CATALOGUING LARGE PHOTO COLLECTIONS

Is Artificial Intelligence unbiased?

Dr. Allison Kupietzky, The Israel Museum, Jerusalem

PHOTOCONSORTIUM AND CITIZEN HERITAGE CONFERENCE

The role of photographic heritage in empowering communities' participation in cultural heritage

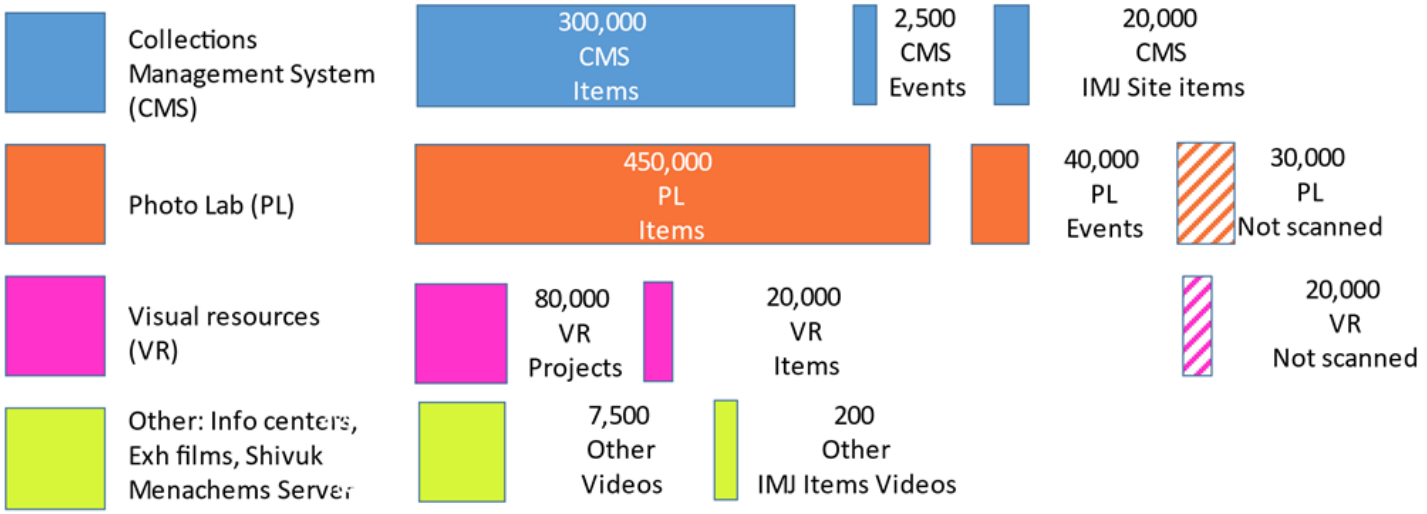
Pisa, June 2022

מוזיאון ישראל,ירושלים
the israel museum, jerusalem
متحف اسرائيل، اورشليم القدس

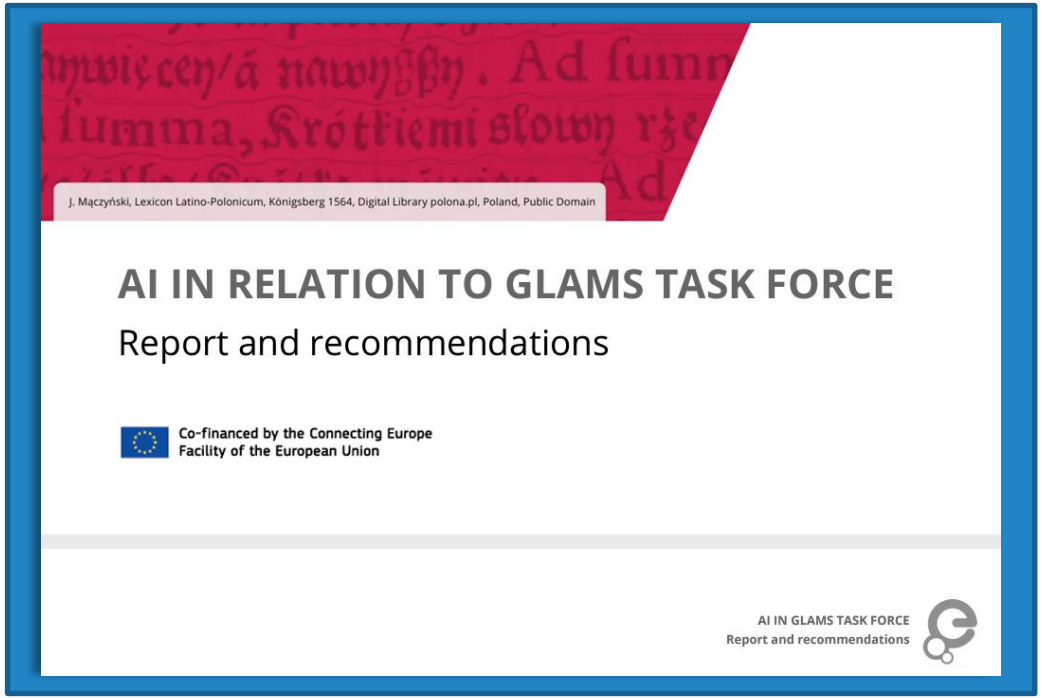
מוזיאון ישראל, ירושלים
the israel museum, jerusalem
متحف إسرائيل، أورشليم القدس

The Israel Museum, Jerusalem Digital Asset Collection

One million media files (972,200 images and videos)



AI in relation to GLAMs Task Force Report - Europeana Pro



https://pro.europeana.eu/files/Europeana_Professional/Europeana_Network/Europeana_Network_Task_Forces/Final_reports/AI%20in%20relation%20to%20GLAMs%20Task%20Force%20Report.pdf

How can AI be used in museum cataloguing?

- Visual recognition – Objects, subjects
- Facial recognition – Artists, Staff, VIP
- OCR text recognition – Typed archival material
- HTR (Handwritten text recognition) – Archival letters
- Number recognition in images – Registration numbers
- Audio to text – Transcription of videos
- Search and retrieval – Semantics (Linked Data)

How can AI be used in museum cataloguing?

Some faults include:

- Gender, racial, and language algorithmic biases…
  - **Algorithmic biases** can occur due to coding based on assumptions and computer misunderstandings

Because of these issues, human intervention is necessary.

VISUAL RECOGNITION

Objects, Subjects

Identifying information about an exhibition

Finding paintings within an exhibition photo (MoMA example)

https://www.moma.org/calendar/exhibitions/history/identifying-art

A project with Google Arts & Culture Lab

Given years of experience and some diligent research, identifying each work of art in an old exhibition photo doesn't sound so hard, does it? Now imagine you have tens of thousands of photos, dating back to 1929. MoMA's Digital Media team and Google Arts & Culture Lab set out to face this daunting challenge—or at least get a head start—using machine learning and computer vision technology.

Our collaborators at Google Arts & Culture Lab used an algorithm to comb through over 30,000 exhibition photos, looking for matches with the more than 65,000 works in our online collection. In total, it recognized over 20,000 artworks in these images, and we used those results to create a vast network of new links between our exhibition history and online collection. These connections bolster an already unparalleled resource for the millions of visitors to moma.org.

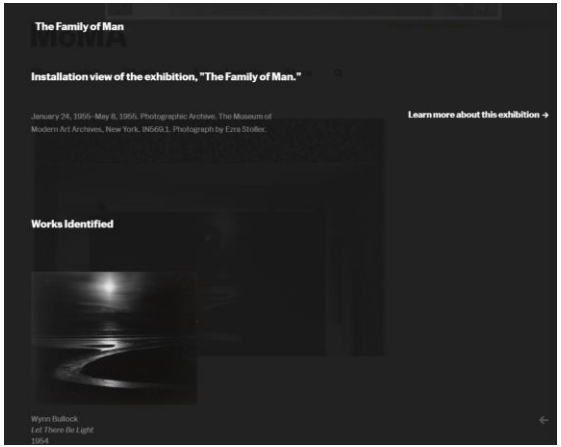
Now a photo from a 1929 painting exhibition opens a window into an iconic work by Paul Cézanne; a 1965 shot of Robert Rauschenberg prints connects you to those same works in MoMA's 2017 Rauschenberg retrospective; and one corner of a 2013 design exhibition becomes a portal into poster art across two centuries. While hardly comprehensive, it's a great start—and a remarkable feat given the sheer volume of information involved.

Why weren't there more matches?

While many works were identified, many others don't currently have anything to be matched with. Exhibitions often contain both works from our collection and items loaned from elsewhere, so the installation images likewise contain many works that aren't part of MoMA's collection. In addition, some works that are in the Museum's collection have not yet been added to our constantly evolving online collection, or have been added but don't yet include an image.

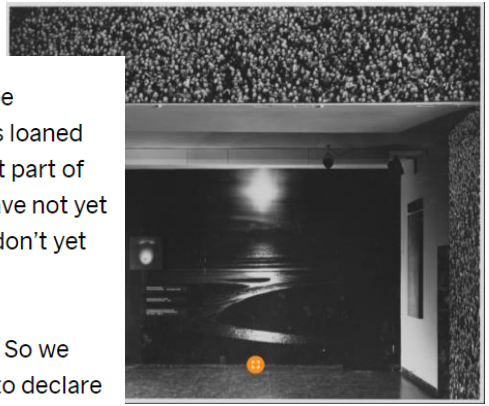
From the outset, our main concern was keeping incorrect matches to a minimum. So we sacrificed quantity for quality: Google Arts & Culture Lab designed the algorithm to declare something a match only when it was very "confident." We learned that, like anyone, an algorithm has strengths and weaknesses. At present, the algorithm is very good at identifying static, two-dimensional images. Sculptures; moving image, installation, and sound works; and text-based artworks proved far more challenging. Unsurprisingly, multiples and editions of the same or very similar images also led to some "false positives." Simply put, a machine can't always tell one soup can from another. The algorithm may also incorrectly match photographs when the work on view was actually a different print of the same (or a very similar) image.

Today, the work begun by this machine learning project has been taken up by MoMA staff. Thus far, what we gave up in processing speed has been made up for by the flexibility of human brains and the thoroughness of our curators' research.



Identifying information about an exhibition

Finding paintings within an exhibition photo (MoMA example)



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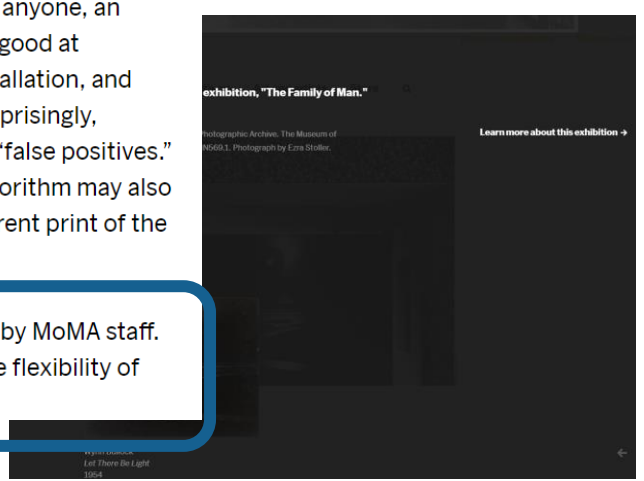

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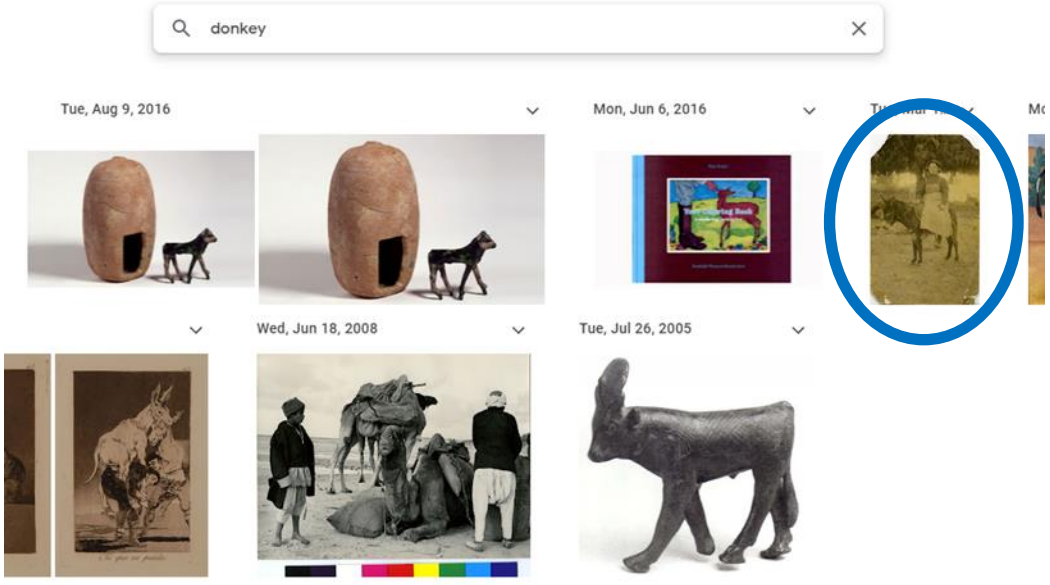
https://www.moma.org/calendar/exhibitions/history/identifying-art

Identifying other items within an image

Searching by identifying traits

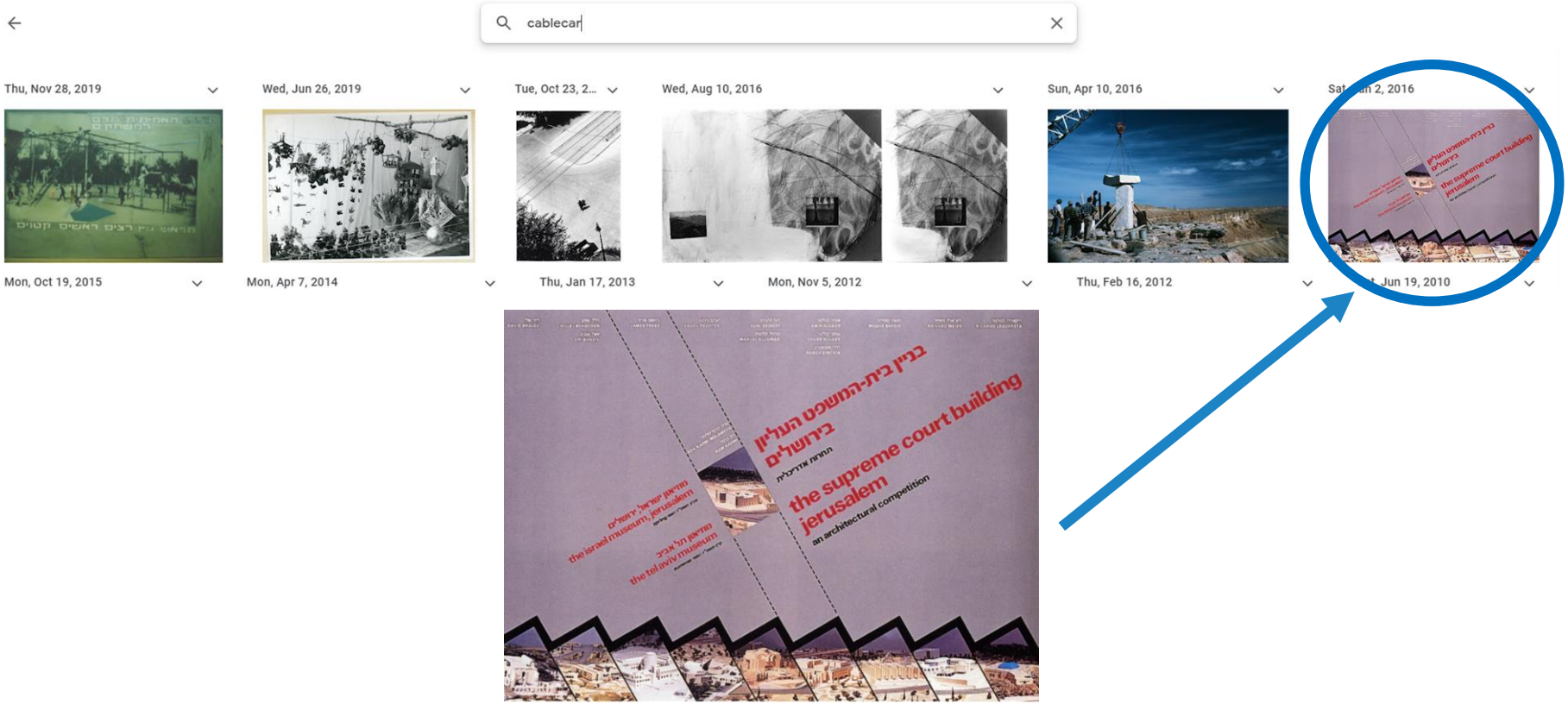


Unknown photographer
Chana Orloff, Petah Tikva
1906
Postcard
Gabriel Talphir Archive, Information Center for Israeli Art, Israel Museum, Jerusalem

Identifying other items within an image

AI's mistaken identification of an object in (or the subject of) an artwork

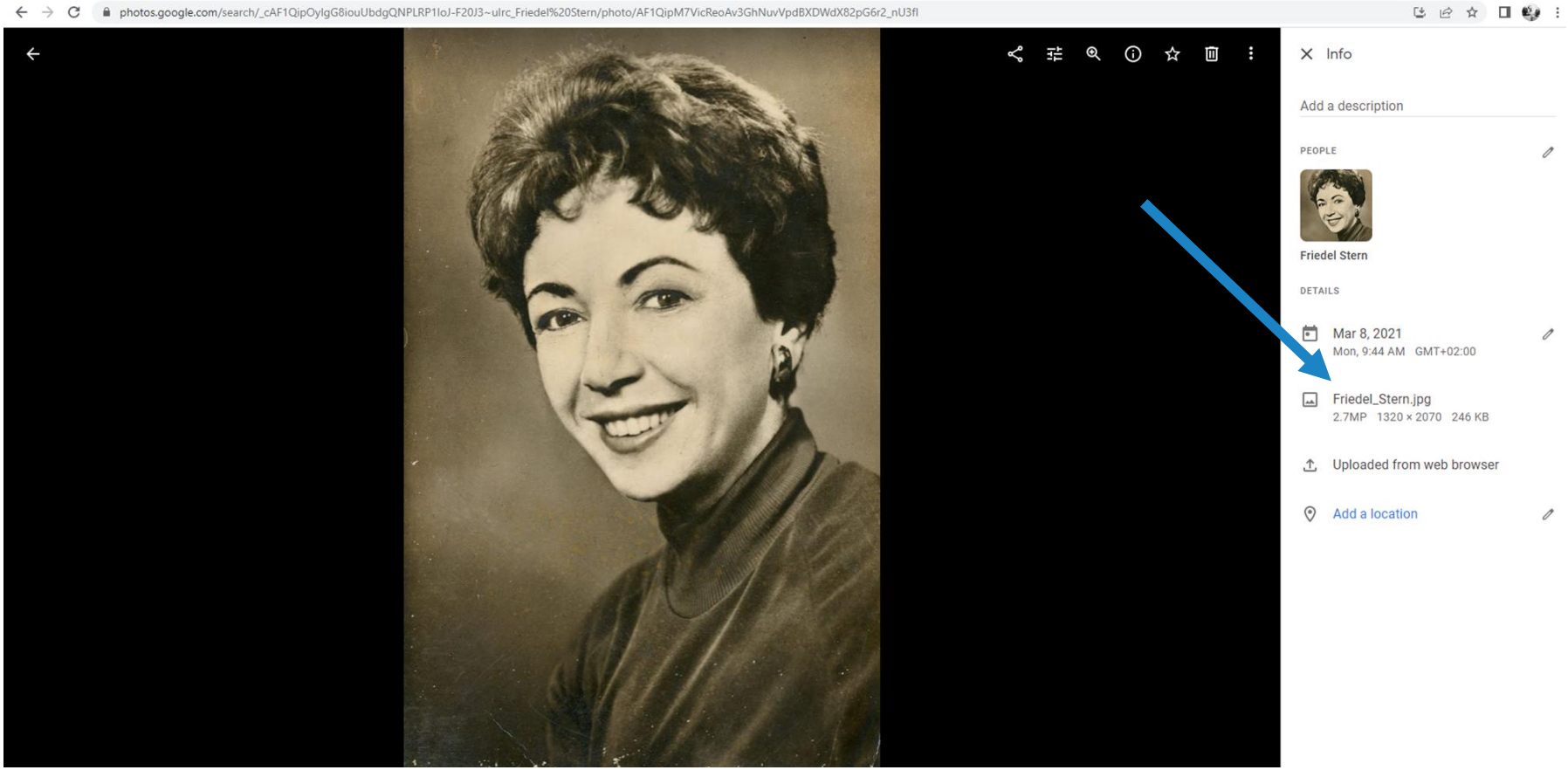
Google images – automated AI keywording: "cable car"

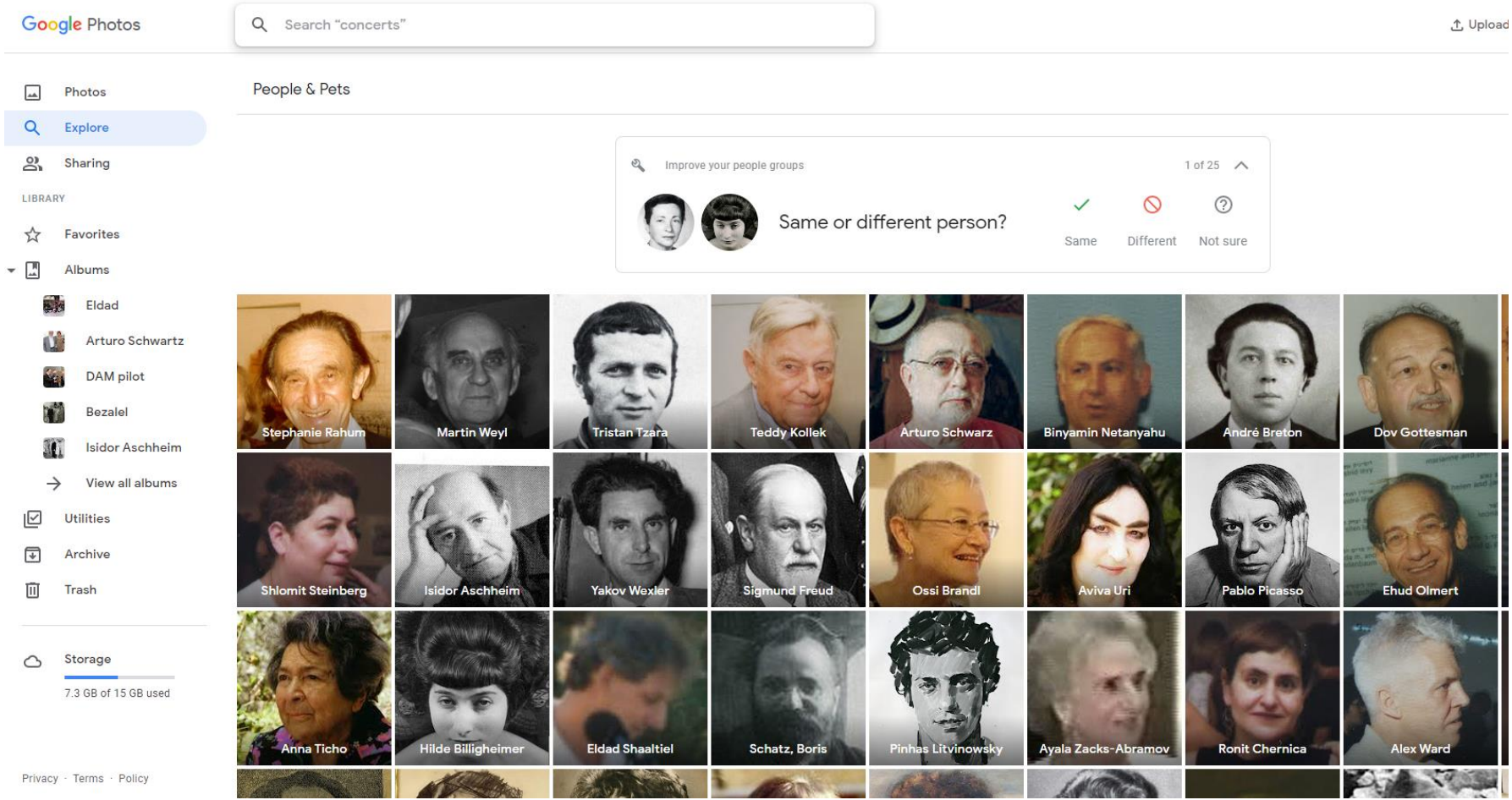


FACIAL RECOGNITION

Artists, Staff, VIPs

Identifying people through legacy data




Google Photos
Search "concerts"
Upload
Photos
Explore
Sharing
LIBRARY
Favorites
Albums
Eldad
Arturo Schwartz
DAM pilot
Bezalel
Isidor Aschheim
View all albums
Utilities
Archive
Trash
Storage
7.3 GB of 15 GB used
Privacy · Terms · Policy
People & Pets
Improve your people groups
1 of 25
Same or different person?
Same
Different
Not sure
Stephanie Rahum
Martin Weyl
Tristan Tzara
Teddy Kollek
Arturo Schwarz
Binyamin Netanyahu
André Breton
Dov Gottesman
Shlomit Steinberg
Isidor Aschheim
Yakov Wexler
Sigmund Freud
Ossi Brandl
Aviva Uri
Pablo Picasso
Ehud Olmert
Anna Ticho
Hilde Billigheimer
Eldad Shaaltiel
Schatz, Boris
Pinhas Litvinowsky
Ayala Zacks-Abramov
Ronit Chernica
Alex Ward

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Add a name
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Tue, Jul 2, 2019

Sun, May 7, 20...

Tue, Nov 29, 2016

Thu, Sep 15, 20...

Sun, Dec 6, 2015

Mon, Oct 19, 2015

Thu, Jun 4, 2015

Thu, Jul 10, 2014

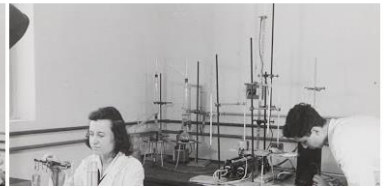
Sun, May 11, 2014

Sun, Apr 6, 2014

Thu, Sep 13, 2012

Thu, Aug 23, 2012

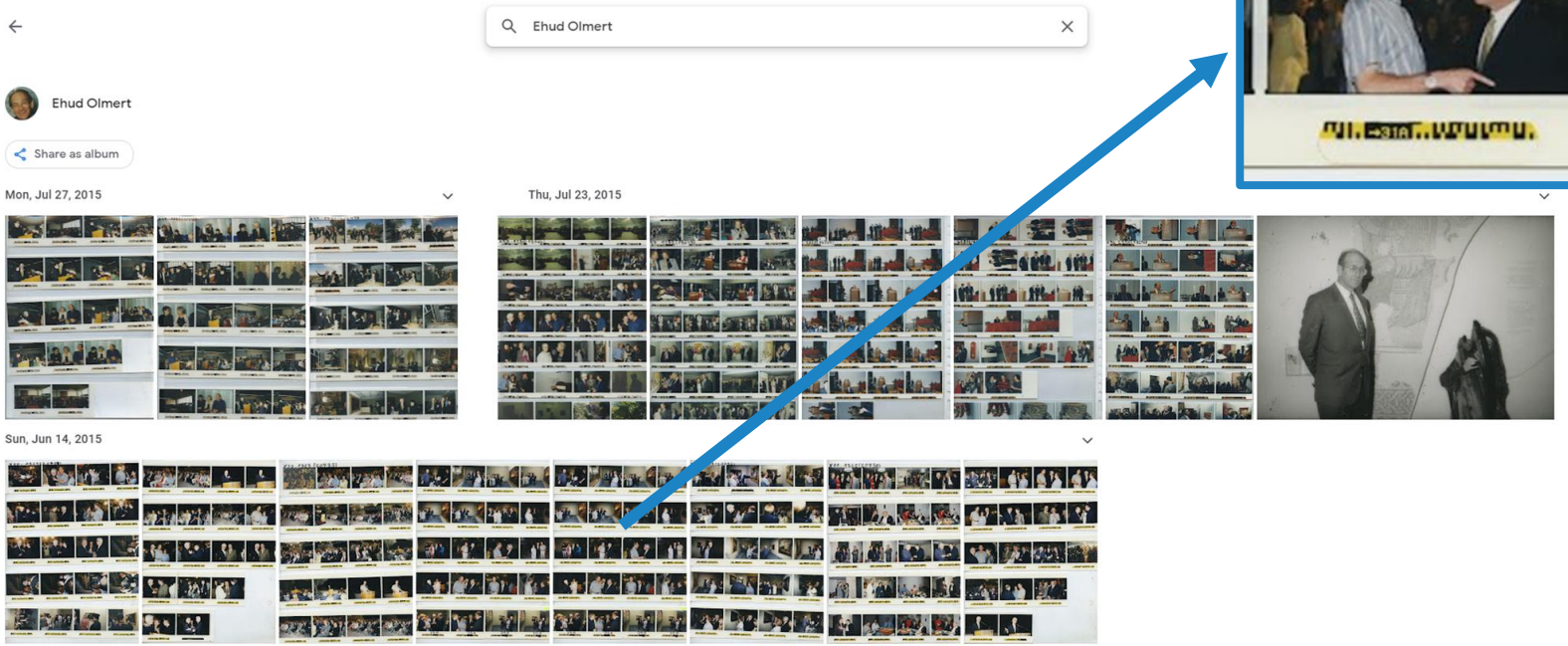
Thu, Mar 22, 2012



Thu, Feb 23, 2012

Ehud Olmert

Landscape of the Bible – Sacred Scenes in European Master Paintings, Israel Museum, Jerusalem, 05/09/2000 – 30/001/2001



André Breton

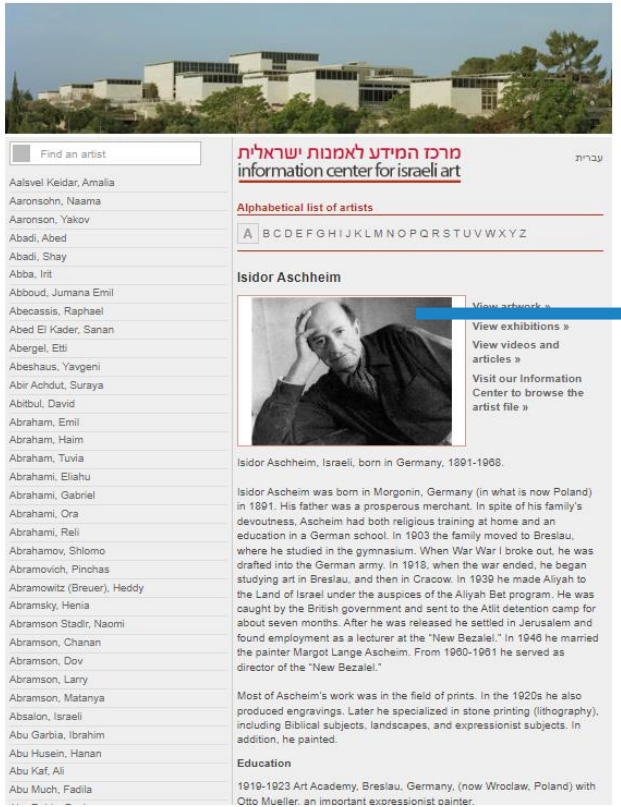
Identifying artists

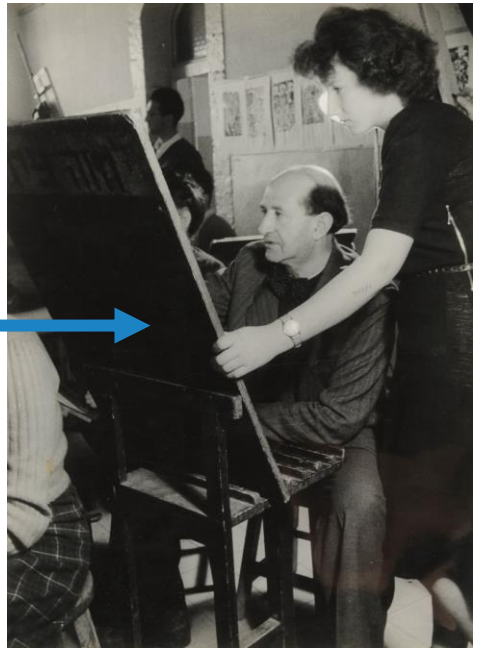
Image search in IMJ's collection

Searching Isidor Ascheim's profile picture to find other images featuring his face

Image search in IMJ's collection

Searching Isidor Ascheim's profile picture to find other images featuring his face





Alfred Bernheim, Israeli, 1885-1974
Isidor Ascheim in classroom, Bezalel, Jerusalem
After 1945
Gift of Warner Communications Inc., New York
B99.0921 (pBez040)

Facial recognition in IMJ's collection

Identifying Avigdor Arikha's face across collections

Thu, Nov 10, 2016

Avigdor Arikha, Israeli, 1929-2010
Canvas with Self Portrait
1976
Oil on canvas
Purchase, Ayala Zacks-Abramov Fund
B77.0620
Israeli Art Department

Sun, Jul 26, 2015

"Avigdor Arikha" exhibition opening, 1998
IMJ Photography Laboratory

Mon, Jan 16, 2012

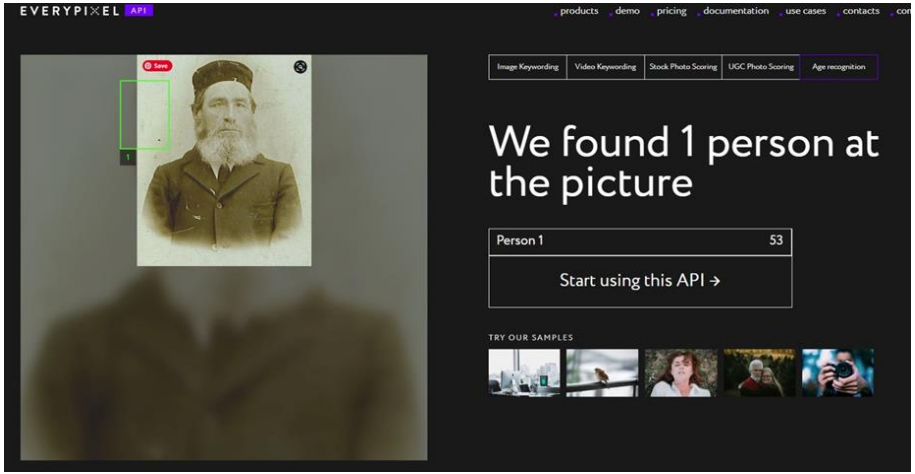
Avigdor Arikha
Photographer: Stanley I. Batkin
From the Archives of the
Information Center for Israeli Art

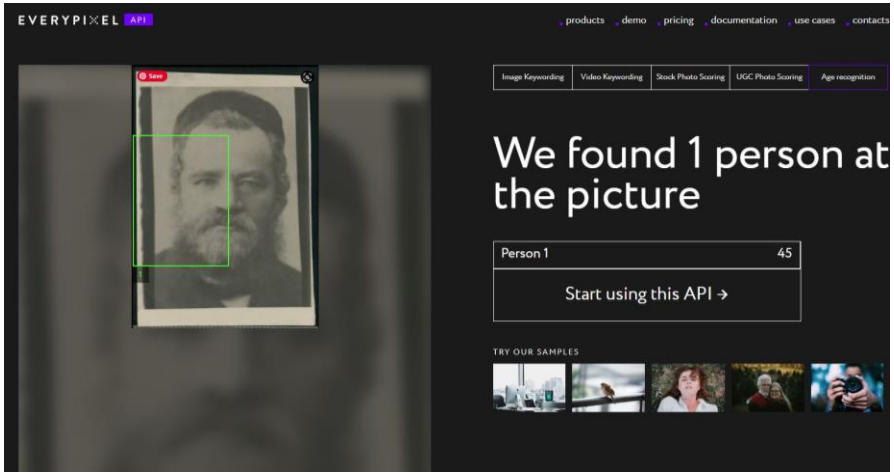
Using facial recognition to identify photos featuring museum staff

Eldad

Can AI match faces – is it the same person

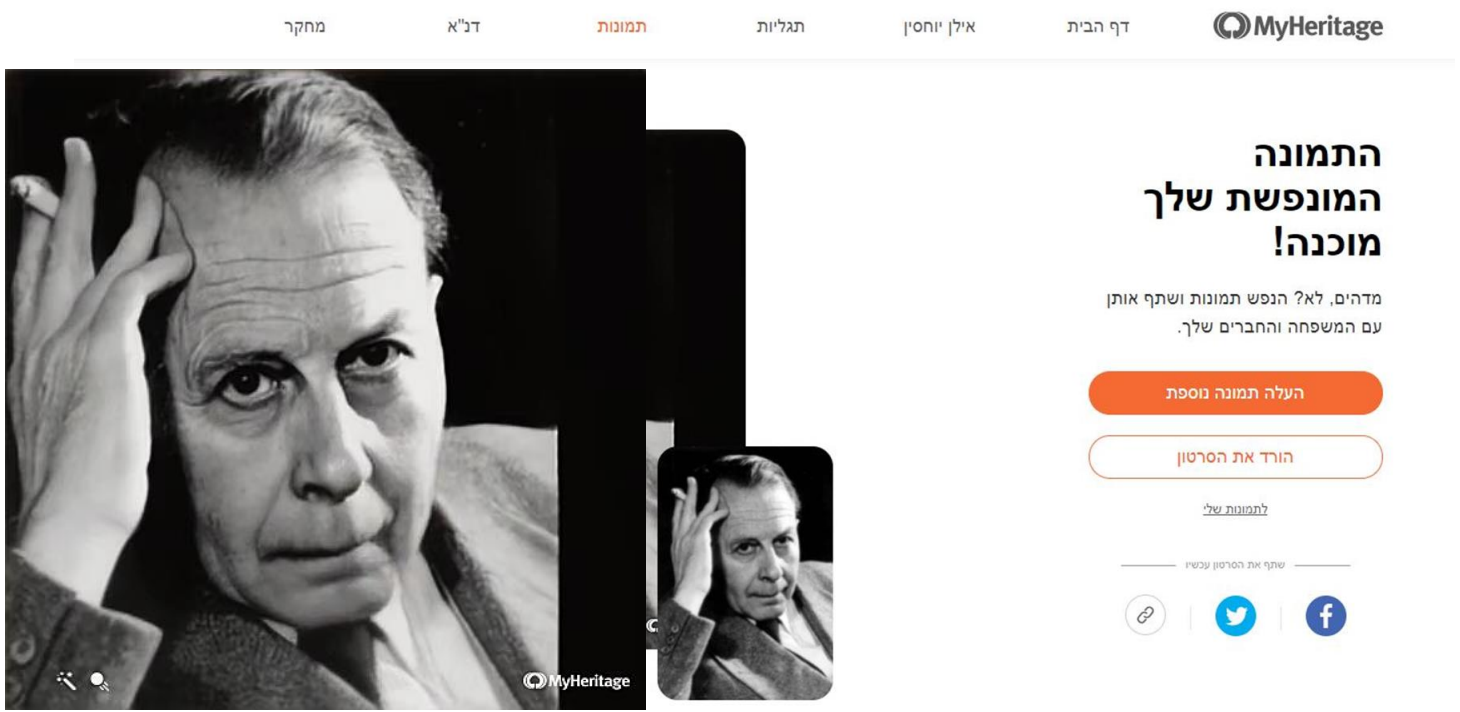
Every Pixel API





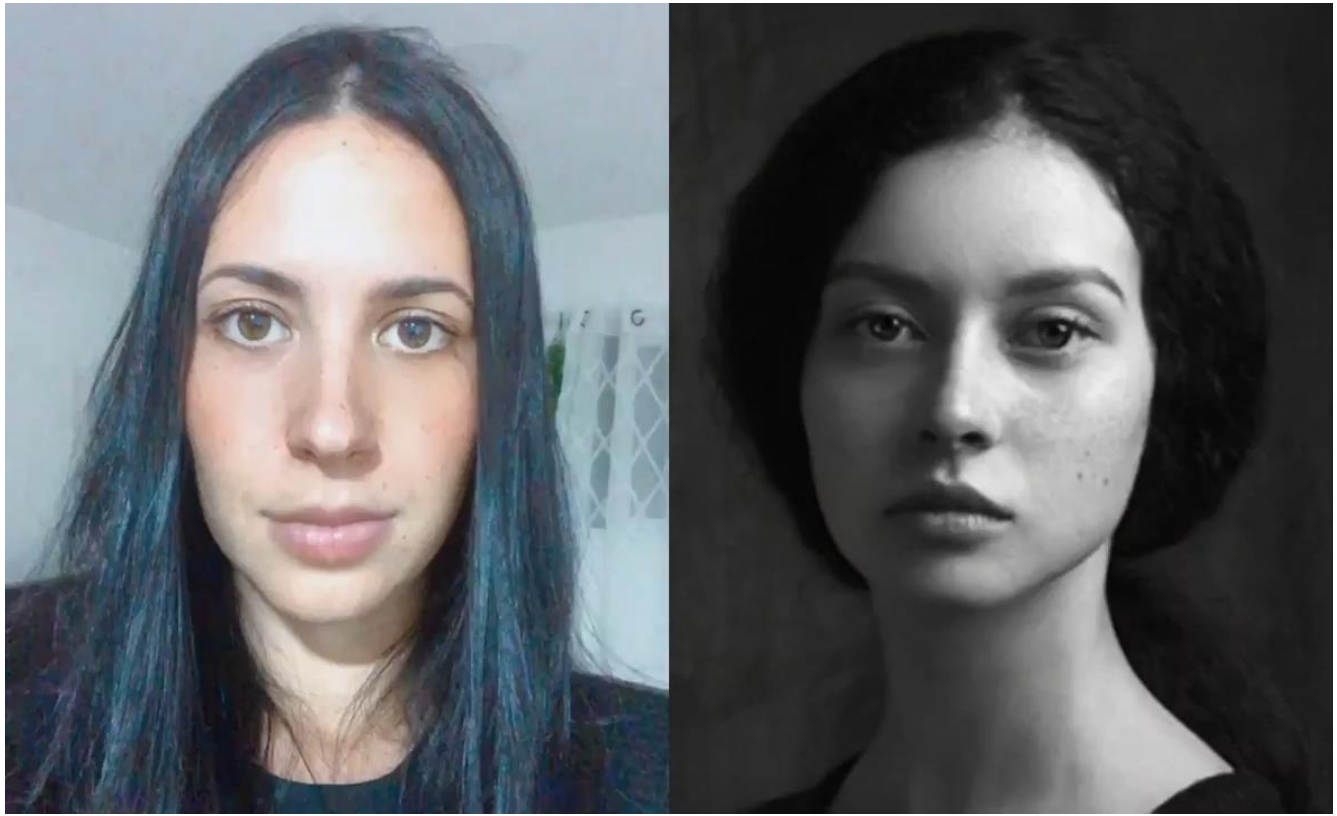
Animating with facial recognition

MyHeritage -- Richard Kauffmann (1887–1958) German / Israeli architect



Animation and facial recognition

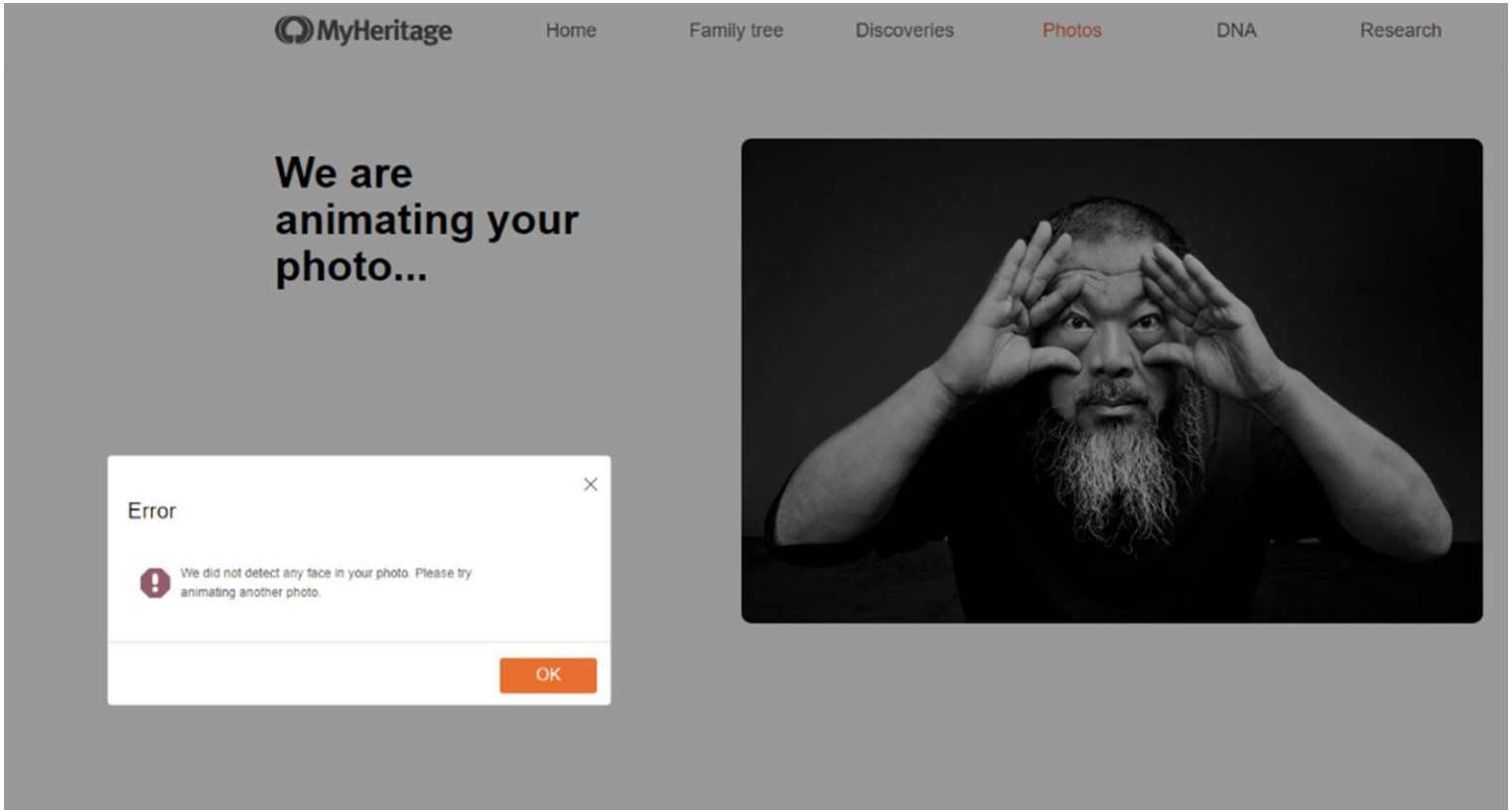
Tool: MyHeritage – Deep Nostalgia [D-ID]



Biases in facial recognition

Tool: MyHeritage

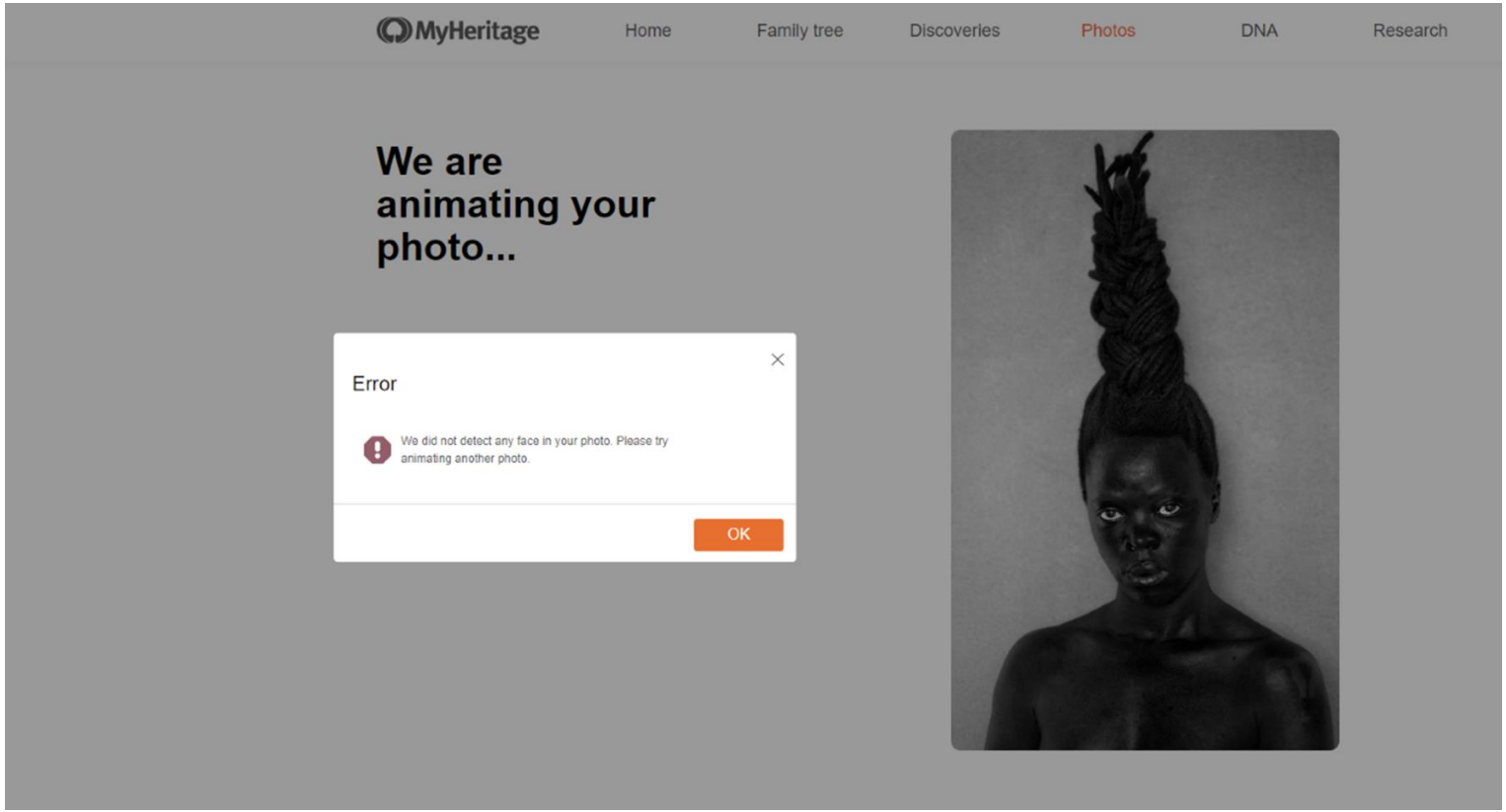
Ai Weiwei, Chinese artist and activist



Biases in facial recognition

Tool: MyHeritage

Zanele Muholi's self-portrait



Tool: MyHeritage

Portrait of Jacob Lawrence LCCN2004663191.jpg

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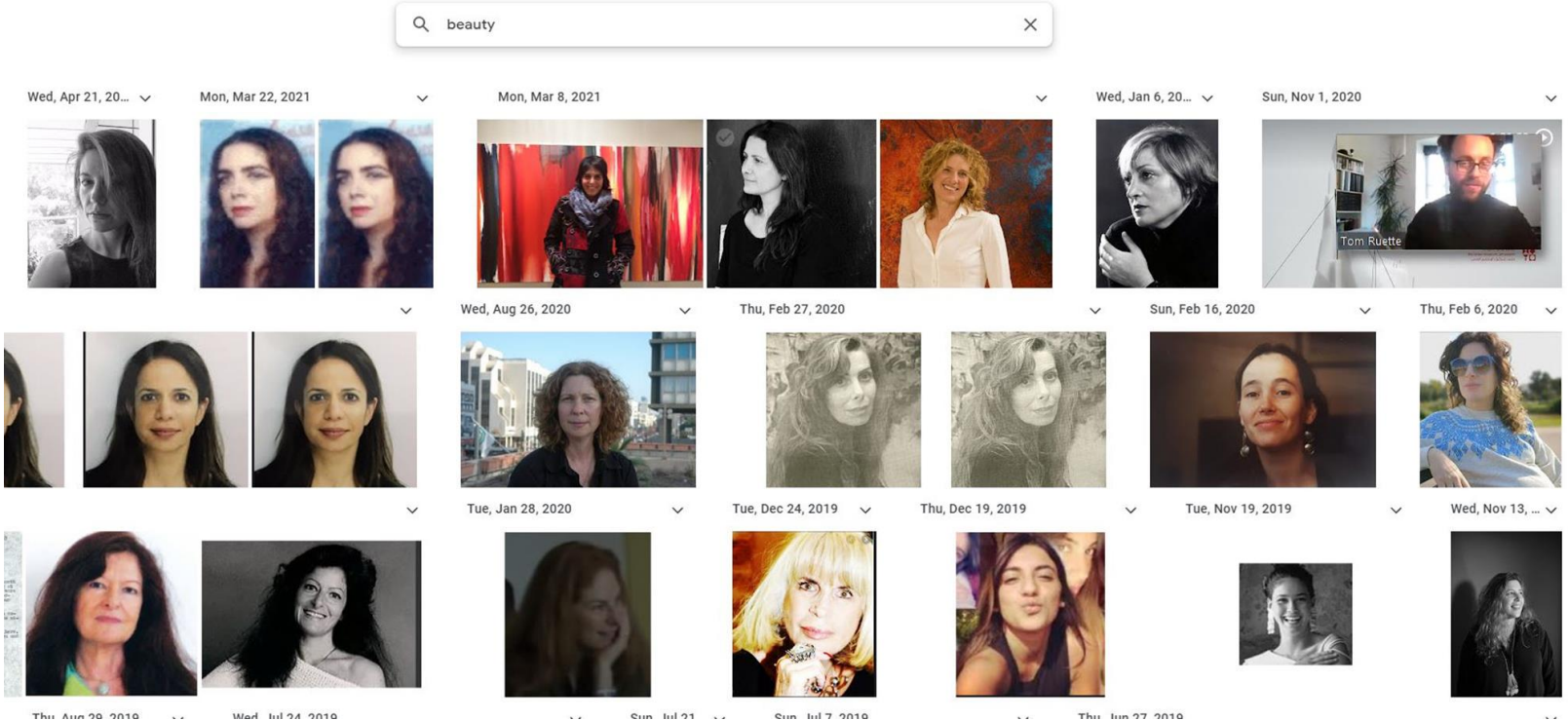
Biases in facial recognition

Bias towards Caucasians and women when searching “beauty”



Biases in facial recognition

TIME

bias

Are Face-Detection Cameras Racist?

By Adam Rose | Friday, Jan. 22, 2010

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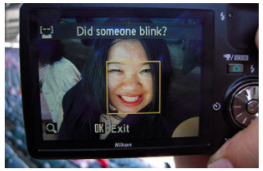

Joz Wang

When Joz Wang and her brother bought their mom a Nikon Coolpix S630 digital camera for Mother's Day last year, they discovered what seemed to be a malfunction. Every time they took a portrait of each other smiling, a message flashed across the screen asking, "Did someone blink?" No one had. "I thought the camera was broken!" Wang, 33, recalls. But when her brother posed with his eyes open so wide that he looked "bug-eyed," the messages stopped.

Wang, a Taiwanese-American strategy consultant who goes by the Web handle "jozjozjoz," thought it was funny that the camera had difficulties figuring out when her family had their eyes open. So she posted a photo of the blink warning on her blog under the title, "Racist Camera! No, I did not blink... I'm just Asian!" The post was picked up by Gizmodo and Boing Boing, and prompted at least one commenter to note, "You would think that Nikon, being a Japanese company, would have designed this with Asian eyes in mind."

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(See the top 10 gadgets of 2009.)

Nikon isn't the only big brand whose consumer cameras have displayed an occasional — though clearly unintentional — bias toward Caucasian faces. Face detection, one of the latest "intelligent" technologies to trickle down to consumer cameras, is supposed to make photography more convenient. Some cameras with face detection are designed to warn you when someone blinks; others are programmed to automatically take a picture when somebody smiles — a feature that, theoretically, makes the whole problem of timing your shot to catch the brief glimpse of a grin obsolete. Face detection has also found its way into computer webcams, where it can track a

HARVARD UNIVERSITY
The Graduate School of Arts and Sciences

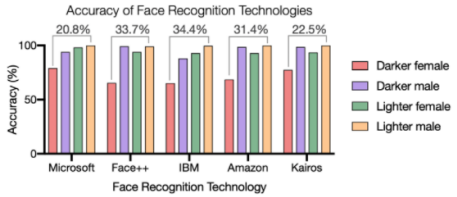
OCTOBER 24, 2020

BLOG, SCIENCE POLICY, SPECIAL EDITION: SCIENCE POLICY AND SOCIAL JUSTICE

Racial Discrimination in Face Recognition Technology

Inequity in face recognition algorithms

Face recognition algorithms boast high classification accuracy (over 90%), but these outcomes are not universal. A growing body of research exposes divergent error rates across demographic groups, with the poorest accuracy consistently found in subjects who are female, Black, and 18-30 years old. In the landmark 2018 "Gender Shades" project, an intersectional approach was applied to appraise three gender classification algorithms, including those developed by IBM and Microsoft. Subjects were grouped into four categories: darker-skinned females, darker-skinned males, lighter-skinned females, and lighter-skinned males. All three algorithms performed the worst on darker-skinned females, with error rates up to 34% higher than for lighter-skinned males (**Figure 1**). Independent assessment by the National Institute of Standards and Technology (NIST) has confirmed these studies, finding that face recognition technologies across 189 algorithms are least accurate on women of color.



MIT News
ON CAMPUS AND AROUND THE WORLD

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Study finds gender and skin-type bias in commercial artificial-intelligence systems

Examination of facial-analysis software shows error rate of 0.8 percent for light-skinned men, 34.7 percent for dark-skinned women.

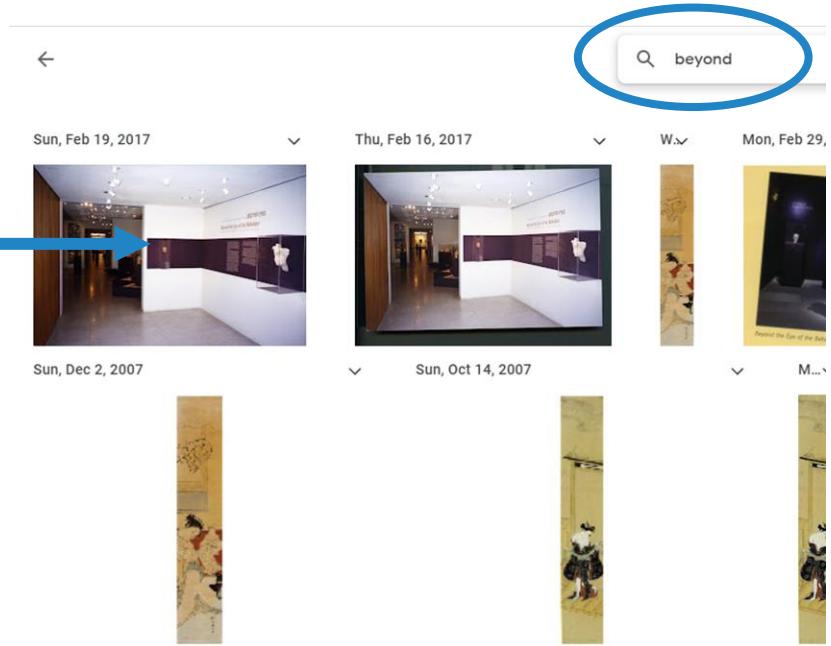
Watch Video

Larry Hardesty | MIT News Office
February 11, 2018

OCR TEXT RECOGNITION

Typed archival material

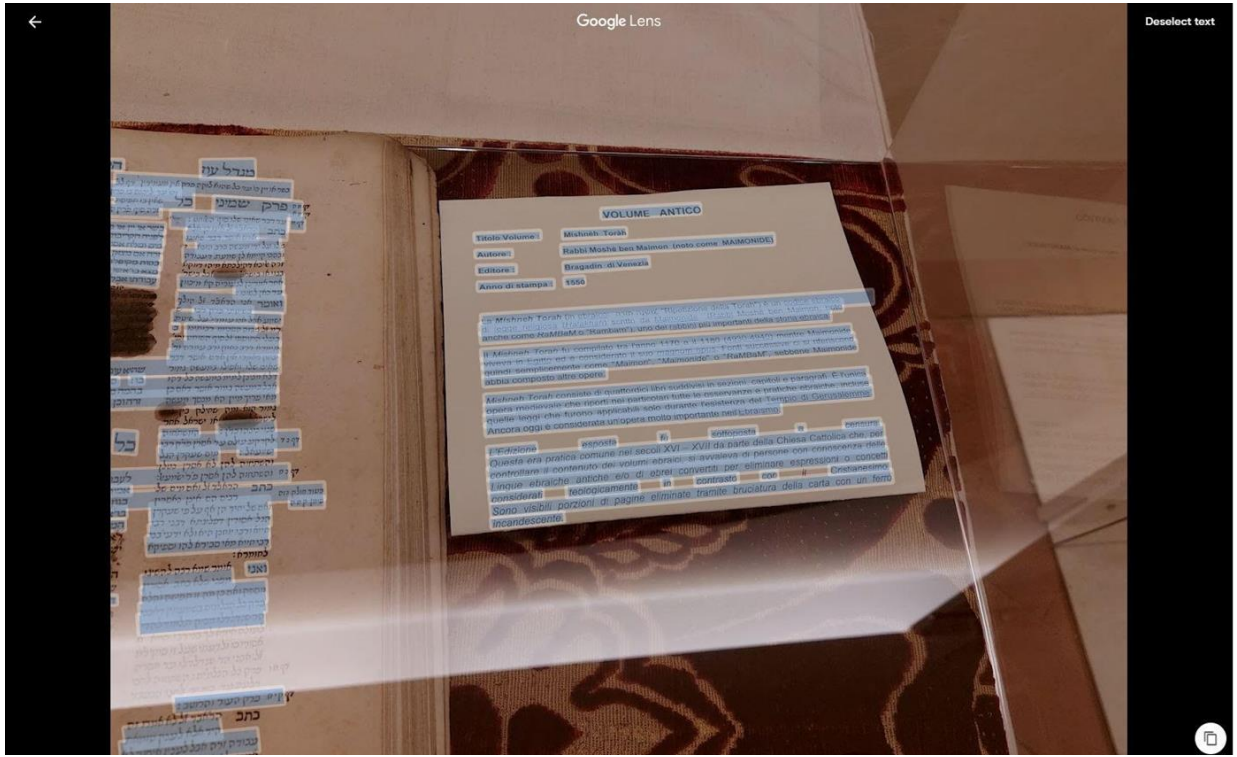
Exhibition documentation



Beyond the Eye of the Beholder: Ideals of Human Beauty in Africa and the Americas, Israel Museum, Jerusalem, 01/03/2005 - 17/01/2006

Translation of texts

Tool: Google Lens



מימרה ללכלכ ילכעילס יר'
ינחק לחילי לין ללס חוסל לכל
סס'יכו שלו (לפילו כיועסק נמול שהיא עיכ
כן !
לכל כיועשת נעור חוסל לחס כן בהמה כ
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di ebraico in) Torah Mishneh La משנה תורה
da scritto (Halakhah) religiosa legge
noto ,Maimon ben Moshè Rabbi) Maimonide
dei uno ,("Rambam" o RaMBaM come anche
,ebraica storia della importanti più rabbini
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Maimonide mentre (4930-4940) 1180 il e
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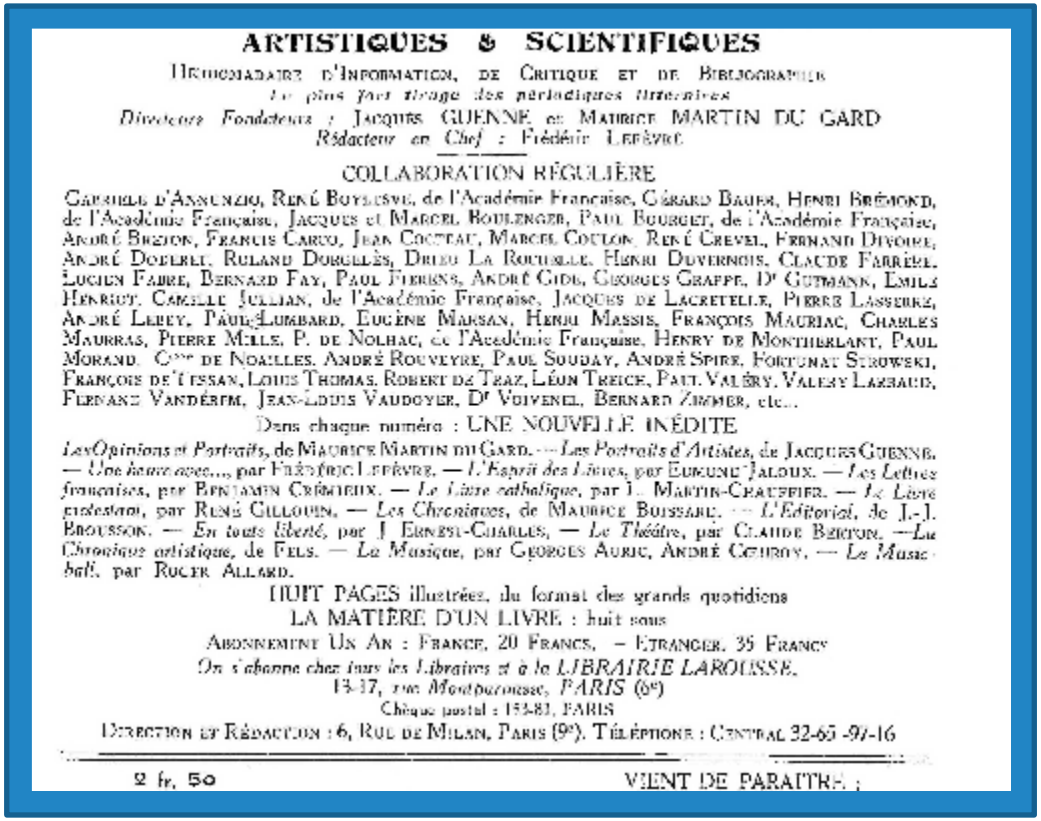
sebbene ,RaMBAM" o "Maimonide" ,"Maimon"
,opere altre composto abbia Maimonide
D
libri quattordici di consiste Torah Mishneh
È .paragrafi e capitoli ,sezioni in suddivisi
nei riporti che medievale opera l'unica
pratiche e osservanze le tutte particolari
furono che leggi quelle incluse ,ebraiche
del l'esistenza durante solo applicabili
è oggi Ancora .Gerusalemme di Tempio
importante molto un'opera considerata
.nell'Ebraismo
Questa L'Edizione esposta fu con a .censura
da XVII - XVI secoli nei comune pratica era
per ,che Cattolica Chiesa della parte
si ,ebraici volumi dei contenuto il controllare
delle conoscenza con persone di avvaleva
,ebrei di e/o antiche ebraiche Lingue
o espressioni eliminare per convertiti
in contrasto .Cristianesimo concetti
visibili Sono considerati teologicamente
tramite eliminate pagine di porzioni
ferro un con carta della bruciatura
.incandescente
ק מתחוק
כל
sottoposta
אמור
סימן קמק

OCR – books, journals, pamphlets

Tools: PDF, OCR



ARTISTIQUES & SCIENTIFIQUES

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Fault: OCR on a calligram by Guillaume Apollinaire

Calligramme de Guillaume Apollinaire (1880-1918)
Salut monde dont je suis la langue éloquente que sa bouche Ô Paris tire et tirera toujours aux allemands, 1918

Guillaume Apollinaire (1880-1918), Bluepencil.svg, Wikicommons

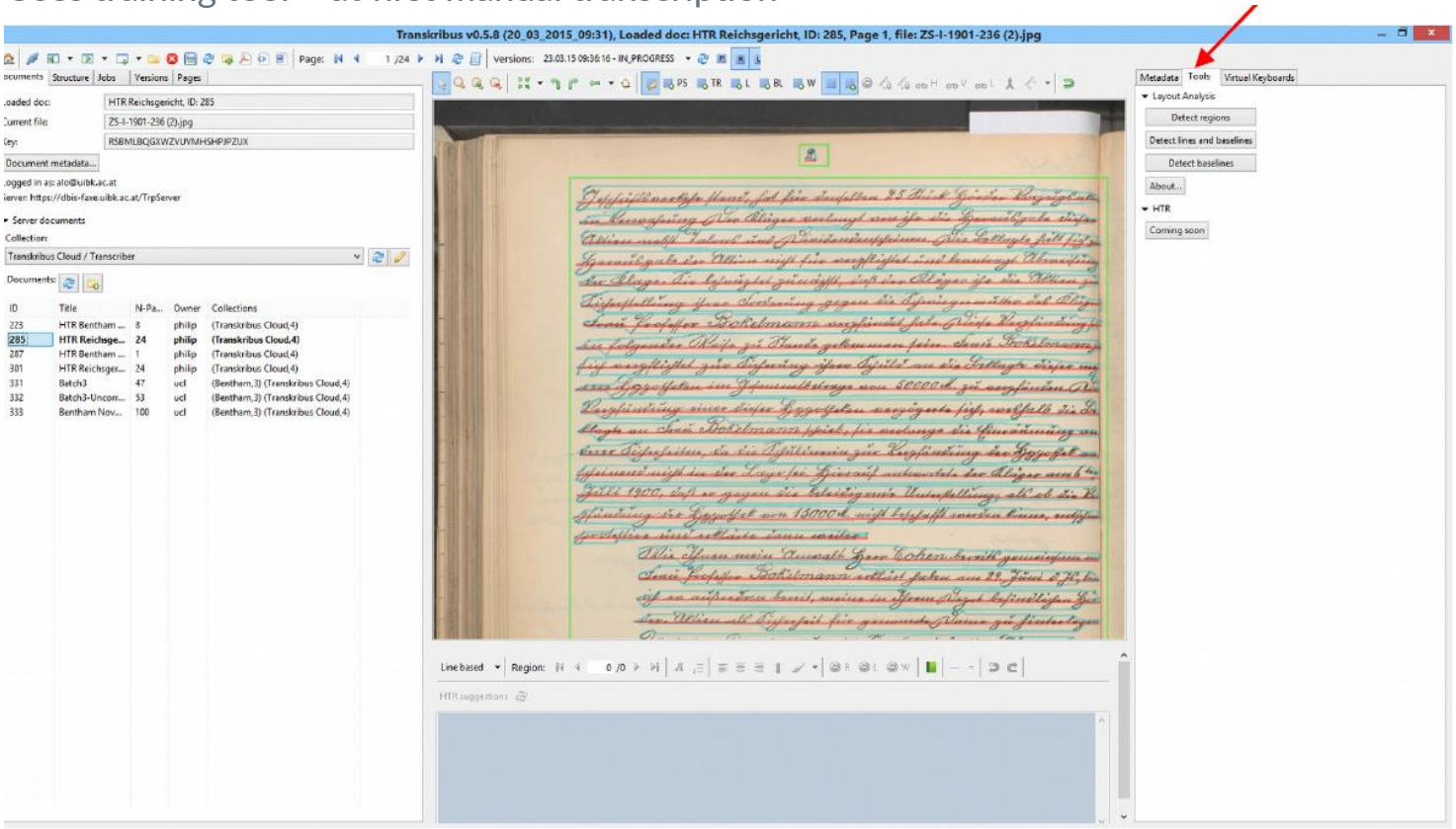
HANDWRITTEN TEXT RECOGNITION

Archival letters

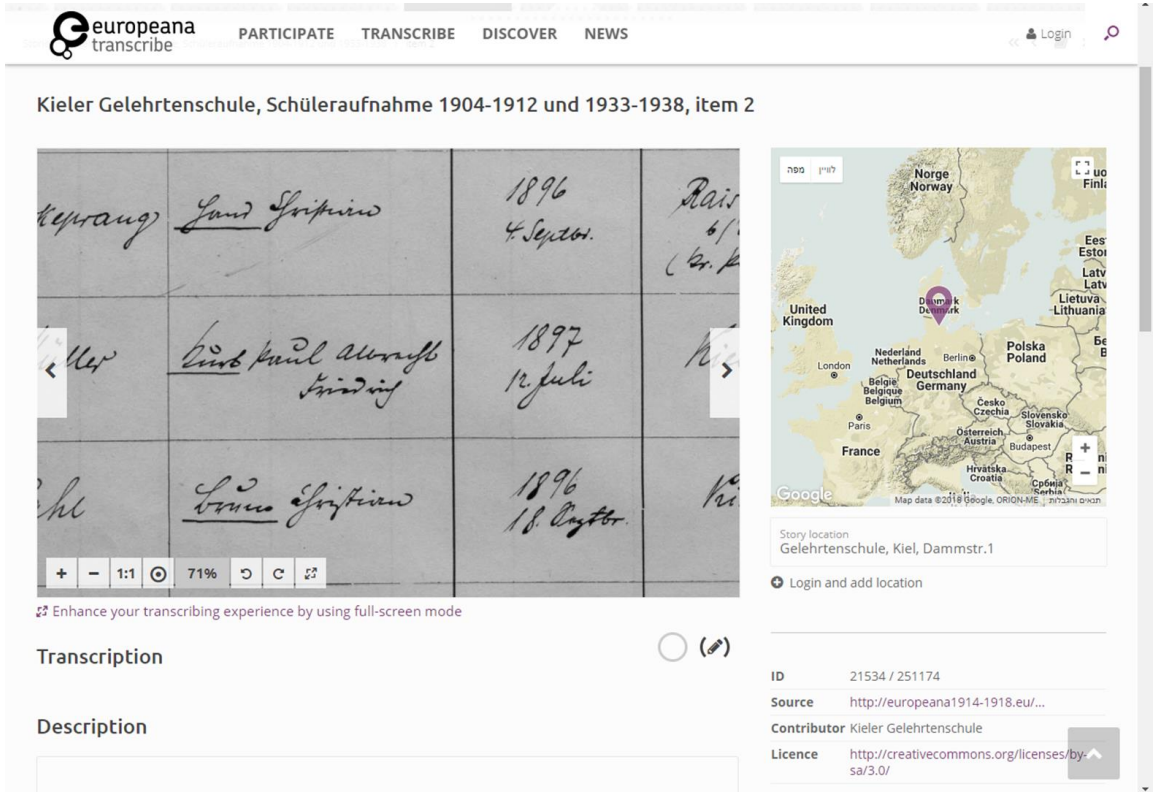
Manuscripts with HTR

Cambridge UK tool: Transkribus – AI transcription tool

Uses training tool – at first manual transcription

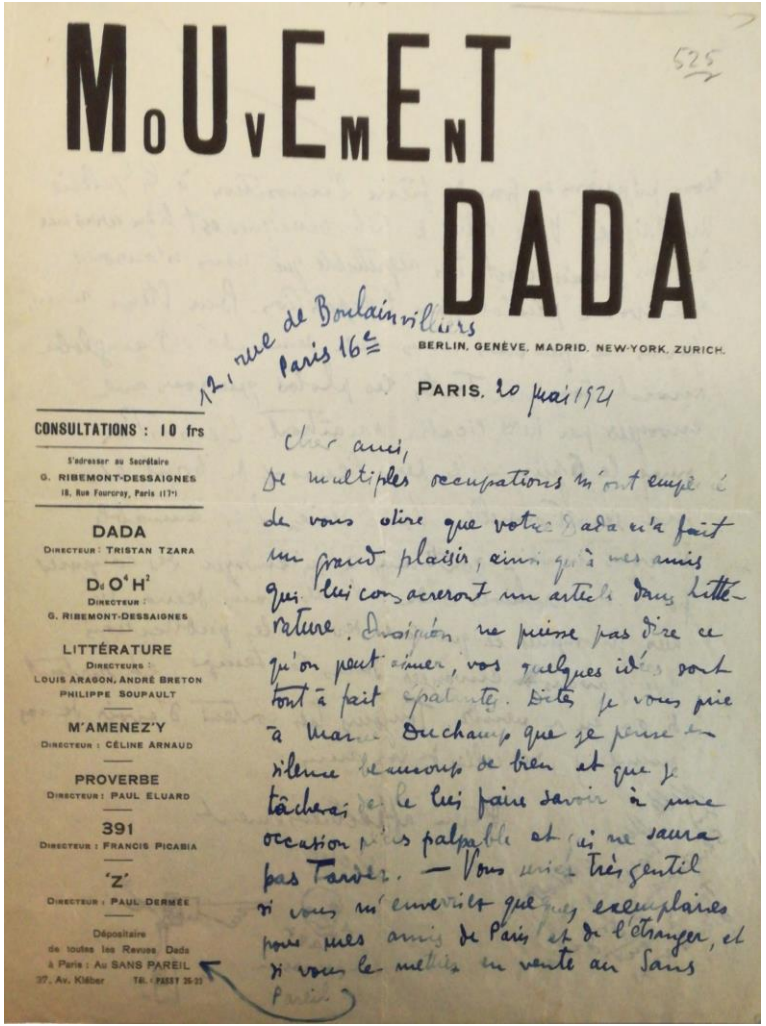


Manuscripts with HTR



Europeana transcription tool uses manual transcription and crowd-sourcing in their transcribe website

Trouble reading texts that are not horizontal or are mixed with handwriting



NUMBER RECOGNITION IN IMAGES

Registration numbers

Number Recognition in Images - Registration numbers

Artwork photographed with registration numbers

OCR managed to find numbers

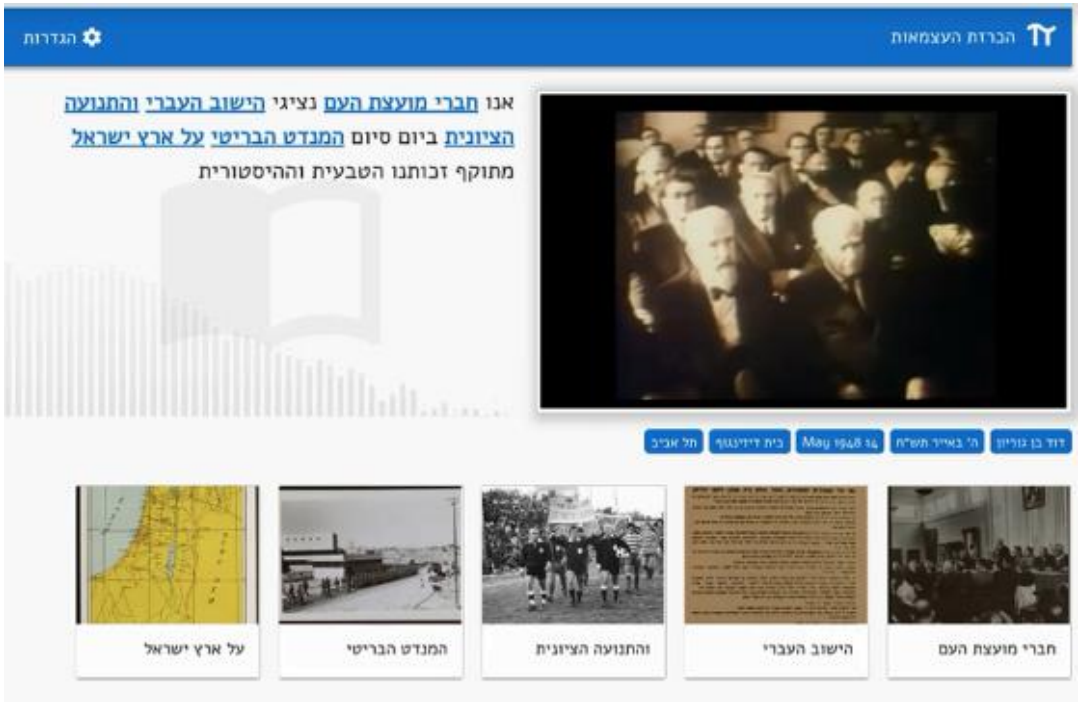
Sometimes…

AUDIO TO TEXT IN VIDEOS

Transcription of videos

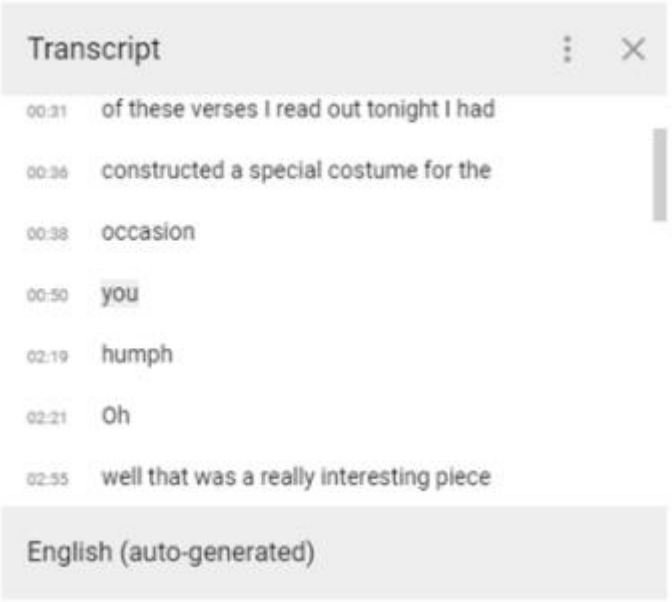
PI video transcription

- Transcribes video audio
- Creates links of keywords in Wiki Data
- Suggests relevant materials based on keywords



YouTube automated transcription of Hugo Ball, Dada

Has trouble with languages other than English (and with Dada)



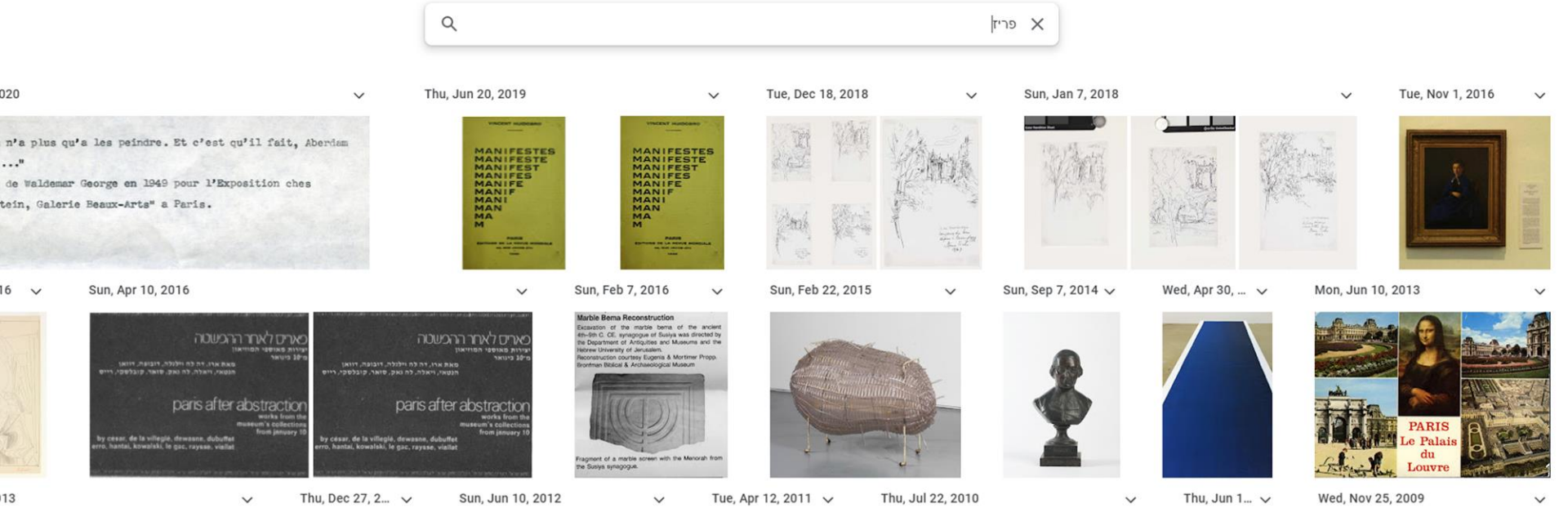
https://www.youtube.com/watch?v=PWKP5OAsYZk

SEARCH & RETRIEVAL

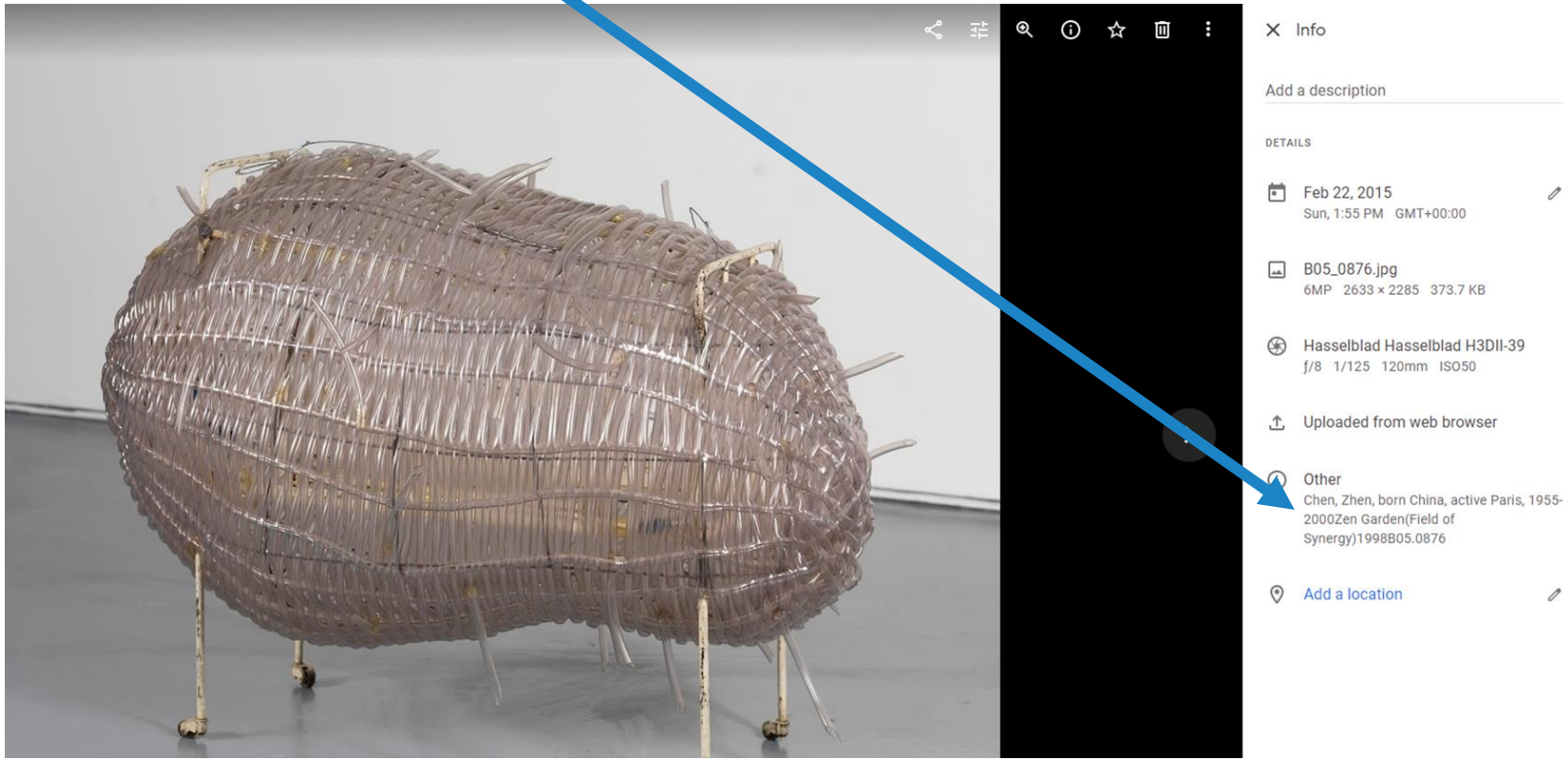
Semantics (Linked Data)

Searching in Hebrew (testing with foreign language)

Searching for “Paris” in Hebrew- Various spellings and translations found



Other info in EXIF data



Analysis of AI in image cataloguing

STRENGTHS

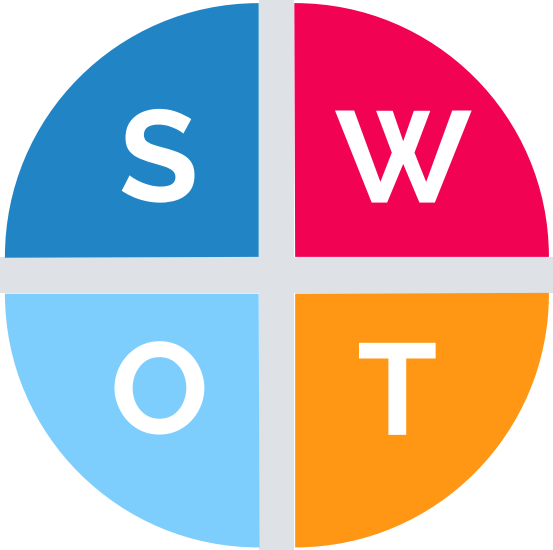
Allows easy access to images across extensive collections of content

Finds connections across database

WEAKNESSES

Results are sensitive to lighting and angles

Pattern of biases relating to age, gender, race, etc.



AI's biases can improve if trained with a more diverse and inclusive range of content

OPPORTUNITIES

Facial recognition can exclude relevant content from searches due to biases

THREATS

Conclusions

There is room for improvement:

- Use of AI should still be taken with a grain of salt
- Autogenerated tags should be marked as such
- Faults can be improved with further training
- Human intervention is still needed

Thank you

Dr. Allison Kupietzky

Collection Database Manager
Head of Information Center for Israeli Art

allison@imj.org.il