

Scaling Data Products Under Startup Constraints

...

A Case Study of ML Bias Testing

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A Case Study of ML Bias Testing



Edwin Ong @edwin

Co-Founder, TinyData

Founded CastTV (acquired by Tribune)

Founded FileFish (acquired by Oracle)

Stanford Symbolic Systems

TinyData

TinyData

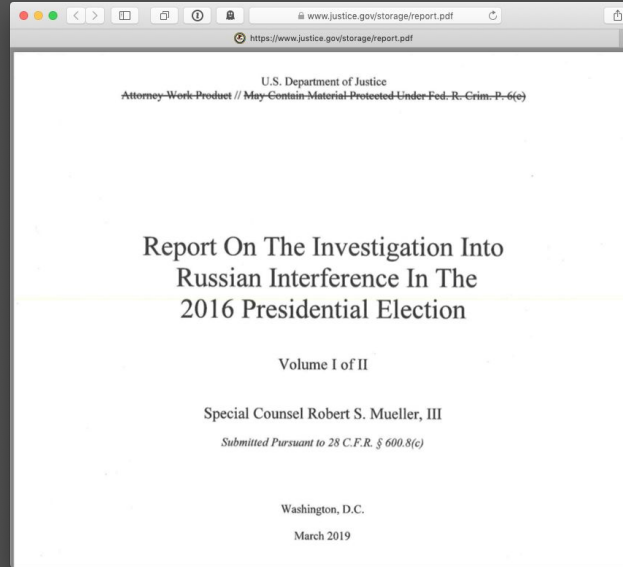
- Help other companies make data products
- Make our own data products



Problem: Testing Machine Learning in Production

- Tools for machine learning testing *in training*
- Not as many tools for machine learning testing in production
- Different tools needed because ML testing is different from traditional software testing

Traditional Software Has Deterministic Outcomes



Request URL

> <https://www.justice.gov/storage/report.pdf>


Status codes

200

↓ Redirects

0

Traditional Software Has Deterministic Outcomes

Pods/probe/exec-liveness.yaml 

```
apiVersion: v1
kind: Pod
metadata:
  labels:
    test: liveness
  name: liveness-exec
spec:
  containers:
  - name: liveness
    image: k8s.gcr.io/busybox
    args:
    - /bin/sh
    - -c
    - touch /tmp/healthy; sleep 30; rm -rf /tmp/healthy; sleep 600
  livenessProbe:
    exec:
      command:
      - cat
      - /tmp/healthy
    initialDelaySeconds: 5
    periodSeconds: 5
```

```
kubectl describe pod liveness-exec
```

ML Has Probabilistic Outcomes



Dog vs Muffin given
new user input

ML Has Probabilistic Outcomes That Change Over Time

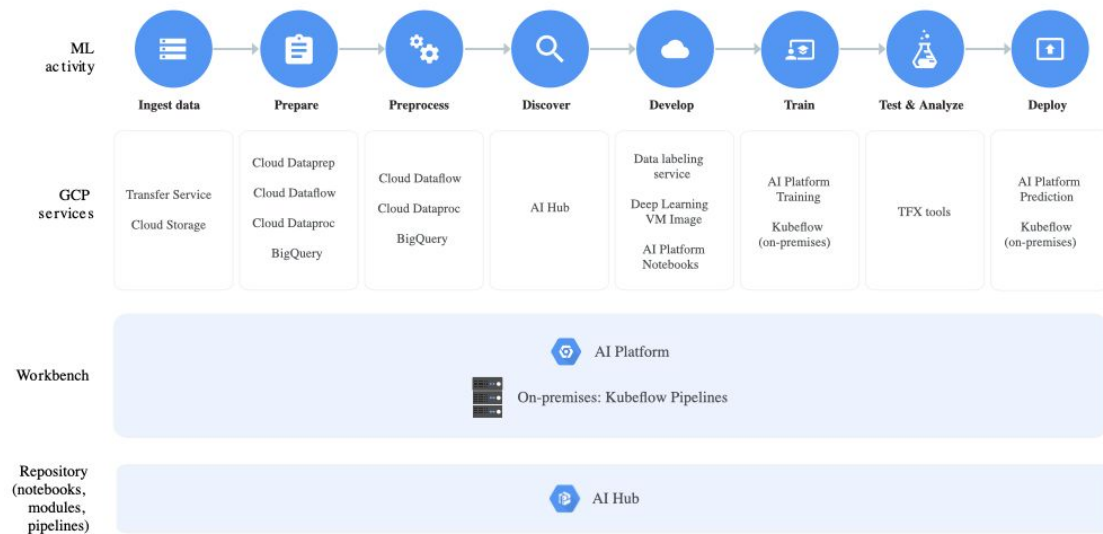


Version 1: Muffin (59%)

Version 2: Muffin (66%)

ML Platforms Often End at Deploy

Machine learning development: the end-to-end cycle



Production Testing

ML Chaos Engineering

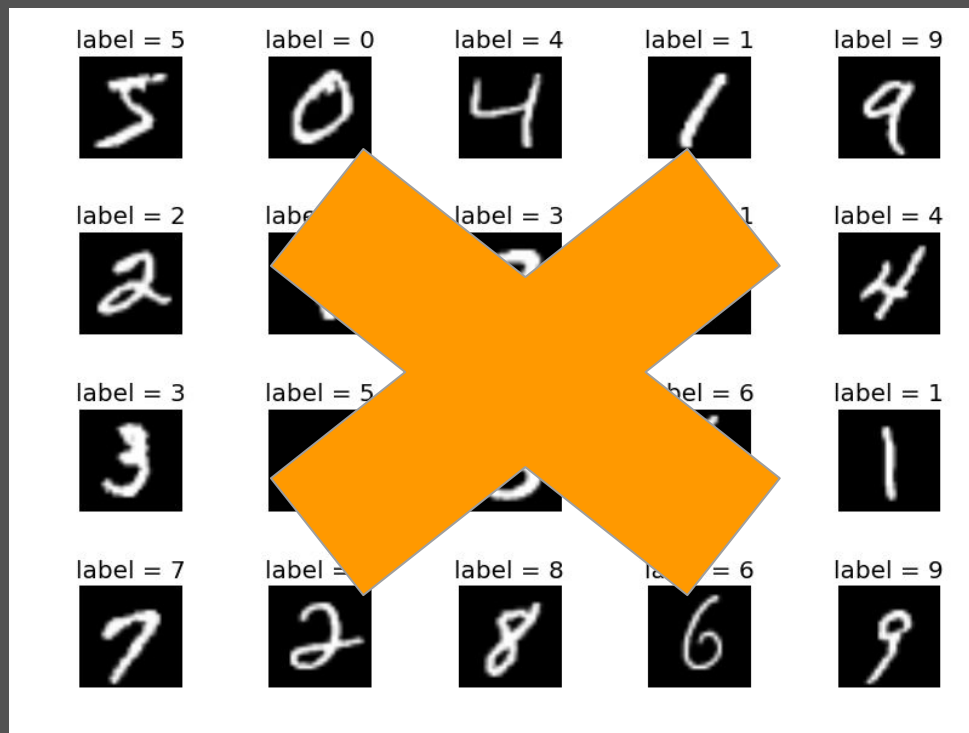
Requirements for Production ML Testing Tool

1. “Entropy”: Generation of new inputs against model servers
2. Recording of outputs from model servers
3. Feedback loop for additional training

Challenges for Building as a Startup

1. Need access to non-toy model servers
2. Need access to generated data for testing model servers

Access to Non-Toy Model Servers



Non-Toy Model Servers: Commercial Cloud Services



Commercial Image Recognition Services

- Opaque systems
- Object and scene detection, facial recognition, facial analysis, NSFW detection, text detection
- Facial analysis includes gender detection

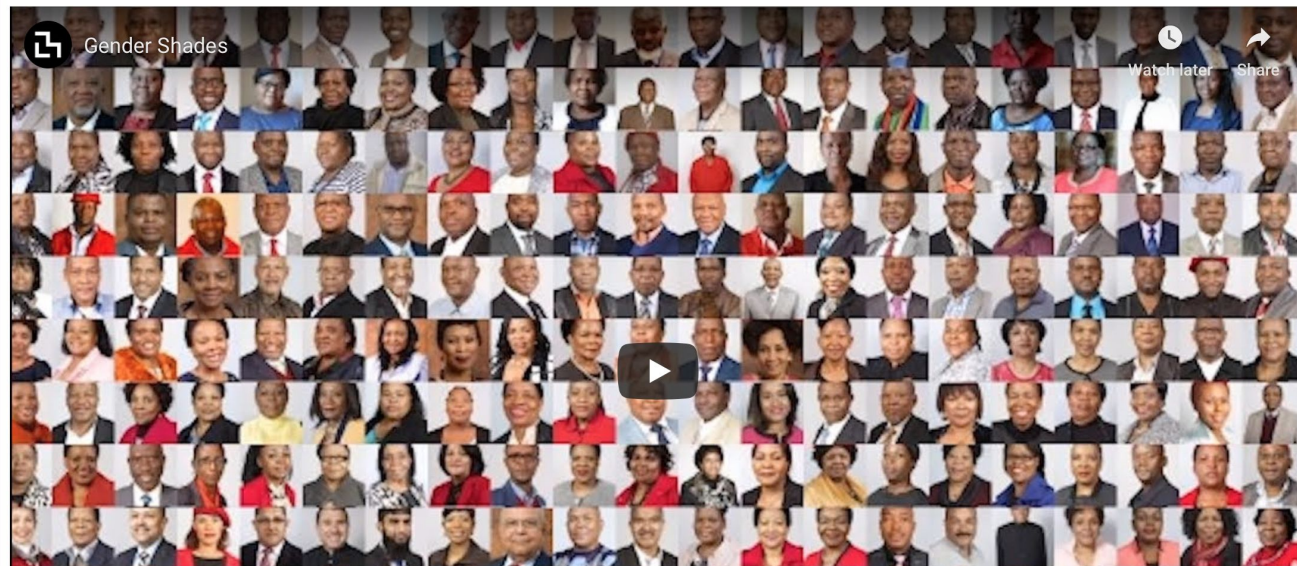
GenderShades.org

Gender Shades

[Home](#) [Results](#) [Research Paper](#) [Dataset](#)

How well do IBM, Microsoft, and Face++ AI services guess the gender of a face?

Explore Results



Testing Commercial Systems for Gender Bias

- Testing = Finding cases where trained systems fail
- Hypothesis: Gender labels are trained on traditional images
- What if we generate “non-traditional” images?

Training Data vs Test Data



Training Data



Test Data

A Man with Long Hair

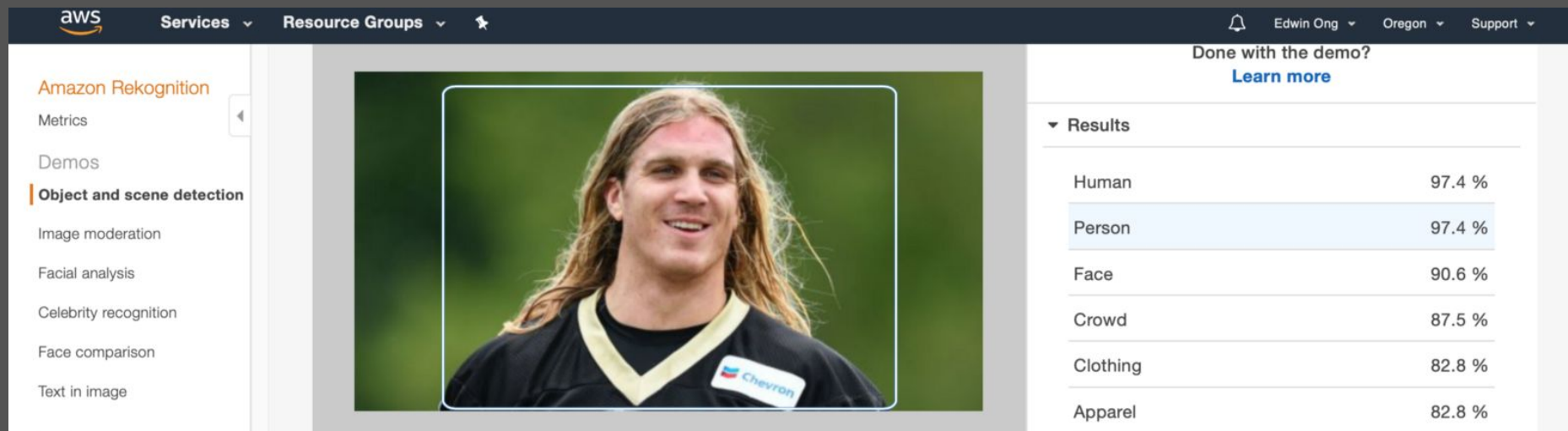


A Man with Long Hair

The screenshot displays the AWS Rekognition console interface. At the top, the navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information (Edwin Ong, Oregon, Support). The left sidebar lists navigation options: 'Amazon Rekognition', 'Metrics', 'Demos', 'Object and scene detection' (highlighted), 'Image moderation', 'Facial analysis', 'Celebrity recognition', 'Face comparison', 'Text in image', 'Video Demos', 'Video analysis', and 'Additional Resources'. The main content area features a large image of a man with long hair, wearing a black shirt with a yellow collar and a 'Chevron' logo. Below the image are two options: 'Choose a sample image' and 'Use your own image' (with a note: 'Image must be .jpeg or .png format and no larger than 5MB. Your image isn't stored.'). On the right, a 'Results' table shows classification percentages for various categories.

Category	Percentage
Human	97.4 %
Person	97.4 %
Face	90.6 %
Crowd	87.5 %
Clothing	82.8 %
Apparel	82.8 %
Female	79 %
Smile	76.1 %
Photography	69.9 %

A Man with Long Hair



The screenshot shows the AWS Rekognition console interface. On the left is a navigation menu with options like 'Amazon Rekognition', 'Metrics', 'Demos', 'Object and scene detection', 'Image moderation', 'Facial analysis', 'Celebrity recognition', 'Face comparison', and 'Text in image'. The main area displays a photo of a man with long hair wearing a black and yellow jersey with a 'Chevron' logo. On the right, a 'Results' table lists various detections and their confidence percentages.

Category	Confidence
Human	97.4 %
Person	97.4 %
Face	90.6 %
Crowd	87.5 %
Clothing	82.8 %
Apparel	82.8 %

Female

79 %

A Woman with Short Hair



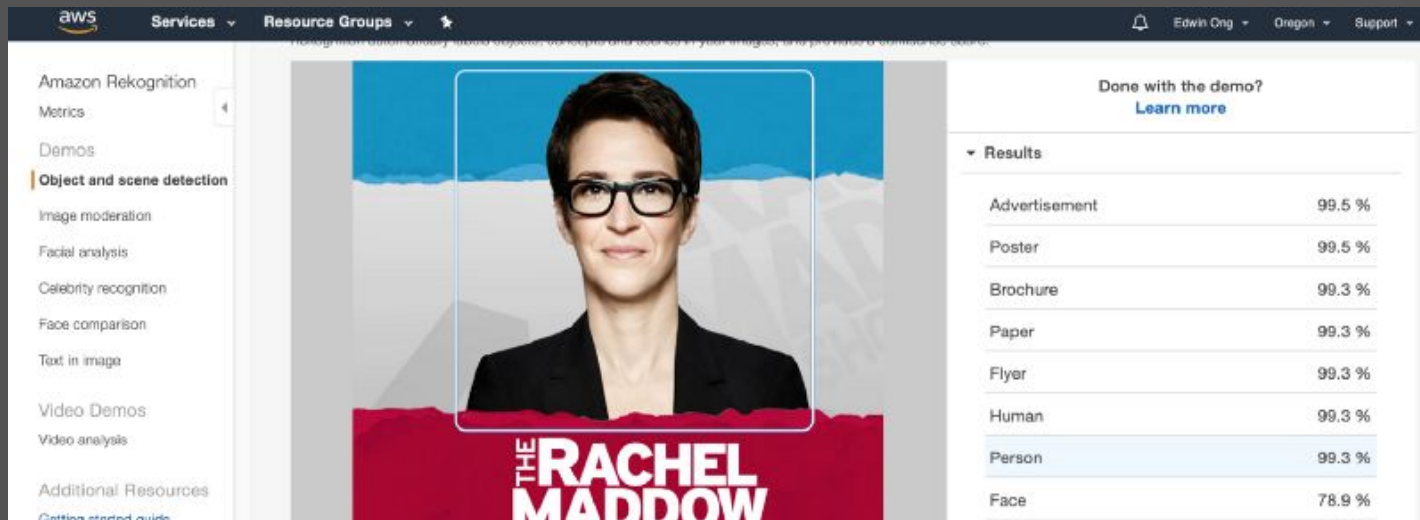
A Woman with Short Hair

Done with the demo?
[Learn more](#)

Results

Advertisement	99.5 %
Poster	99.5 %
Brochure	99.3 %
Paper	99.3 %
Flyer	99.3 %
Human	99.3 %
Person	99.3 %
Face	78.9 %
Accessories	71.6 %
Accessory	71.6 %
Glasses	71.6 %
Man	59 %

A Woman with Short Hair



Done with the demo?
[Learn more](#)

▼ Results

Advertisement	99.5 %
Poster	99.5 %
Brochure	99.3 %
Paper	99.3 %
Flyer	99.3 %
Human	99.3 %
Person	99.3 %
Face	78.9 %

Man

59 %

A Woman with Short Hair


Watson Stories About Developers Offerings Use Cases

See all features

1/2

Pre-trained models

Watson Visual
Recognition's category-specific models enable you to analyze images for scenes, objects, faces, colors, foods, and other content.



Paste an image URL here...

person	0.81
blue color	0.73
portrait photo	0.70
newsreader	0.56
people	0.50

Face Model -

Locate faces within an image and assess gender and age.

Face 1

age 43-48	0.52
MALE	0.84

Food Model +

Explicit Model +

Text Model (private beta) +

A Woman with Short Hair


Watson Stories About Developers Offerings Use Cases

See all features

1/2

Pre-trained models

Watson Visual Recognition's category-specific models enable you to analyze images for scenes, objects, faces, colors, foods, and other content.



person	0.81
blue color	0.73
portrait photo	0.70
newsreader	0.56
people	0.50

Face Model

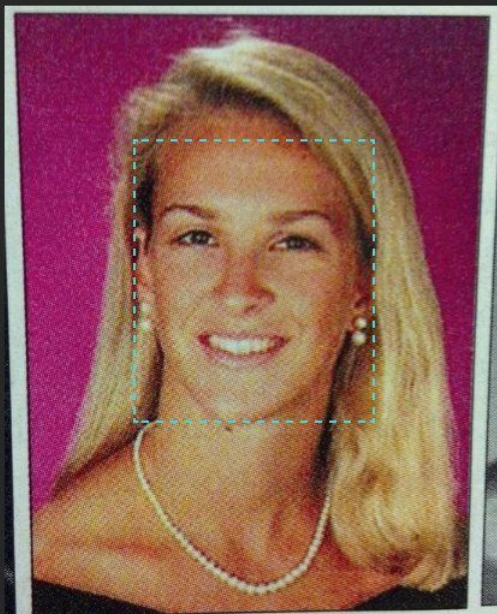
Locate faces within an image and assess gender and age.

Face 1

age 43-48	0.52
MALE	0.84

MALE 0.84

Woman with Long Hair



RACHEL MADDOW

General Model +

Face Model -

Locate faces within an image and assess gender and age.

Face 1

age 20-23 0.87

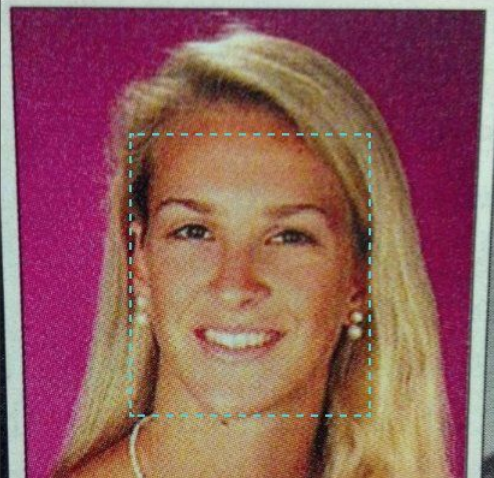
FEMALE 1.00

Food Model +

Explicit Model +

Text Model (private beta) +

Woman with Long Hair



General Model +

Face Model -

Locate faces within an image and assess gender and age.

Face 1

age 20-23	0.87
FEMALE	1.00

Food Model +

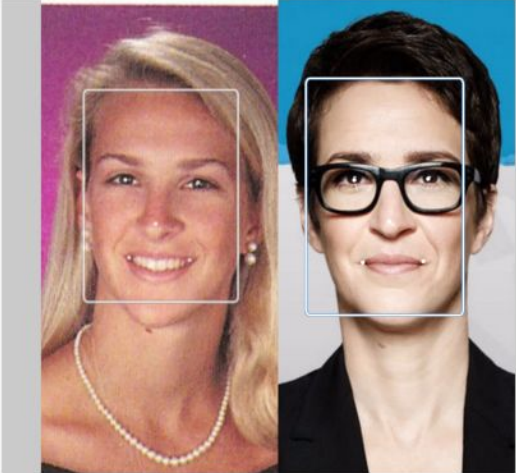
Explicit Model +

FEMALE **1.00**

“Facial Analysis”?


Facial analysis

Get a complete analysis of facial attributes, including confidence scores.



Done with the demo?
[Learn more](#)

▼ Results




looks like a face	100 %
appears to be male	79 %
age range	26 - 43 years old
smiling	68.2 %
appears to be happy	68.6 %
wearing glasses	99.9 %

[Show more](#)

► Request

► Response

Choose a sample image



Use your own image
Image must be .jpeg or .png format and no larger than 5MB. Your image isn't stored.

[Upload](#) or drag and drop

Use image URL [Go](#)

Data Generation

The screenshot shows the Flickr Creative Commons page. At the top, the Flickr logo is on the left, and navigation links for 'Sign Up', 'Explore', 'Create', and 'Get Pro' are in the center. A search bar on the right contains the text 'Photos, people, or groups'. Below the navigation is the heading 'Explore / Creative Commons'. A paragraph explains that many Flickr users offer their work under a Creative Commons license. Below this, it says 'Here are some recently added bits and pieces:'. There are two main sections for license types. The first is 'Attribution License', represented by a person icon, with five small photo thumbnails and a link to '35,574,951 photos (See more)'. The second is 'Attribution-NoDerivs License', represented by a person and equals sign icon, with five small photo thumbnails and a link to '9,699,577 photos (See more)'. On the right side of the page, the Creative Commons logo is displayed, followed by a quote: '"Creative Commons is a non-profit that offers an alternative to full copyright."' and the URL 'creativecommons.org'. Below this is a 'Briefly...' section with three sub-headers: 'Attribution means:' (with a person icon), 'Noncommercial means:' (with a crossed-out dollar sign icon), and 'No Derivative Works means:' (with an equals sign icon). Each sub-header includes a brief definition of the license type.

flickr Sign Up Explore Create Get Pro Photos, people, or groups

Explore / Creative Commons

Many Flickr users have chosen to offer their work under a Creative Commons license, and you can browse or search through content under each type of license.

Here are some recently added bits and pieces:

Attribution License

From [sybarite48](#) From [Extinction...](#) From [Extinction...](#) From [Extinction...](#) From [Extinction...](#)

» **35,574,951** photos ([See more](#))

Attribution-NoDerivs License

From [70023venus2009](#) From [little-pete](#) From [little-pete](#) From [70023venus2009](#) From [Chris Bailey](#)

» **9,699,577** photos ([See more](#))

creativecommons

"Creative Commons is a non-profit that offers an alternative to full copyright."
creativecommons.org

Briefly...

Attribution means: You let others copy, distribute, display, and perform your copyrighted work - and derivative works based upon it - but only if they give you credit.

Noncommercial means: You let others copy, distribute, display, and perform your work - and derivative works based upon it - but for noncommercial purposes only.

No Derivative Works means: You let others copy, distribute, display, and perform only verbatim copies of your

Data Generation

The screenshot shows the Wikipedia page for the category "Lists of people". The page is in English and is titled "Category:Lists of people - Wikipedia". The main content area is titled "Category:Lists of people" and includes a description: "From Wikipedia, the free encyclopedia". Below this, there is a note: "These are **lists of people**. See also Category:People." and another note: "Also see the list of pages that are not yet included in this category@." A blue banner with a red and blue icon states: "Pages in this category should be moved to subcategories where applicable. This category may require frequent maintenance becoming too large. It should directly contain very few, if any, pages and should mainly contain subcategories." The "Subcategories" section lists 37 subcategories, including "Lists of people by activity", "Lists of people by age", "Lists of people by association", "Lists of people by belief", "Lists of people by aspect of death", "Lists of people by ethnicity", "Lists of people by honor or award", "Lists of people by ideology", "Lists of people by language", "Lists of people by legal status", "Lists of people by magazine appearance", "Lists of people by marital status", "Lists of people by medical condition", "Lists of people by name", "Lists of people by nationality", "Lists of people by occupation", "Lists of people by organization", "Lists of people by period", "Lists of people by physical attribute", "Lists of people by place", "Lists of men", "Lists of women", "Lists of award winners", "Bible-related lists of people", "Lists of celebrities", "Lists of European people", "Lists of families", and "Family trees". The "Pages in category 'Lists of people'" section states: "The following 3 pages are in this category, out of 3 total. This list may not reflect recent changes (learn more)." The left sidebar contains navigation links for the Wikipedia main page, contents, featured content, current events, random article, donate to Wikipedia, Wikipedia store, interaction, help, about Wikipedia, community portal, recent changes, contact page, tools, what links here, related changes, upload file, special pages, permanent link, page information, Wikidata item, print/export, create a book, download as PDF, printable version, languages, and a search box.

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Wikipedia store

Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact page

Tools
What links here
Related changes
Upload file
Special pages
Permanent link
Page information
Wikidata item

Print/export
Create a book
Download as PDF
Printable version

Languages

Deutsch
Español
Français
한국어
Italiano
Pycckий
Tiếng Việt
中文

Category:Lists of people

From Wikipedia, the free encyclopedia

These are **lists of people**. See also Category:People.

Also see the list of pages that are not yet included in this category@.

Pages in this category should be moved to subcategories where applicable. This category may require frequent maintenance becoming too large. It should directly contain very few, if any, pages and should mainly contain subcategories.

Subcategories

This category has the following 37 subcategories, out of 37 total.

- ▶ Lists of people by activity (4 C, 58 P)
- ▶ Lists of people by age (6 C, 9 P)
- ▶ Lists of people by association (29 P)
- ▶ Lists of people by belief (9 C, 21 P)
- ▶ Lists of people by aspect of death (1 C, 10 P)
- ▶ Lists of people by ethnicity (26 C, 499 P)
- ▶ Lists of people by honor or award (5 C, 16 P)
- ▶ Lists of people by ideology (37 P)
- ▶ Lists of people by language (3 C, 14 P)
- ▶ Lists of people by legal status (5 C, 32 P)
- ▶ Lists of people by magazine appearance (3 C, 115 P)
- ▶ Lists of people by marital status (1 C, 2 P)
- ▶ Lists of people by medical condition (40 P)
- ▶ Lists of people by name (6 C)
- ▶ Lists of people by nationality (190 C, 169 P)
- ▶ Lists of people by occupation (49 C, 102 P)
- ▶ Lists of people by organization (8 C, 53 P)
- ▶ Lists of people by period (5 C)
- ▶ Lists of people by physical attribute (2 C, 11 P)
- ▶ Lists of people by place (16 C, 84 P)

L

- ▶ Lists of LGBT-related pe
- ▶ Lists of living people (11
- ▶ Lists of people-related s

N

- ▶ Lists of North American
- ▶ Lists of groups with spee

R

- ▶ Lists of people associat

S

- ▶ Lists of survivors (13 P)

T

- ▶ Top people lists (5 C, 21

V

- ▶ Lists of victims (1 C, 7 P

Pages in category "Lists of people"

The following 3 pages are in this category, out of 3 total. This list may not reflect recent changes (learn more).

Prototype Data

www.epguides.com

epguides.com - Main Menu Page

[my_shows](#) | [preferences](#)

epguides.com™

Cataloguing the opiate of the masses on the small screen since 1995.

This site contains episode lists for over 8500 TV shows. Each list displays only titles and airdates, but in most cases the episode title is a link to the page for that episode at [TVmaze.com](#) or [TV.com](#), where there is more information such as guest stars and a plot summary. If lists are available from multiple sources, you can switch between them.

To view a simple guide with summaries grouped for all episodes of a show, click the "Printable Guide" box on the show's page.

Show search:

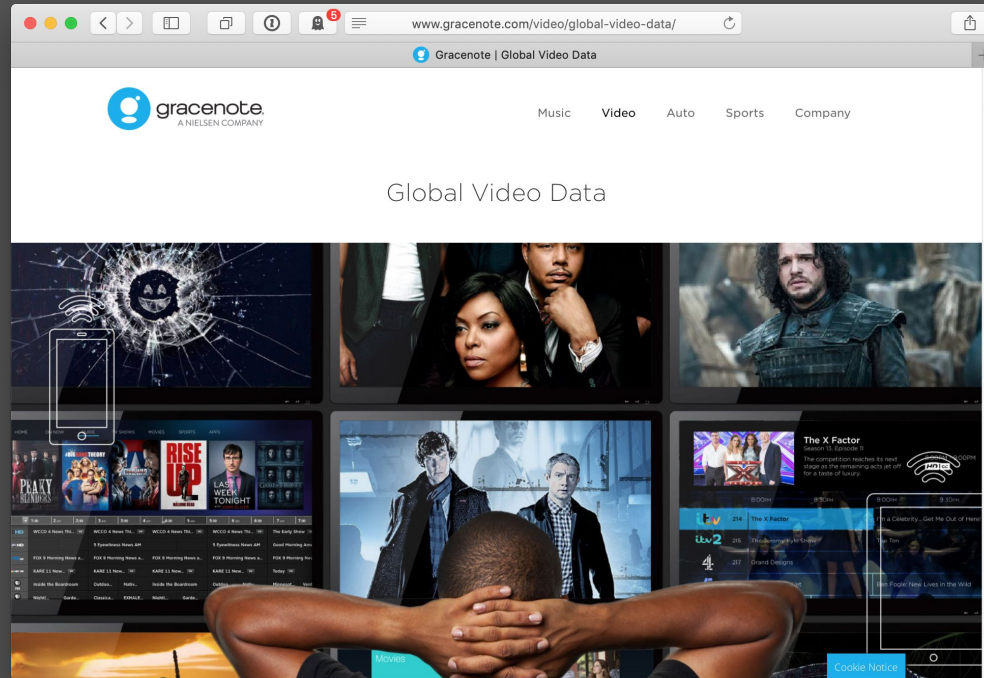
Full Menu for All Shows (by first letter)
[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#)

Current U.S. Schedule Grid	Current Shows	Shows on Hiatus or Cancelled	All Menus & Grids
Fall 2018 Schedule Grid	New Episodes Today US UK CA AU NZ JP KR	SEARCH epguides.com	FAQ
TV Related Merchants	TV Themes on CD	all shows as .csv	Chicago TV
Other TV Related Web Sites	Acknowledgments & Disclaimer	Apps	UK Radio Shows

recently added shows (all): [RSS](#) recently added shows (US only): [RSS](#)

Check out these [Customizable TV Listings](#)

Global Standard



Data Generation

The screenshot shows the Wikipedia page for the category "Lists of people". The page title is "Category:Lists of people" and it includes a navigation bar with "Read", "Edit", and "View history" options. The main content area features a blue banner with a warning icon and text: "Pages in this category should be moved to subcategories where applicable. This category may require frequent maintenance becoming too large. It should directly contain very few, if any, pages and should mainly contain subcategories." Below this, the "Subcategories" section lists 37 subcategories, such as "Lists of people by activity", "Lists of people by age", "Lists of people by association", "Lists of people by belief", "Lists of people by aspect of death", "Lists of people by ethnicity", "Lists of people by honor or award", "Lists of people by ideology", "Lists of people by language", "Lists of people by legal status", "Lists of people by magazine appearance", "Lists of people by marital status", "Lists of people by medical condition", "Lists of people by name", "Lists of people by nationality", "Lists of people by occupation", "Lists of people by organization", "Lists of people by period", "Lists of people by physical attribute", "Lists of people by place", "Lists of men", "Lists of women", "Lists of award winners", "Bible-related lists of people", "Lists of celebrities", "Lists of European people", "Lists of families", and "Family trees". The "Pages in category 'Lists of people'" section indicates that there are 3 pages in this category. The left sidebar contains the standard Wikipedia navigation menu, including "Main page", "Contents", "Featured content", "Current events", "Random article", "Donate to Wikipedia", "Wikipedia store", "Interaction", "Help", "About Wikipedia", "Community portal", "Recent changes", "Contact page", "Tools", "What links here", "Related changes", "Upload file", "Special pages", "Permanent link", "Page information", "Wikidata item", "Print/export", "Creates a book", "Download as PDF", "Printable version", and "Languages".

Data Generation

The screenshot shows the Wikipedia page for the category "Lists of women". The page is in English and is part of the en.wikipedia.org domain. The browser address bar shows the URL "en.wikipedia.org/wiki/Category:Lists_of_women". The page title is "Category:Lists of women - Wikipedia". The page content includes a sidebar with navigation links, a main content area with a search bar, and a list of subcategories and pages in the category. The subcategories listed are "Lists of women by nationality" (92 C, 1 P), "Lists of women by occupation" (14 C, 37 P), "Feminism-related lists" (23 P), and "Lists of fictional females" (12 P). The pages in the category are listed in three columns, starting with "Lists of women" and "100 Women (BBC)".

WIKIPEDIA
The Free Encyclopedia

Category:Lists of women

From Wikipedia, the free encyclopedia

- Lists of Women.**
See also: *Category:Lists of men* and *List of transgender people*

Subcategories

This category has the following 5 subcategories, out of 5 total.

- [Lists of women by nationality](#) (92 C, 1 P)
- [Lists of women by occupation](#) (14 C, 37 P)

F

- [Feminism-related lists](#) (23 P)
- [Lists of fictional females](#) (12 P)

L

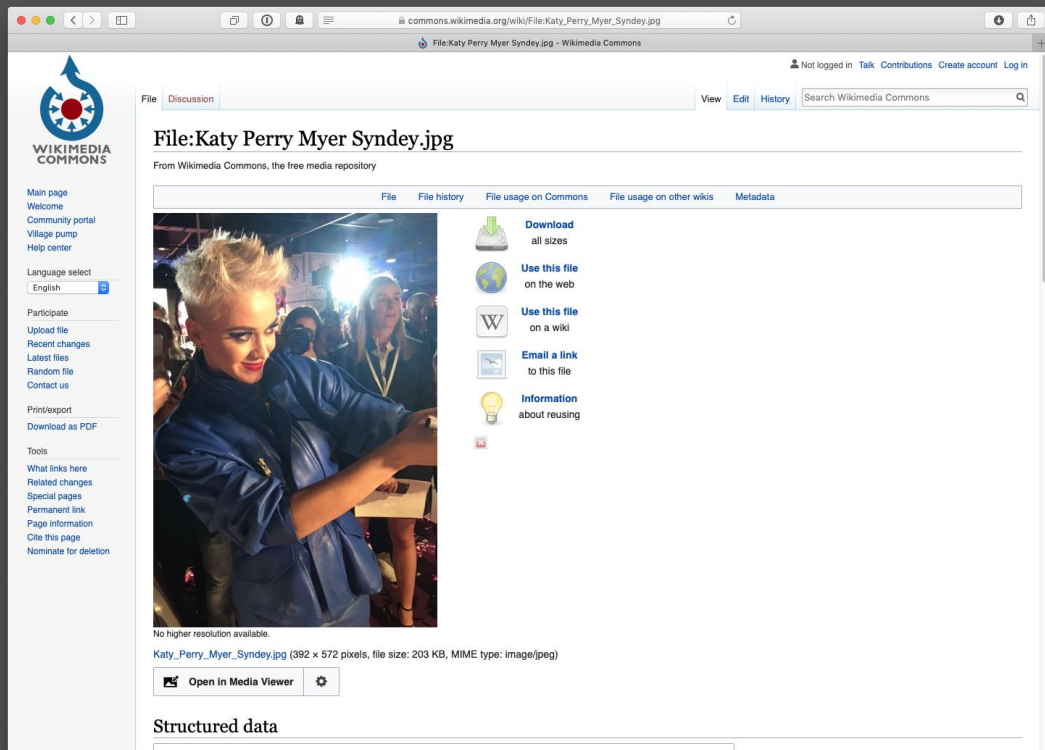
- [Lists of female office-holders](#) (1 C, 8 P)

Pages in category "Lists of women"

The following 67 pages are in this category, out of 67 total. This list may not reflect recent changes (learn more).

- Lists of women
- 0-9
 - 100 Women (BBC)
- A
 - List of Female Academy Award winners and nominees for non-gendered categories
- B
 - List of women's firsts
 - Forbes list of The World's 100 Most Powerful Women
 - Four Beauties
- G
 - List of women geologists
- H
 - Hasty Pudding Woman of the Year
 - List of women in the Heritage Floor
- I
- Q
 - List of princess-abbesses of Quedlinburg
- R
 - Rachel Carson Prize (environmentalist award)
 - List of women of the Restoration Movement
 - List of women who led a revolt or rebellion
 - List of roads in Switzerland named after women
 - List of Roman women
 - List of female Fellows of the Royal Academy of Engineering

Data Generation




The screenshot shows a web browser window displaying the Wikimedia Commons page for the file `File:Katy Perry Myer Syndey.jpg`. The browser's address bar shows the URL `commons.wikimedia.org/wiki/File:Katy_Perry_Myer_Syndey.jpg`. The page features the Wikimedia Commons logo on the left, a navigation menu, and a main content area. The main content area includes a file thumbnail of Katy Perry, a list of actions (Download, Use this file on the web, Use this file on a wiki, Email a link to this file, Information about reusing), and a structured data section.

File: [Discussion](#) [View](#) [Edit](#) [History](#)

File:Katy Perry Myer Syndey.jpg

From Wikimedia Commons, the free media repository

[File](#) [File history](#) [File usage on Commons](#) [File usage on other wikis](#) [Metadata](#)



[Download](#) all sizes

[Use this file on the web](#)


[Use this file on a wiki](#)

[Email a link to this file](#)

[Information about reusing](#)

No higher resolution available.

`Katy_Perry_Myer_Syndey.jpg` (392 x 572 pixels, file size: 203 KB, MIME type: image/jpeg)

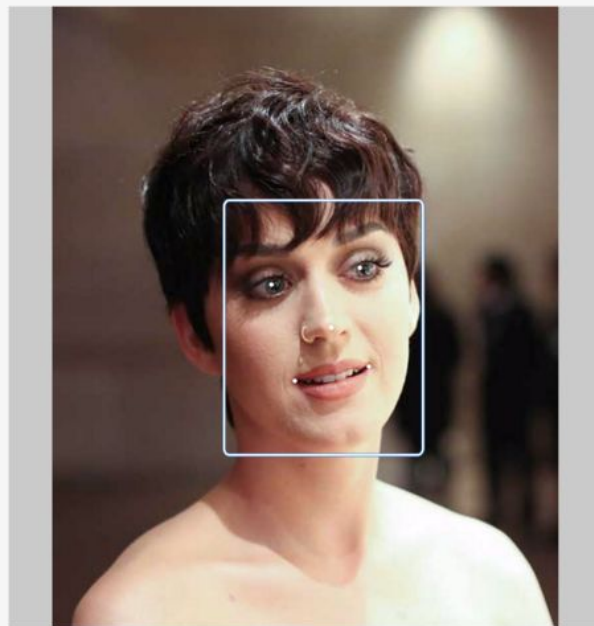
[Open in Media Viewer](#) 

Structured data

Woman with Short Hair

Facial analysis

Get a complete analysis of facial attributes, including confidence scores.



Choose a sample image

Use your own image

Done with the demo?

[Learn more](#)

▼ Results



looks like a face	99.9 %
appears to be male	77.2 %
age range	26 - 43 years old
not smiling	50.5 %
appears to be surprised	88.1 %
not wearing glasses	98.9 %

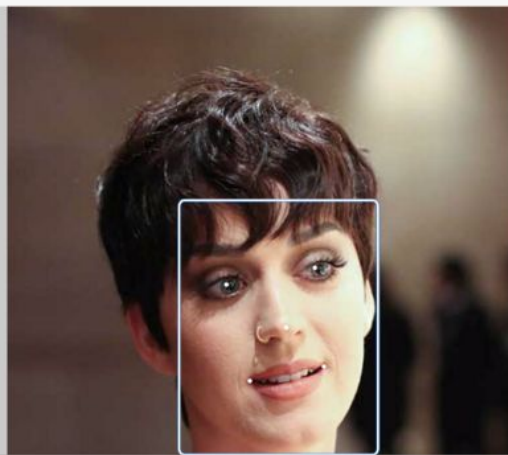
[Show more](#)

► Request

Woman with Short Hair

Facial analysis

Get a complete analysis of facial attributes, including confidence scores.



Done with the demo?
[Learn more](#)

▼ Results



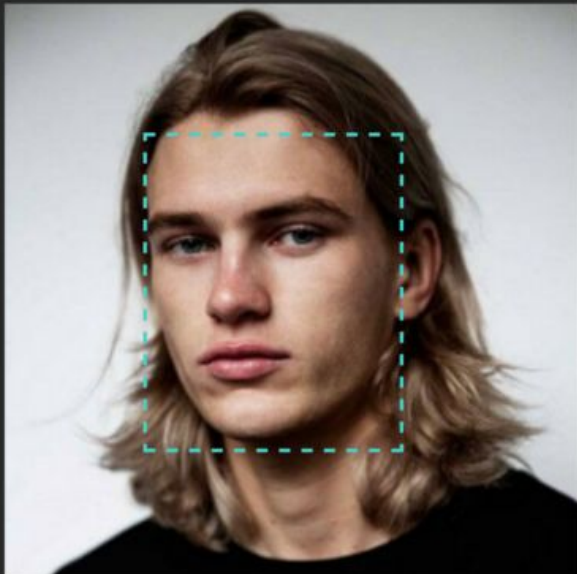
looks like a face	99.9 %
appears to be male	77.2 %
age range	26 - 43 years old
not smiling	50.5 %

appears to be male 77.2 %

Choose a sample image

Use your own image

Man with Long Hair



adult 0.50

celebrity 0.50

Face Model -

Locate faces within an image and assess gender and age.

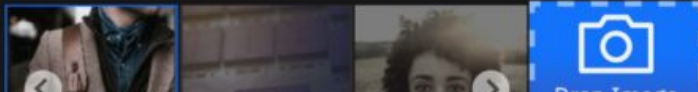
Face 1

age 20-22 1.00

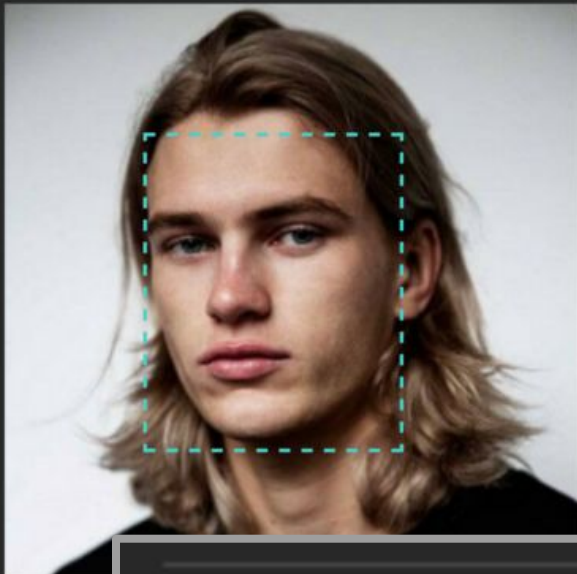
FEMALE 0.61

Food Model +

Explicit Model +



Man with Long Hair



adult 0.50

celebrity 0.50

Face Model —

Locate faces within an image and assess gender and age.

Face 1

age 20-22 1.00

FEMALE 0.61

FEMALE 0.61

Drop Image

Man with Long Hair

Facial analysis

Get a complete analysis of facial attributes, including confidence scores.



Choose a sample image



Use your own image

Image must be .jpeg or .png format and no larger than 5MB. Your image isn't stored.



Upload

or drag and drop

Use image URL

Go

Done with the demo?

[Learn more](#)

▼ Results



looks like a face 99.9 %

appears to be female 73.9 %

age range 23 - 38 years old

not smiling 99.4 %

appears to be calm 83.6 %

not wearing glasses 99.9 %

[Show more](#)

Man with Long Hair

Facial analysis

Get a complete analysis of facial attributes, including confidence scores.



Done with the demo?

[Learn more](#)

▼ Results



looks like a face 99.9 %

appears to be female 73.9 %

age range 23 - 38 years old

not smiling 99.4 %

is smiling 99.6 %

has glasses 0.9 %

Choose a sample image



Use your own image

Image must be .jpeg or .png format and no larger than 5MB. Your image isn't stored.


appears to be female

73.9 %

Show more

Man with Makeup

GENERAL FACE NSPW COLOR MORE MODELS




General [VIEW DOCS](#)

model	0.884
veil	0.873
face	0.830
woman	0.815
one	0.810
eye	0.788
facial expression	0.781
serious	0.726
hair	0.719
jewelry	0.719
girl	0.701
wear	0.691

Man with Makeup

GENERAL FACE NSFW COLOR MORE MODELS



General [VIEW DOCS](#)

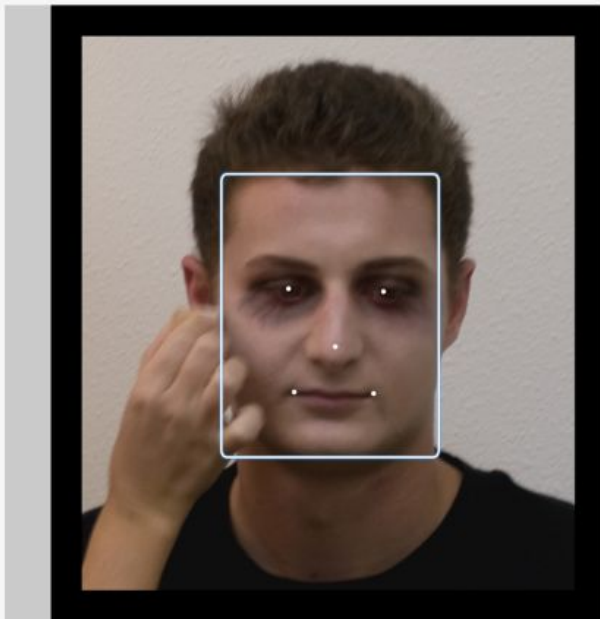
model	0.884
veil	0.873
face	0.830
woman	0.815
one	0.810
eye	0.788
facial expression	0.781
serious	0.726
hair	0.719
jewelry	0.719
girl	0.701

woman 0.815

Man with Makeup

Facial analysis

Get a complete analysis of facial attributes, including confidence scores.



Choose a sample image



Use your own image

Image must be .jpeg or .png format and no larger than 5MB. Your image isn't stored.

Done with the demo?

[Learn more](#)

▼ Results



looks like a face	100 %
appears to be female	68 %
age range	23 - 38 years old
not smiling	96.7 %
not wearing glasses	99.9 %
not wearing sunglasses	99.9 %

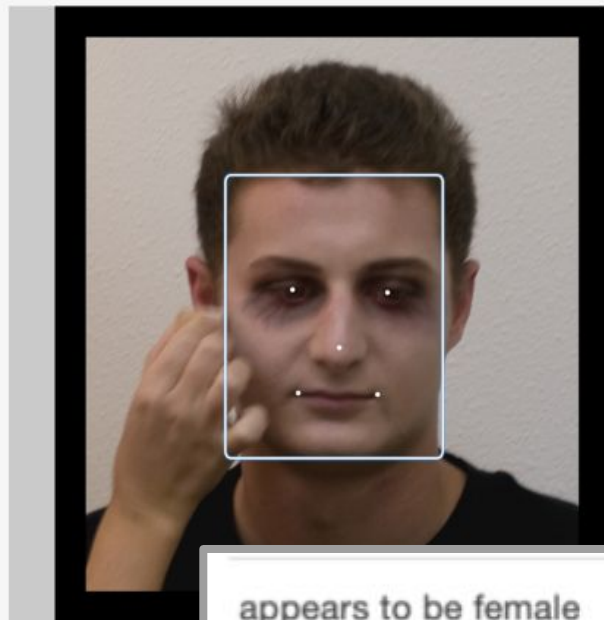
[Show more](#)

► Request

Man with Makeup

Facial analysis

Get a complete analysis of facial attributes, including confidence scores.



Done with the demo?

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▼ Results



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	99.9 %

appears to be female

68 %

Choose a sample image



Image must be .jpg or .png format and no larger than 5MB. Your image isn't stored.

► Request

Man with Makeup



wear	0.925
adult	0.921
backstage	0.920
menswear	0.913
punk	0.902
facial expression	0.899
glamour	0.890
actor	0.890
actress	0.875
jewelry	0.858
model	0.839
woman	0.835

Man with Makeup



woman












0.835

wear	0.925
adult	0.921
backstage	0.920
menswear	0.913
punk	0.902
facial expression	0.899
glamour	0.890
actor	0.890
actress	0.875
jewelry	0.858
model	0.839
	0.835











Automating Data Generation + Testing

TinyData Home Projects Datasets APIs

Projects / Gender Classification Tests

Label							
female		male	female	male	male	Edit	Delete
female		male	female	female	male	Edit	Delete
female		female	female	female	female	Edit	Delete
female		male	female	male	male	Edit	Delete
female		male	female	female	male	Edit	Delete
female		male	male	male	female	Edit	Delete
female		male	male	male	male	Edit	Delete


Automating Data Generation + Testing

female		female	female	female	female	Edit	Delete
female		male	female	male	female	Edit	Delete
female		female	female	male	female	Edit	Delete
female		male	female	female	male	Edit	Delete
female		male	female	female	female	Edit	Delete
female		female	male	male	male	Edit	Delete
female		male	male	male	female	Edit	Delete
female		female	female	female	female	Edit	Delete
female		female		female	female	Edit	Delete
female		female		female	female	Edit	Delete





Tracking Results Over Time

TinyData Home Projects Datasets APIs

Projects / Gender Classification Tests / Image



API Result

	<code>{:value=>"Female", :confidence=>99.8526840209961}</code>
	"Female"
	<code>{:concepts=>[{:id=>"a1_cVWr8NK5", :name=>"feminine", :value=>0.59999096, :app_id=>"main"}, {:id=>"a1_zgR2BBt0", :name=>"masculine", :value=>0.4000091, :app_id=>"main"}]}</code>
	<code>{"gender"=>"FEMALE", "gender_label"=>"female", "score"=>0.9999682}</code>

Takeaways

- Even the best trained commercial ML systems are far from perfect
- Systems return different results over time as new versions get deployed
- Cumbersome & intractable to test without tools & automation

Scaling Data Products as a Startup

- Bootstrap servers with commercial APIs
- Bootstrap data with open web, public & synthetic datasets
- Automation is startups' best friend

Questions / Comments

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