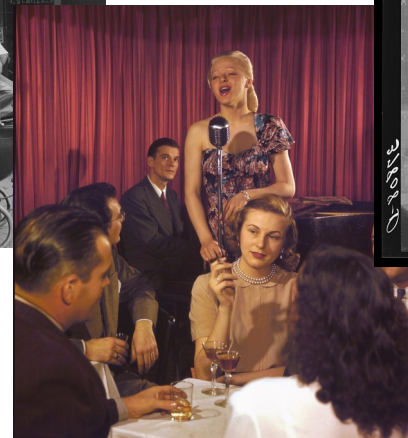1st ✔   2nd ✔   3rd ✔

1st ✔   2nd ✔   3rd ✘

(images courtesy of FamilySearch users)

Example

Why?

Grateful family - would have never known!

Zillions of photos of unidentified people

Example

If we hadn't found them:

We know who it isn't

Considerations

- ● State of the Art – still plenty of mistakes

  ex: in a 7-person photo

  20 yr-old → "51-69" yrs

  10 yr-old → "20-32" yrs

  2 people wearing glasses → "no glasses"

- ● Legal, Ethical, PR Issues

  – Faces of living individuals only by explicit <u>opt-in</u> with <u>informed</u> consent (Illinois BIPA, more to come)

  – Google (yes, that Google) no face recognition in cloud vision API, recently disabled gender

Places

Why?

- Context and setting
- Longitudinal studies in area
- Local trends, events
- Reduce search space (for other photos)

Places

- Map-based photo-sharing apps
  (GPS/metadata)

- lyfmap.com for historical memories
  (depends on users)

Places

Where?

Computer Vision

+

records, tree, HSNs

(addresses, cities / towns)

Scene Text Recognition

Scene Text Recognition

House Numbers Recognized
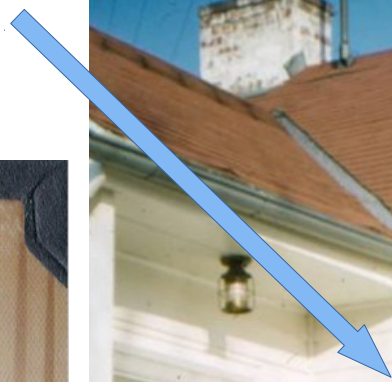
Landmark Recognition
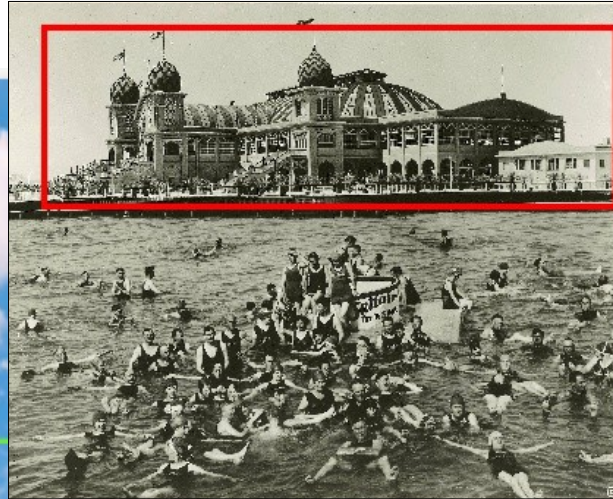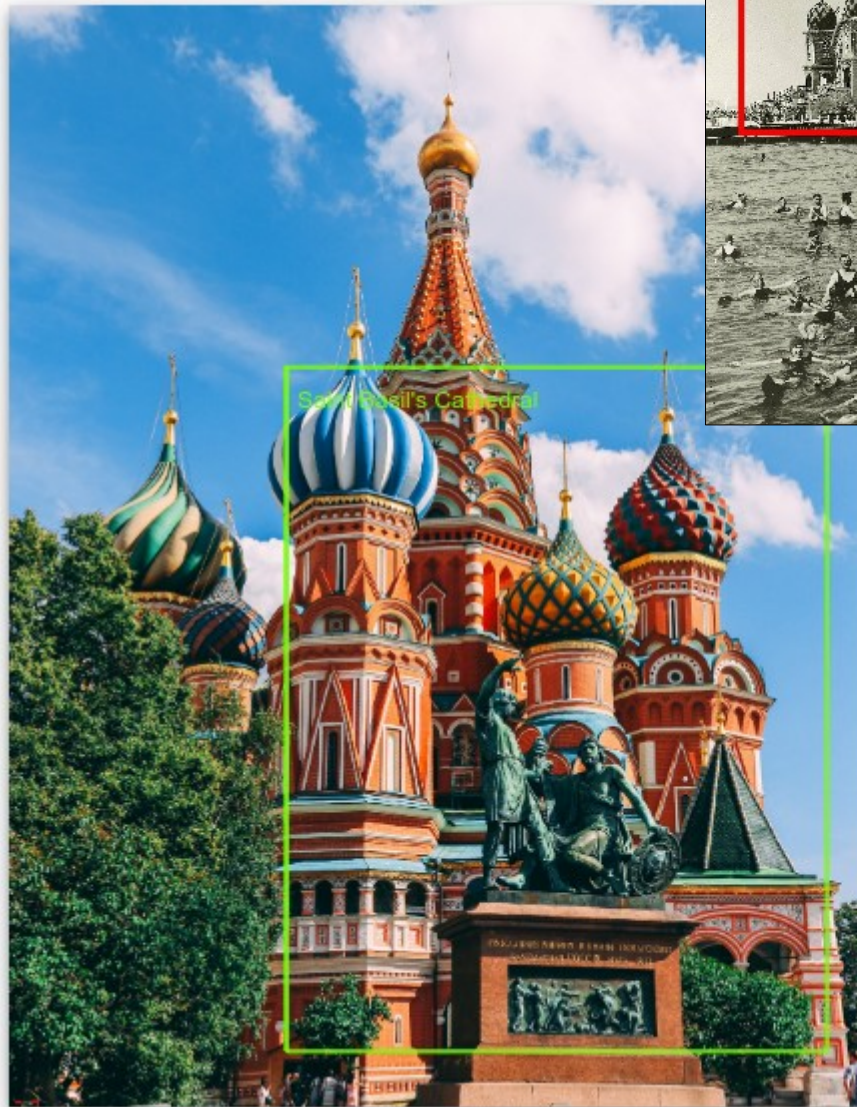
Hyeonwoo Noh et al. "Large-Scale Image Retrieval with Attentive Deep Local Features" arxiv.org/pdf/1612.06321.pdf
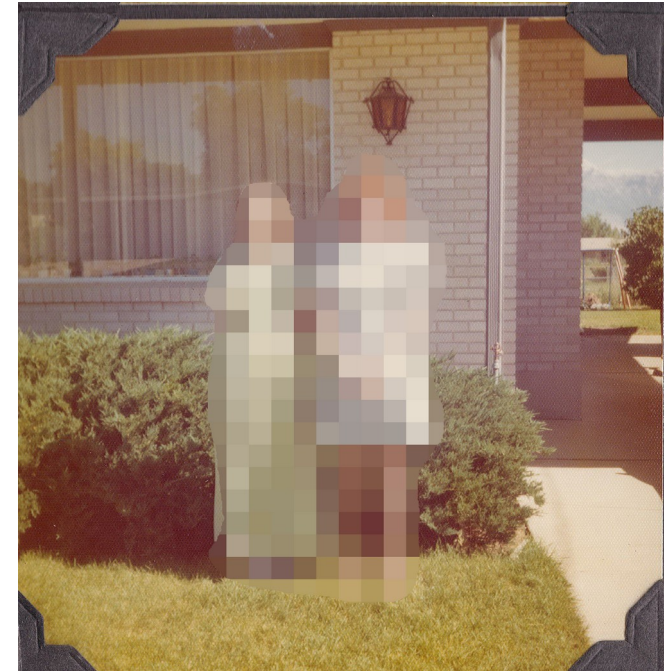Teichmann et al. "Detect-to-Retrieve..." https://arxiv.org/abs/1812.01584

Landmark Recognition

Landmark Recognition

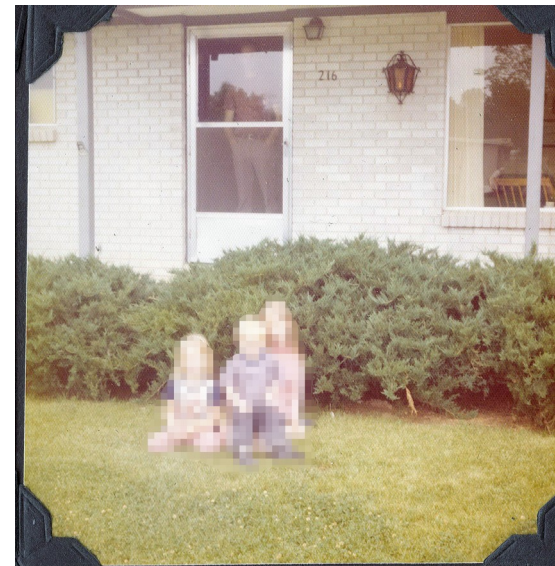- Dozens of photos
- Various angles
- Outside and Inside
- Various rooms

Can We Go Further?

Many buildings survive
Provo ≥ 2,266 1940
343 1900

Use them as anchors
and project backward

3D → 4D

Original courtesy Provo City Library. Cropped, then colorized using Iizuka, et al. "Let There Be Color" SIGGRAPH2016.

Uses

- Better place recognition
- Discovery experiences
- Story telling
- History in general (not just FH)
- Other uses?

Conclusion

- Computer Vision can help us leverage information from photos

- Faces, Places in particular

- More uses for CV in FHT

Thank You!