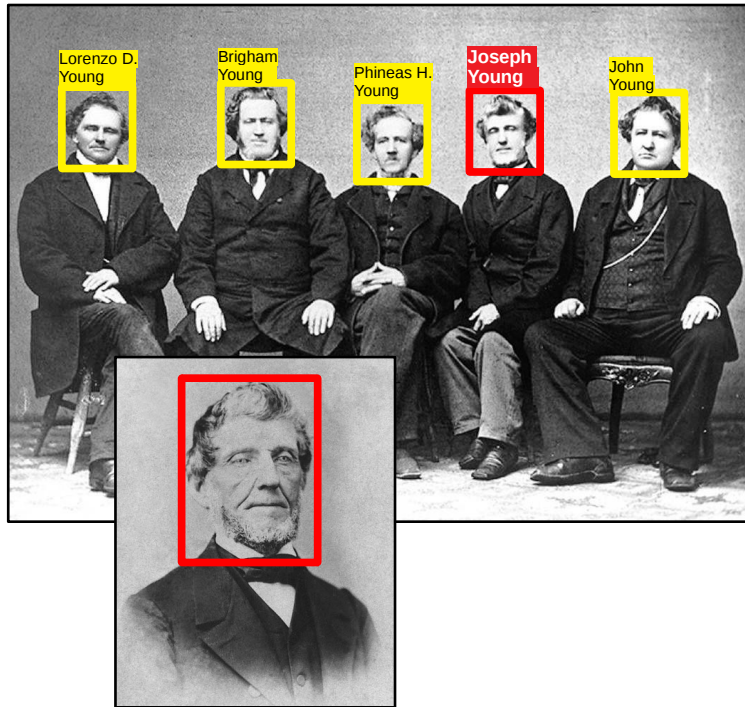
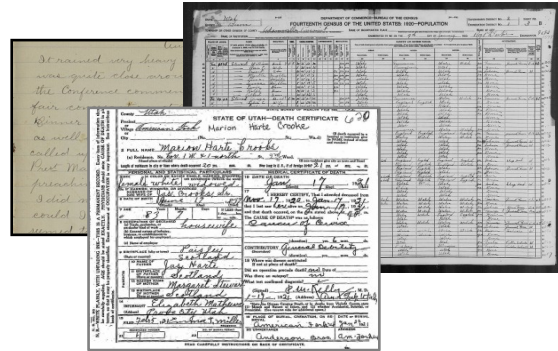
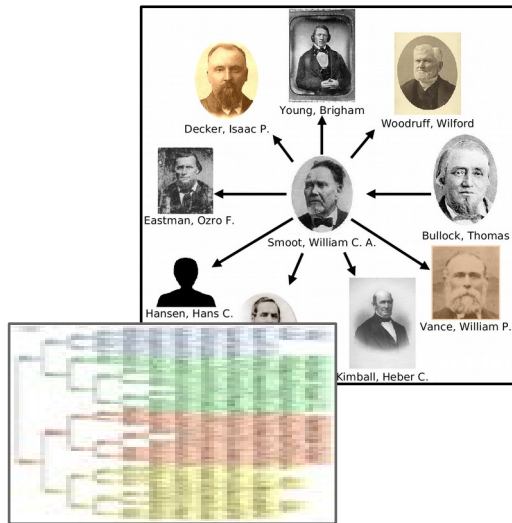


Faces, Places and Kin: Applying Computer Vision to Family History



Databases



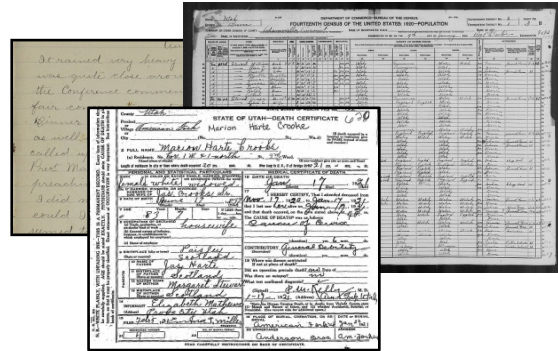
Records and Documents



Images, Media
(People, Places, Events)

Genealogies, Links,
Historical Social Networks

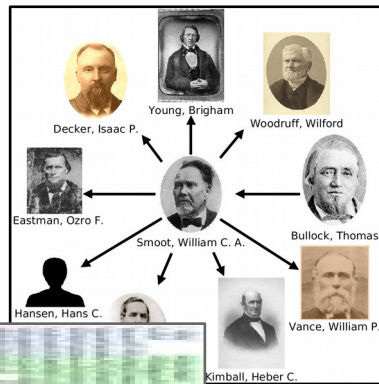
Databases



Records and Documents



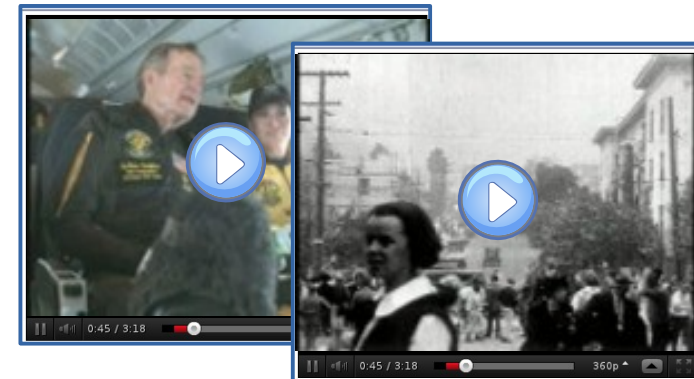
Images, Media
(People, Places, Events)



Genealogies, Links,
Historical Social Network



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



Video

Who? When? Where?



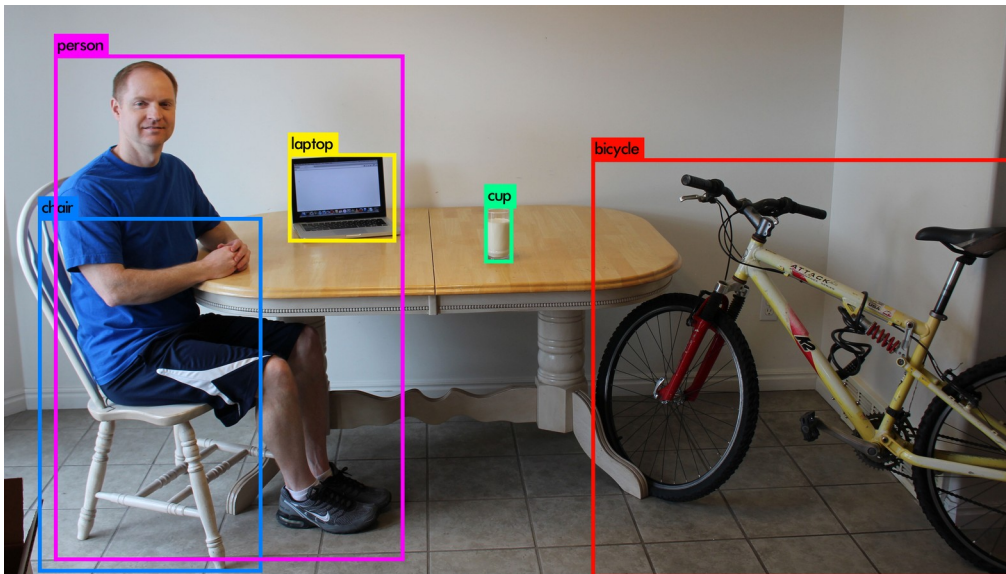
- **Context** (captions, labels, titles, text)
- **Metadata** (image or collection-level)
- **Tags**



Computer Vision, Machine Learning



www.cityscapes-dataset.com



Redmon, et al. 2018 "YOLOv3: An Incremental Improvement"



Image Classification, Object Recognition



What?

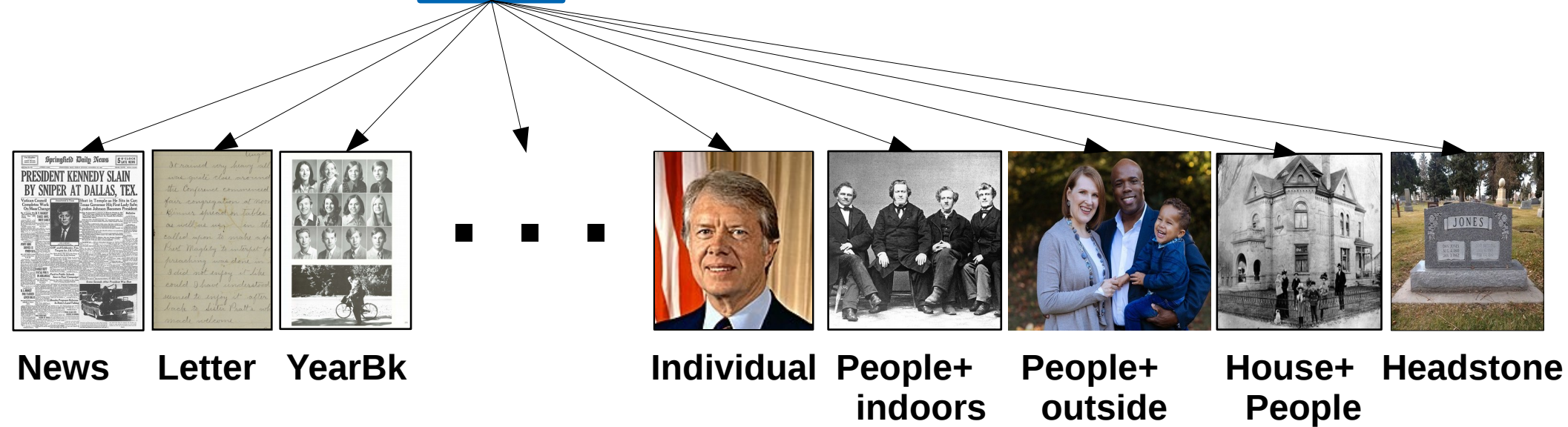
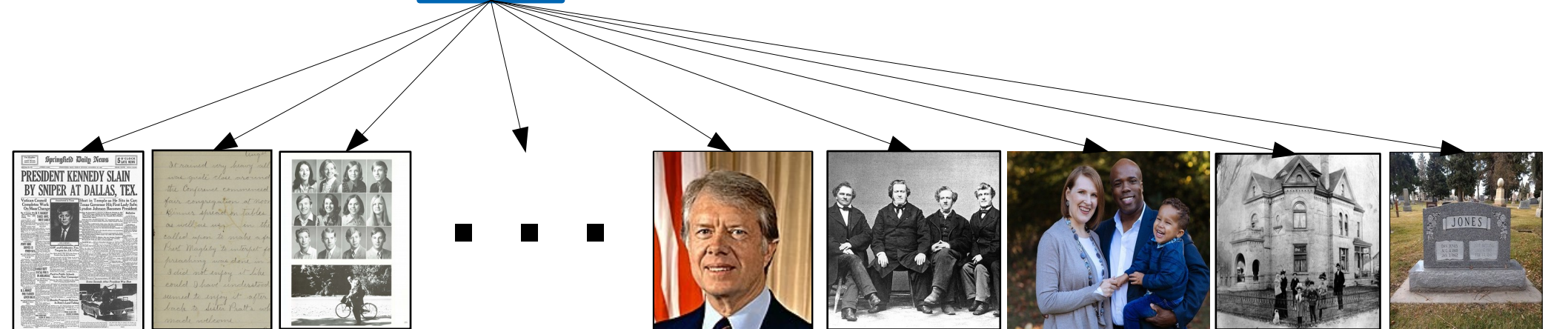


Image Classification, Object Recognition



What?

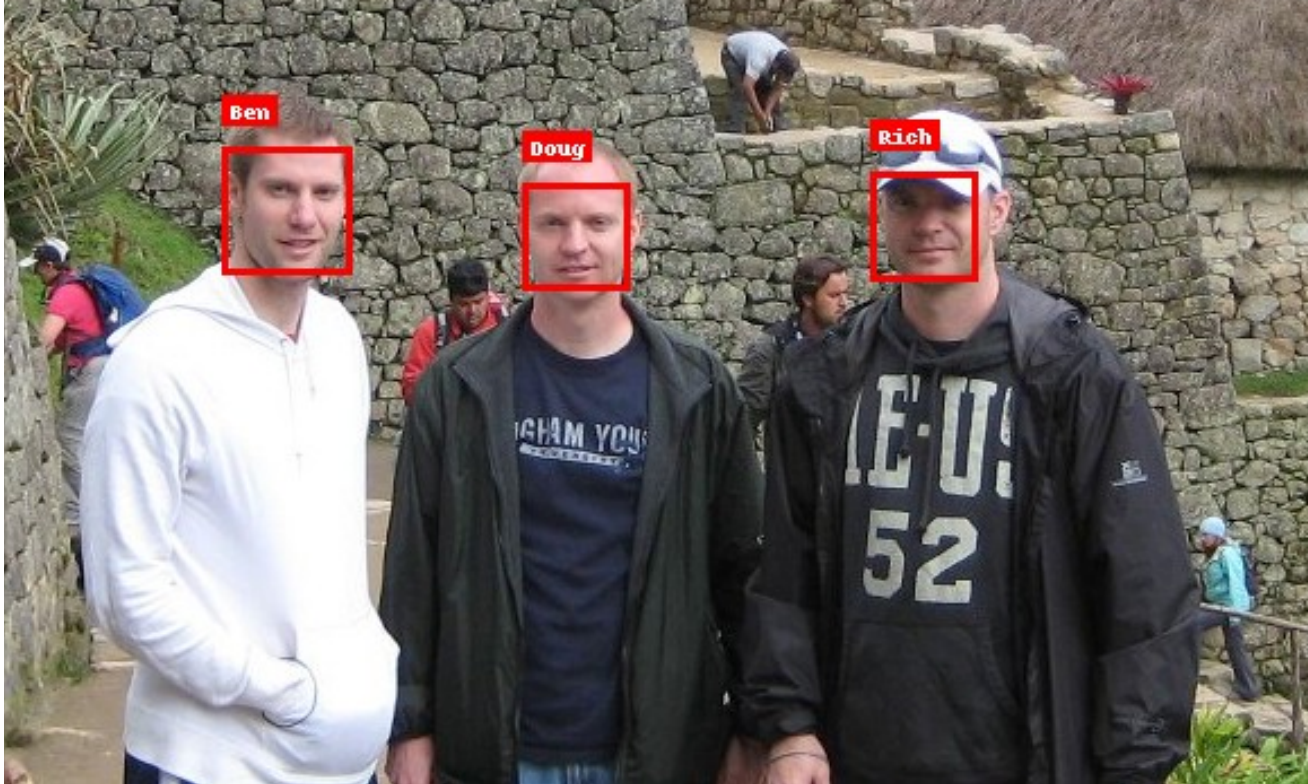


News	Letter	YearBk
Layout	HR	Layout
OCR	NLP	Faces
Articles	Entities	OCR
NLP	HSNs	Names
Entities	Links	HSNs
Images		Links
Links		

Individual	People+ indoors	People+ outside	People+ House	Headstone
Face	Faces	Faces	Faces	Locate text
Age	Ages	Ages	Ages	OCR
HSN	HSNs	HSNs	HSNs	Metadata
Links	Links	Links	House #	Cem Record
			Street	Tree
			Location	HSNs
			Links	Links

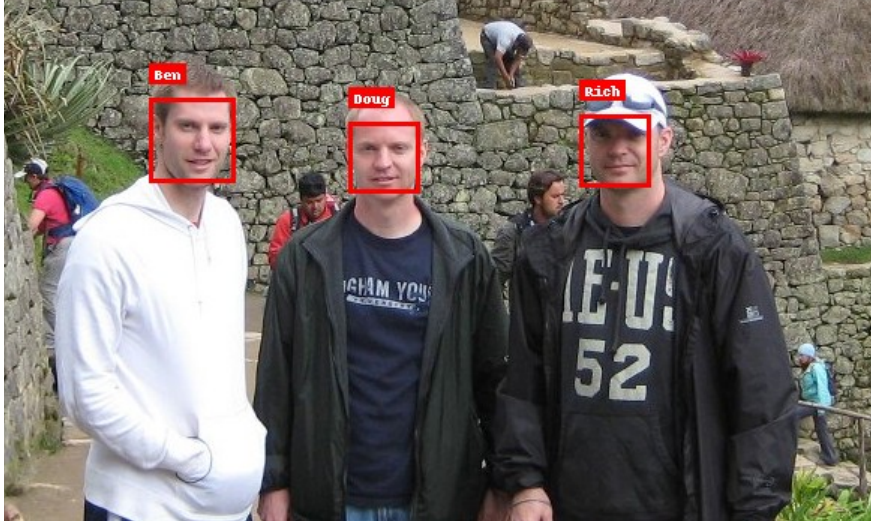
How?

Face Recognition



Who?

Face Analysis (age, gender, etc.)



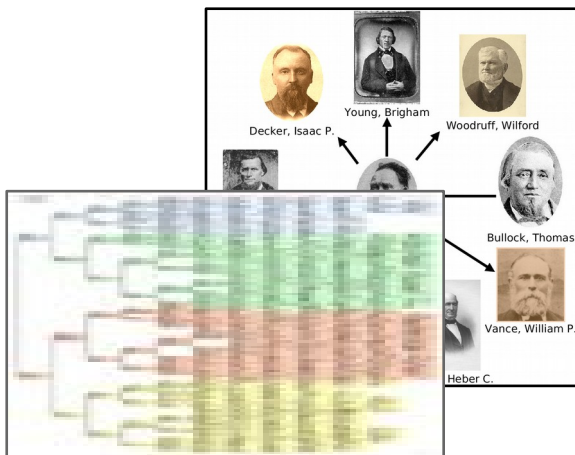
When?

2007-2021

1993-2007

2005-2021

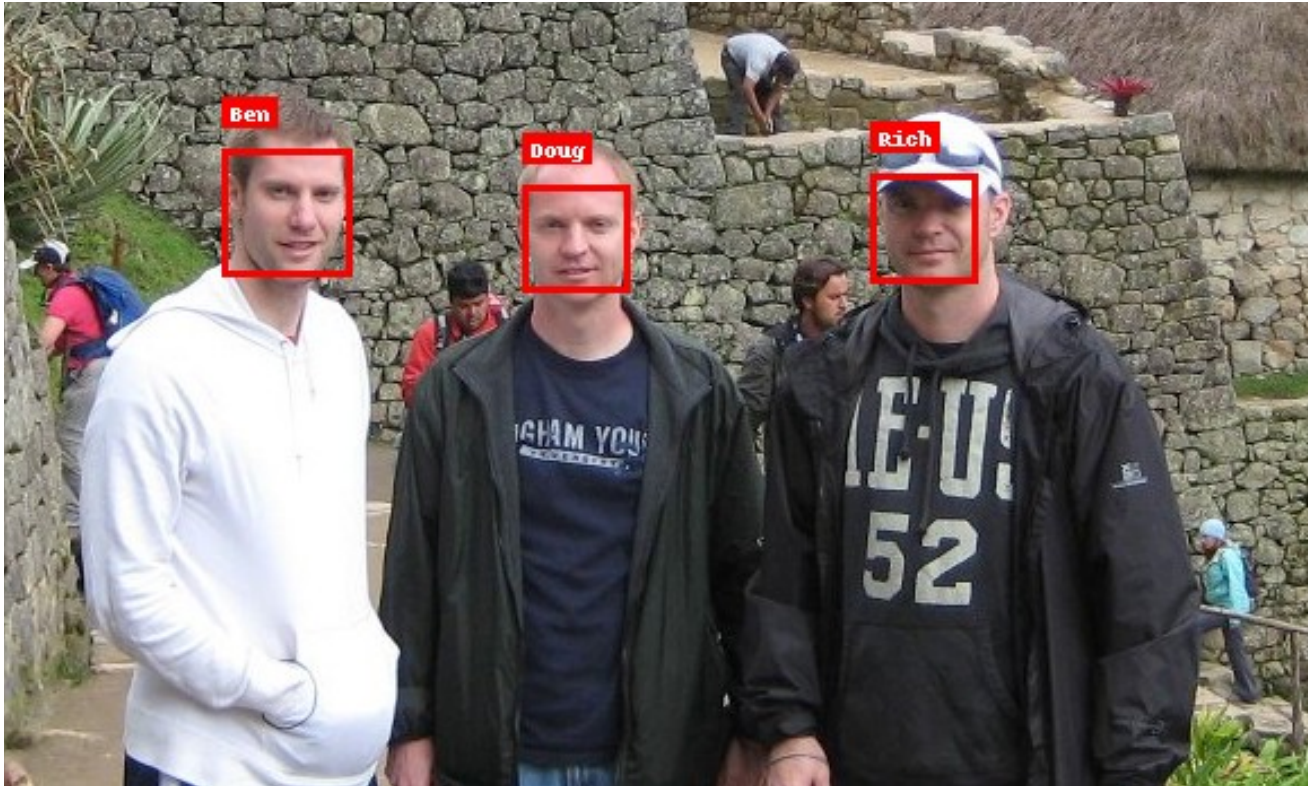
+



estimate=2009
error \approx 1.5 years

(individual errors \approx 3 to 11 years)

Face Recognition

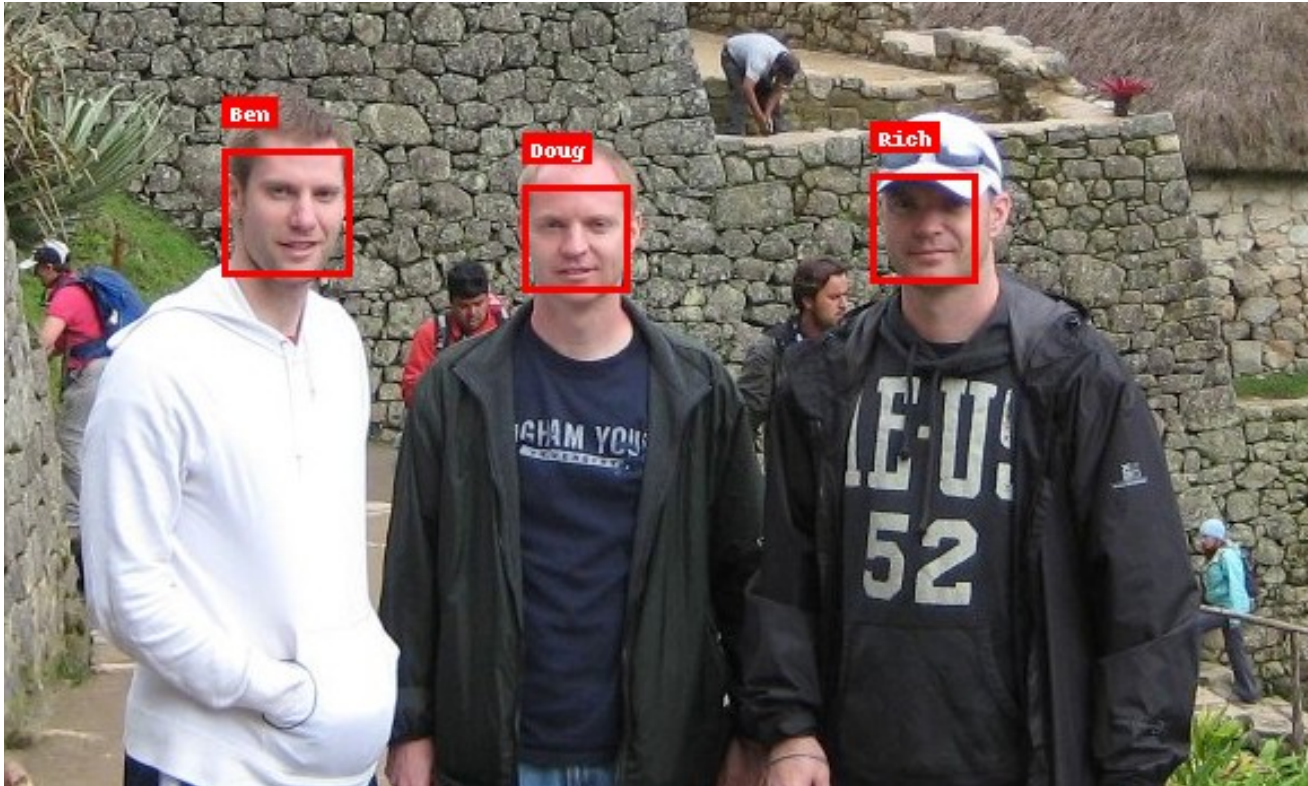


Who?

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) \approx farmer*

Wife (19-35)

Daughter (1-4)

36 families

* Includes “farmer,” “farming,” “farm partner,” “livestock farmer,” “share cropper”

Example

36 candidate families

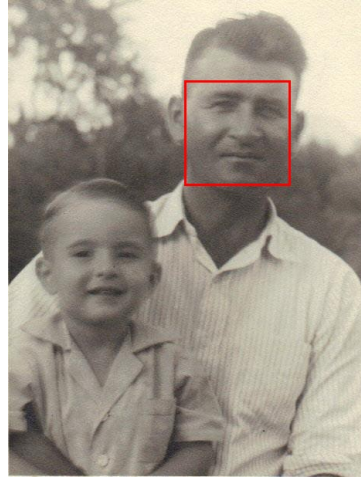
35: photo of husband or wife in FS*

31: a photo of both

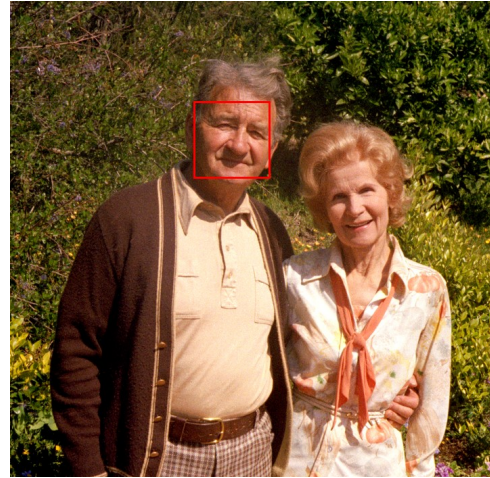
9: no “good” photo of either
(decent quality, close in age)

Top 3 Matches

1st ✓



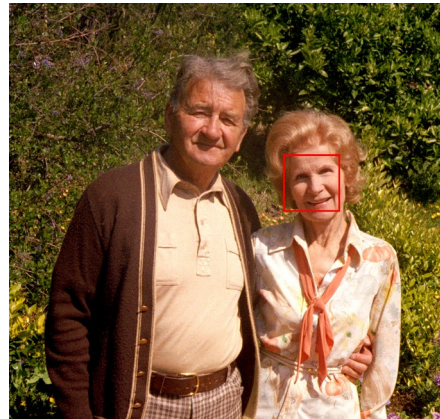
2nd ✓



3rd ✓



1st ✓



2nd ✓



3rd ✗

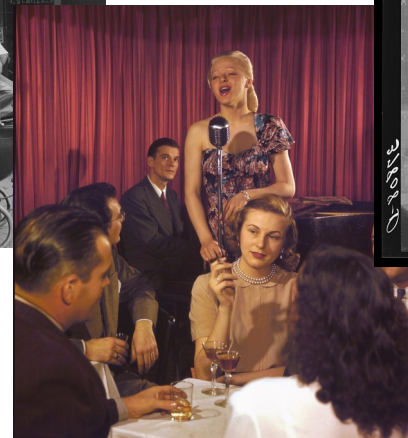


Example

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 opt-in with informed 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

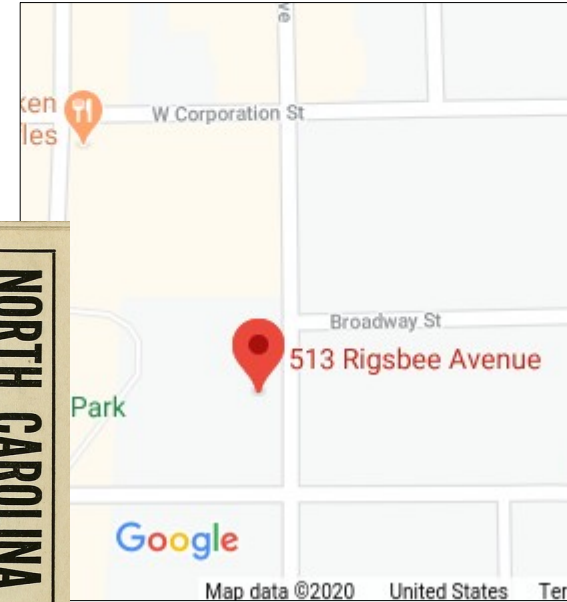
+

records, tree, HSNs

(addresses, cities / towns)



Scene Text Recognition



781

The Depositors National Bank
of Durham, N. C.
(Member F. D. I. C.)
"Seeking New Business On the Service We Render"

Center Restaurant 117 E Chapel Hill
Central Lunch 420 W Main
City Cafe 228 Rigsbee av
City Sandwich Shop 124 E Main
Costello's Cafe 1026 Cleveland
Dixie Cafe 119 W Chapel Hill
Durham Cafe 217 E Main
Durham Sandwich Shop 815 Fayetteville
Farmers Cafe 209 Morgan
Forest Inn 1314 S Duke
Forks The New Raleigh rd cor Holloway
Friendly Cafe (c) 514 Pine
G & G Lunch 1203 Angier av
Garris O Penton 902½ Rose Hill av
Goody Shop 1000-02 W Main
Grill & Fountain The 111 E Main
Harvey's Cafeteria Inc 105 E Main
Hillside Sandwich Shop (c) 1111 Pine
Hollywood Inn Cafe (c) 118 S Mangum

HOTEL MALBOURNE COFFEE SHOP, 225 E Main, Tel F-176 (For further information see page 24 Buyers' Guide)
Ideal Diner 101 Rigsbee av
Jean's Luncheonette 2022 Angier av
Jones Drucilla A Mrs 506 Carr
Kounis Jas 401 Rigsbee av
Lakewood Lunch 1912 Lakewood av
Lewis' Dinery 807 W Main
Lincoln Cafe 114 S Mangum
Little Acorn 613 Rigsbee av
Lucky Clover Inn 402½ Carr
Lucky Strike Lunch Room 600 Carr

MALBONE CAFE (c), 801 Fayetteville, Tel J-6221
Mangum Cafe 513 Rigsbee av
Manhattan Lunch 526 E Main
Mason Pearl 1024 84
Midway Lunch (c) 414 E Pettigrew
Monticello Cafe 321 E Chapel Hill
Morris A Bertran 418 Blackwell
Morris Elliott B 903½ Angier av
N C Cafe 215 E Chapel Hill
Old Star Cafe (c) 532 E Pettigrew
Oriental Restaurant The 116-18 E Parrish
PALMS RESTAURANT THE, 36 E Chapel Hill, Tel L-8021 (For further information see page 36 Buyers' Guide)
Paul's Place 712 9th
Phil Beal (c) 704 Fayetteville
Planter's Cafe 502 E Chapel Hill
Plaza Cafe 210 N Corcoran
Poole Mary E Mrs 507 Morgan
Pratt Alex L 2413 W Pettigrew
R & W Lunch 911½ E Main
Red Top Inn Roxboro rd extd
Red's Diner 2106 Angier av
Reeves Geo W 711 E Main
Rinaldi's Grill 1117 W Main
Royal Cafe (c) 324 Pine

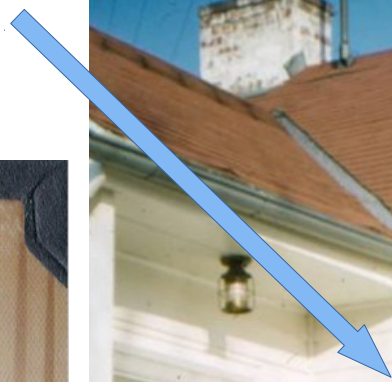
NORTH CAROLINA MUTUAL LIFE INSURANCE CO.
Old Line Legal Reserve Life Insurance
"NO HOME COMPLETE WITHOUT NORTH CAROLINA MUTUAL POLICIES"
Home Office, Durham, N. C.

Washington Duke Tavern, 207 N Corcoran, Tel F-101 (For further information see page 25 Buyers' Guide)
West End Lunch Room 3013 Hillsboro rd
West Side Lunch 1003½ W Chapel Hill

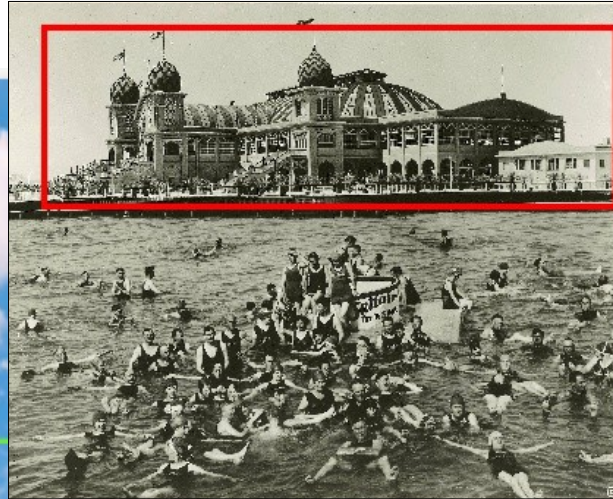
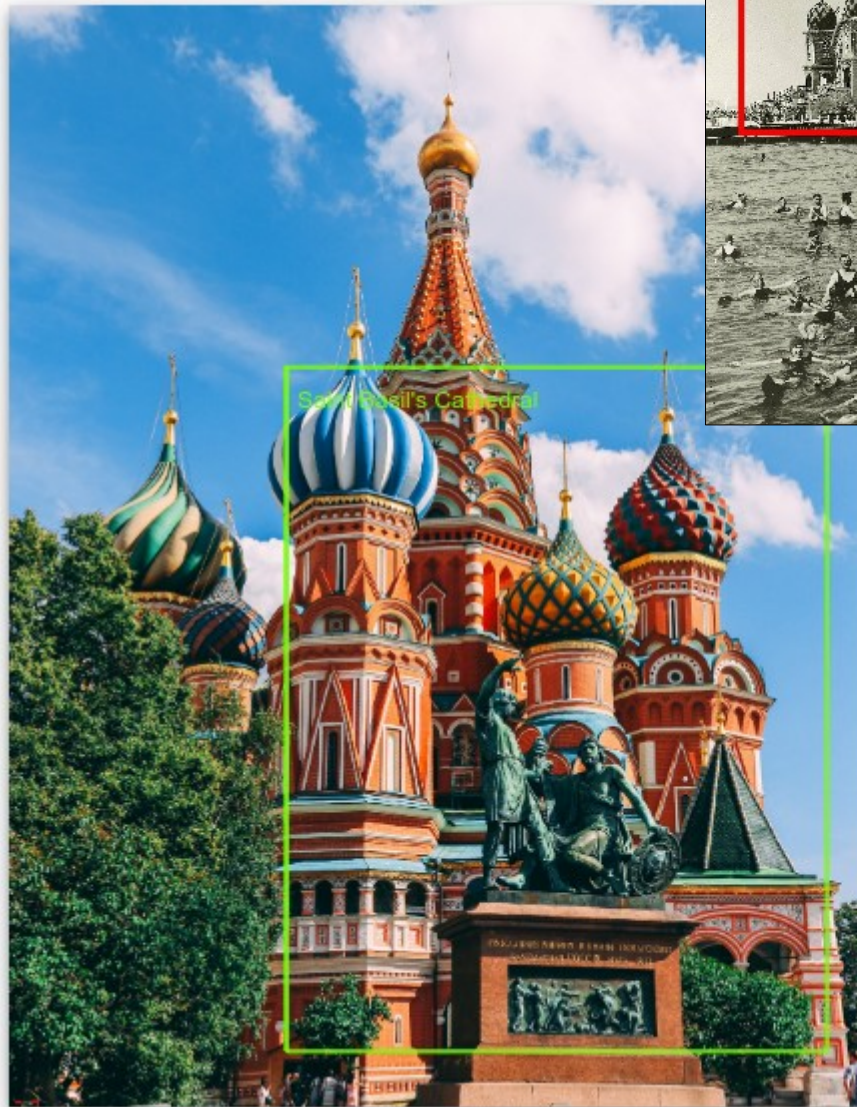
Mangum Cafe 513 Rigsbee av

Scene Text Recognition

House Numbers Recognized



Landmark Recognition



cropped from image shared by Google under Creative Commons Attribution 4.0 License.
<https://cloud.google.com/vision/docs/detecting-landmarks>

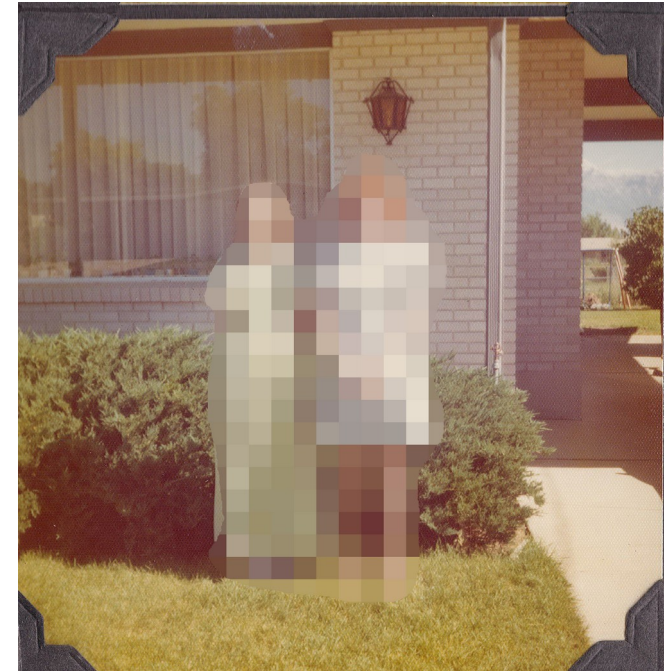
Hyeonwoo Noh et al. "Large-Scale Image Retrieval with Attentive Deep Local Features" arxiv.org/pdf/1612.06321.pdf
Teichmann et al. "Detect-to-Retrieve..." <https://arxiv.org/abs/1812.01584>

Landmark Recognition



Landmark Recognition

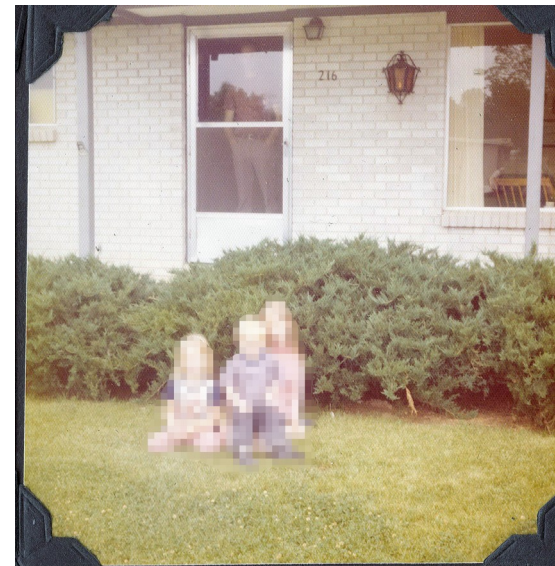
- Dozens of photos
- Various angles
- Outside and Inside
- Various rooms



Can We Go Further?

Many buildings survive
Provo \geq 2,266 1940
343 1900

Use them as anchors
and project backward



3D → 4D



Original courtesy Provo City Library. Cropped, then colored 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!