

Introduction (Module 0)

Science des données

IFT3700/IFT6758

Automne 2018

©Alain Tapp

Big data, la révolution!



Une tonne de
données



Puissance de calcul



Arentisage
automatique

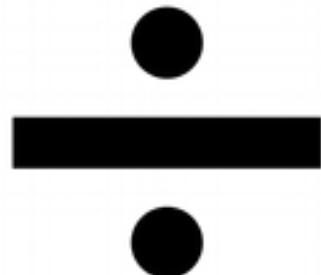
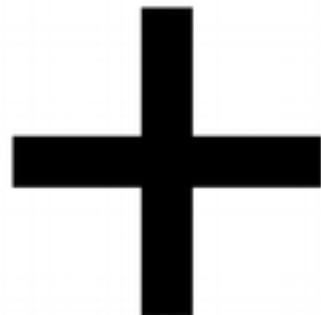
Puissance de calculs

FLOPS

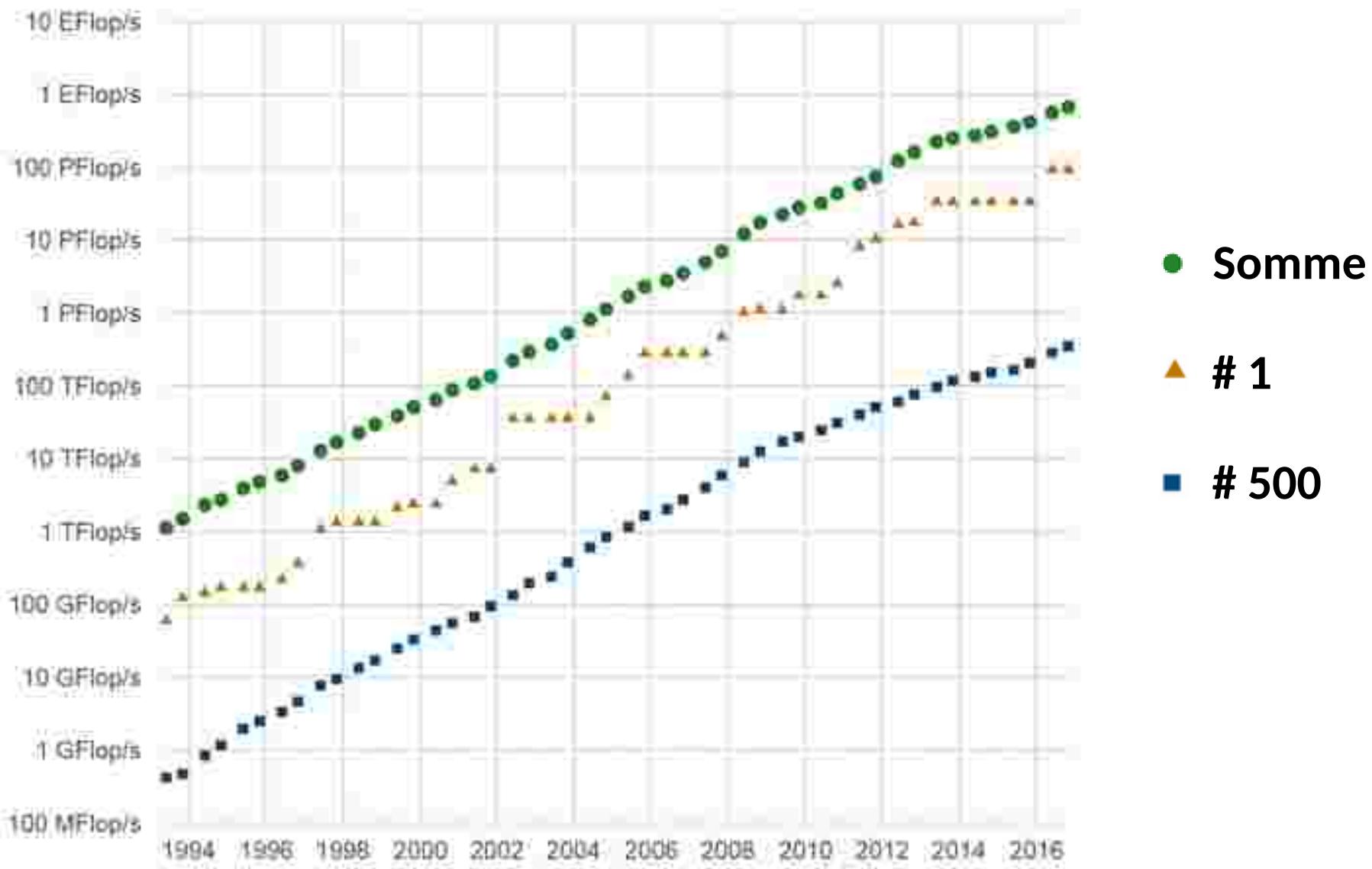
Floating-point Operations Per Second

Opérations en virgule flottante par seconde

T-FLOPS = 1 000 0000 0000 000 FLOPS



Top 500!





**Xeon E3
0.17 T-FLOPS**

**Nvidia RTX 2080 Ti
76 T-FLOPS**

**Summit
200 000 T-FLOPS**



1995



2018

4 mois



1 seconde

10 000 ans



1 nuit

Data

POPULAR SCIENCE

THE CONTROL CENTERS

Brain Activity from the Brain
Data That Tells Your Moods,
Minds, and More

DATA ALGORITHM

Let a Computer Predict
What You'll Buy

NEW WAYS OF SEEING

From 3D
Lenses to
Augmented

WEIRDUM

DATA IS POWER

HOW INFORMATION
IS CHANGING
THE FUTURE



PLANE



SCIENCE



TECHNOLOGY



LITERATURE

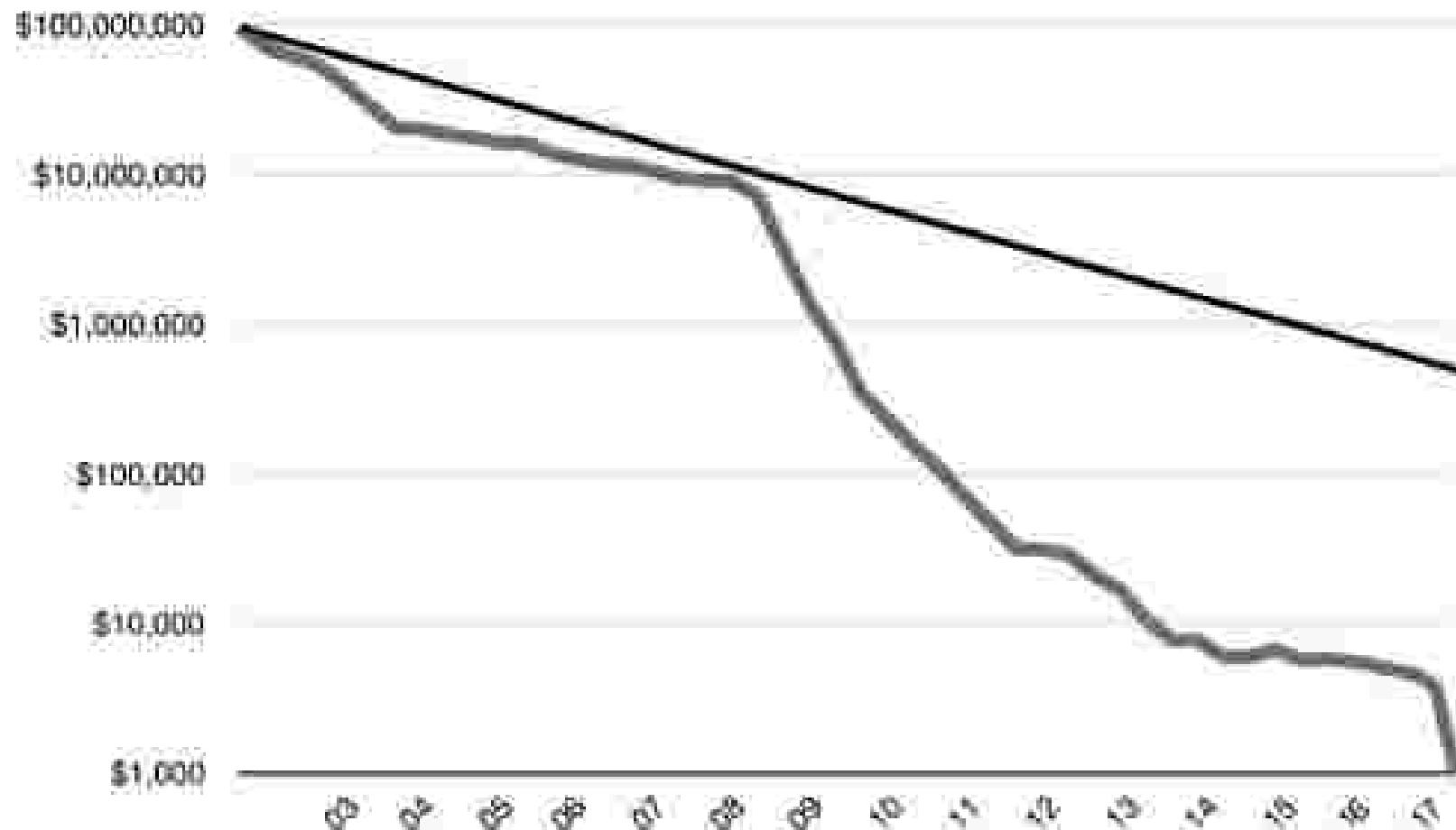


ART



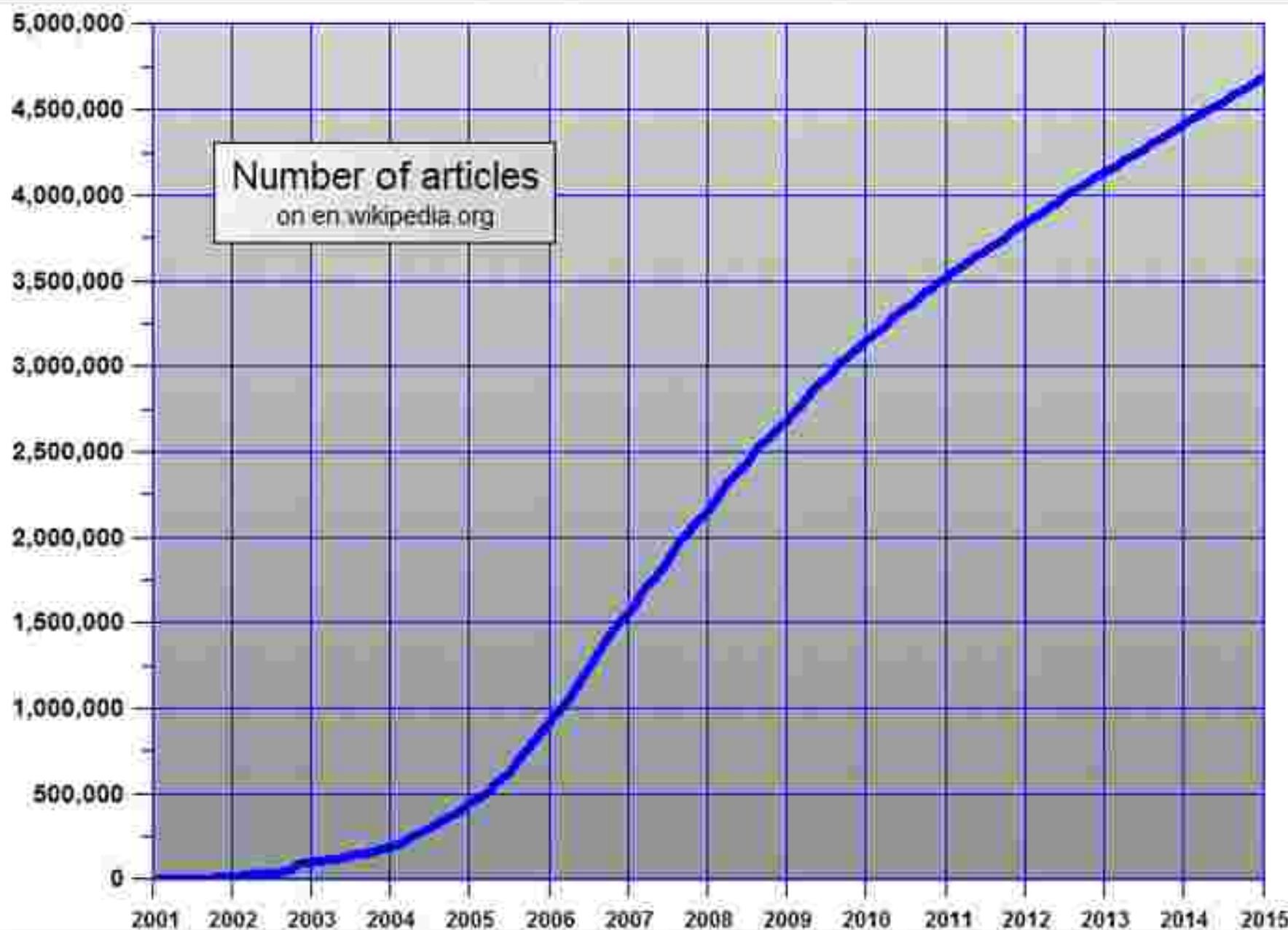
HISTORY

Cout du séquençage d'un génome versus la loi de Moore.



Mars 2012

“Encyclopaedia Britannica cost **\$1400** for a full **32-volume** print edition. Now, the Encyclopaedia Britannica will only be available in digital versions.“





WIKIPEDIA
La enciclopedia libre

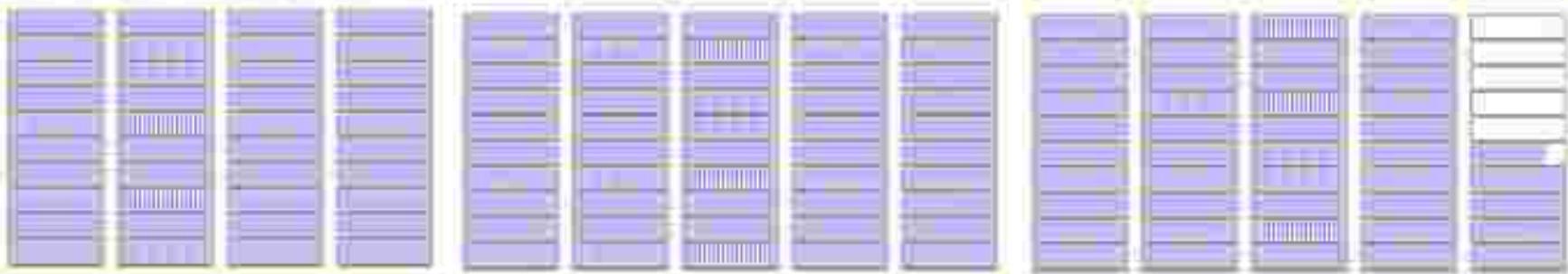


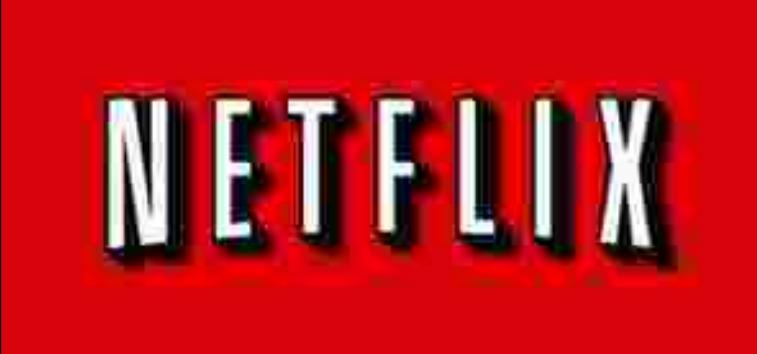
WIKIPEDIA
The Free Encyclopedia



WIKIPÉDIA
L'encyclopédie libre

2696 volumes de 500 pages (Septembre 2018)





NETFLIX

- Minage de données
- Recherche d'information
- Système de recommandation
- Apprentissage automatique



amazon



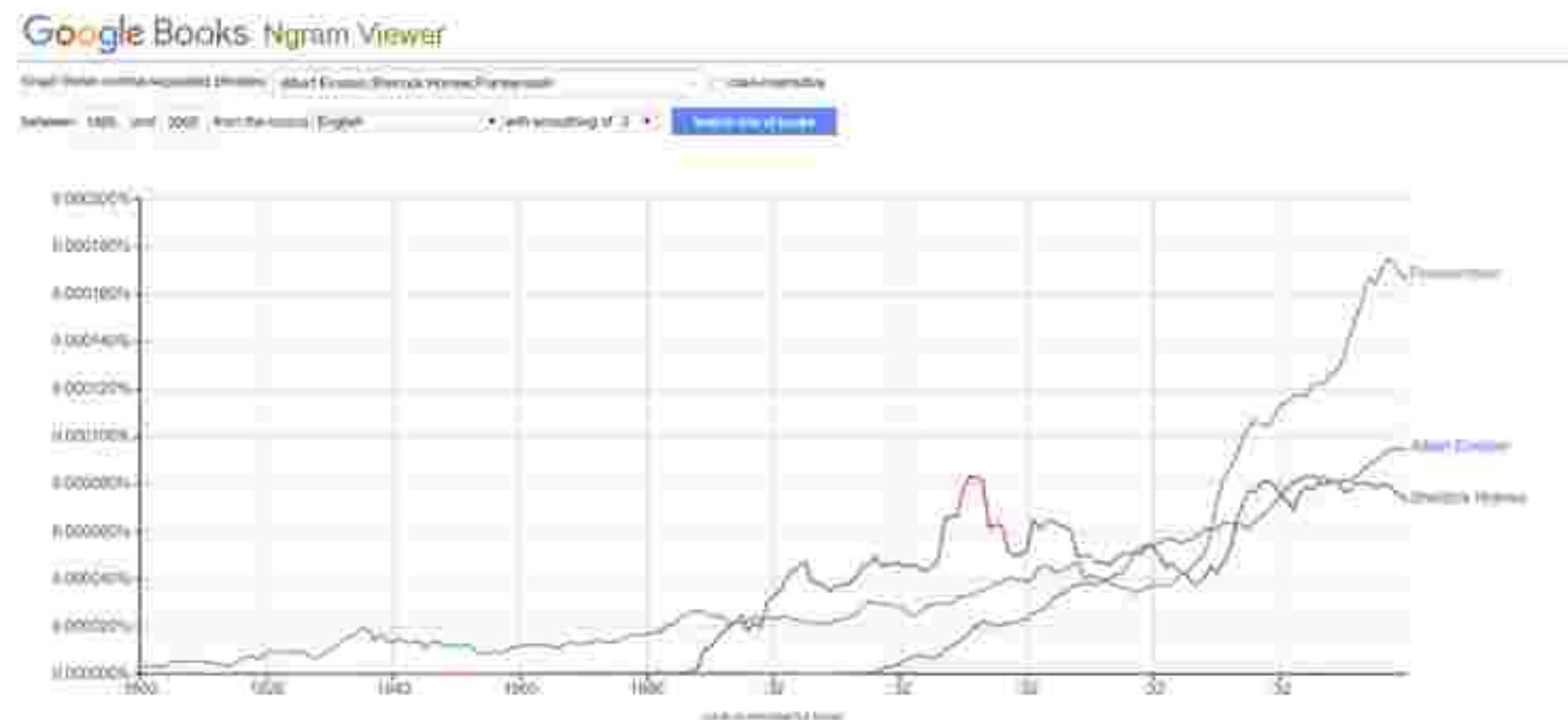
Google

Data

- Médical
- Légal
- Finance, bourse
- Assurance
- Œuvres, livres, pièce musicale, photo, films
- SMS, courriel, tweets
- Facebook
- Transactions, payments
- Page www, Wikipédia, reddit

Frankenstein
Albert Einstein
Sherlock Holmes

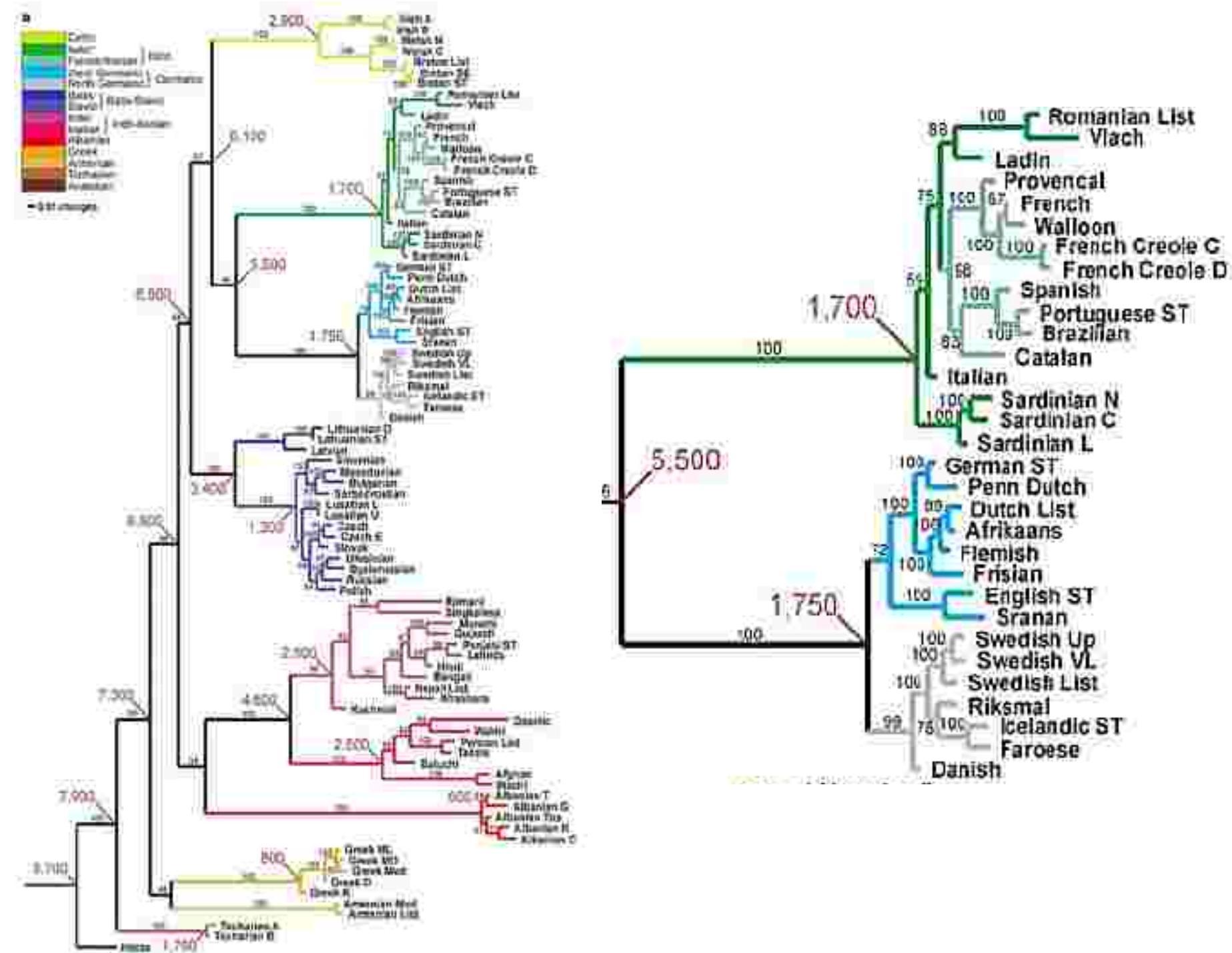
1800-2018

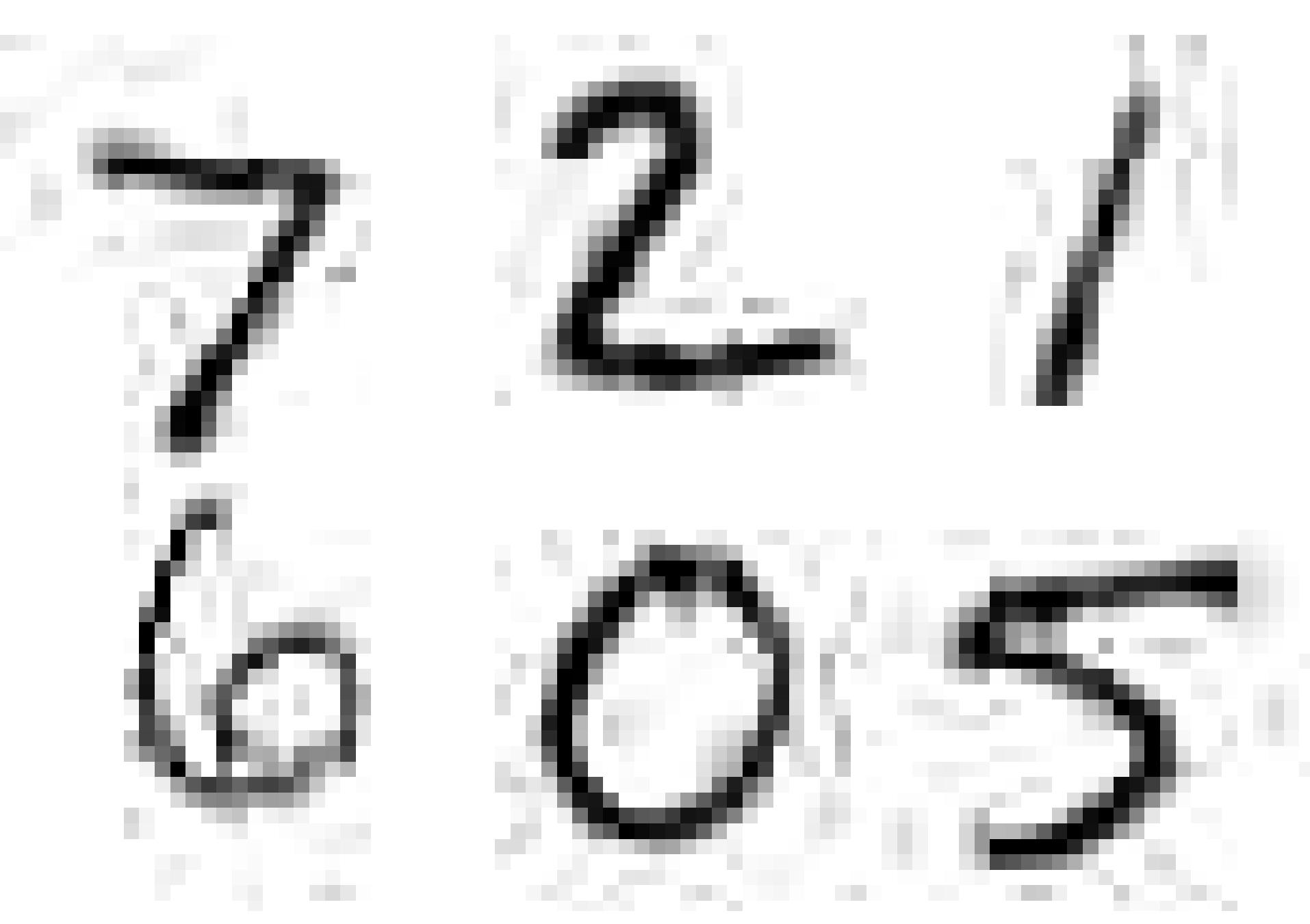


Visualisation

THE INDO-EUROPEAN & URALIC Language Families







7

2

1

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1

8

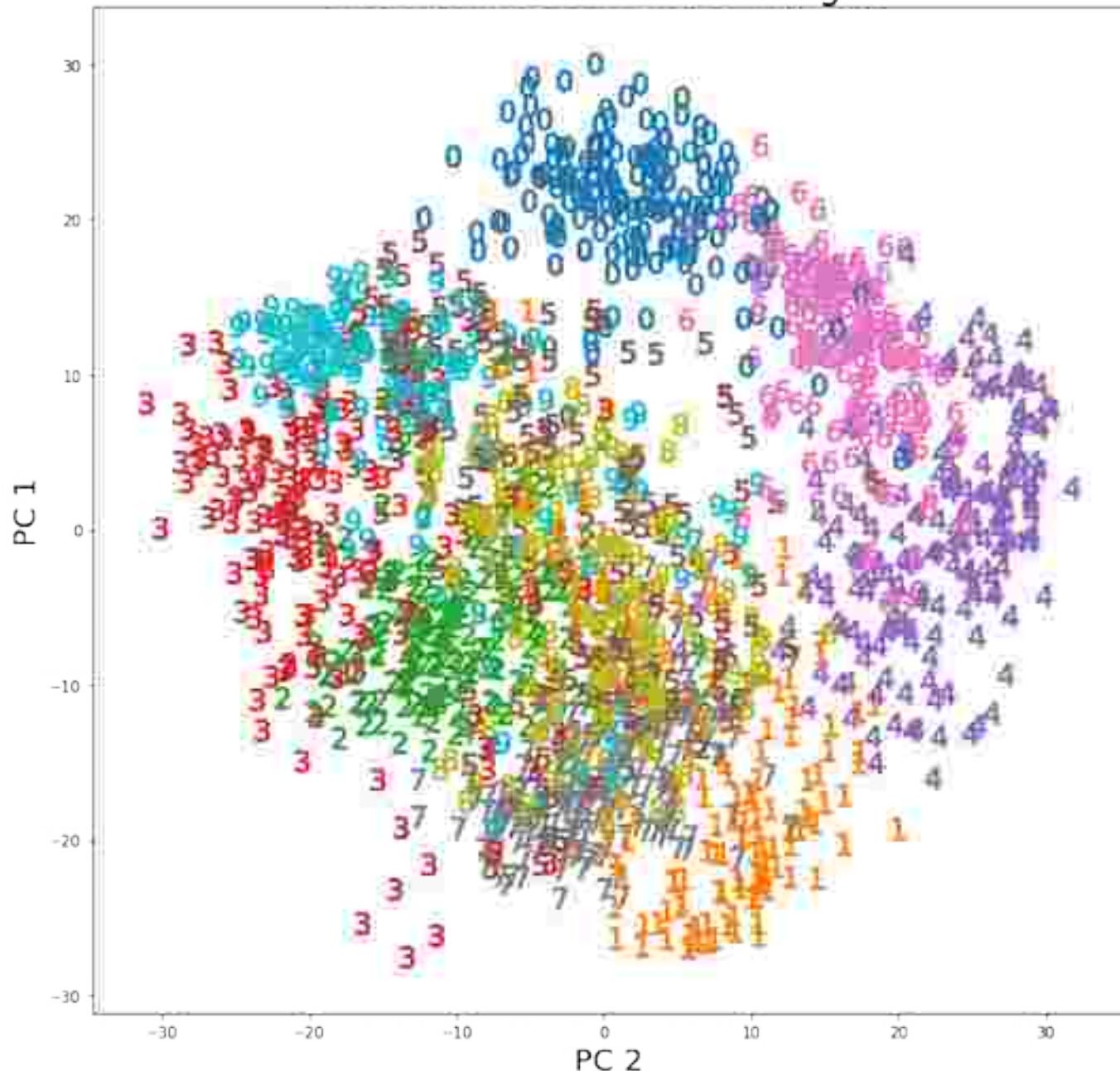
4

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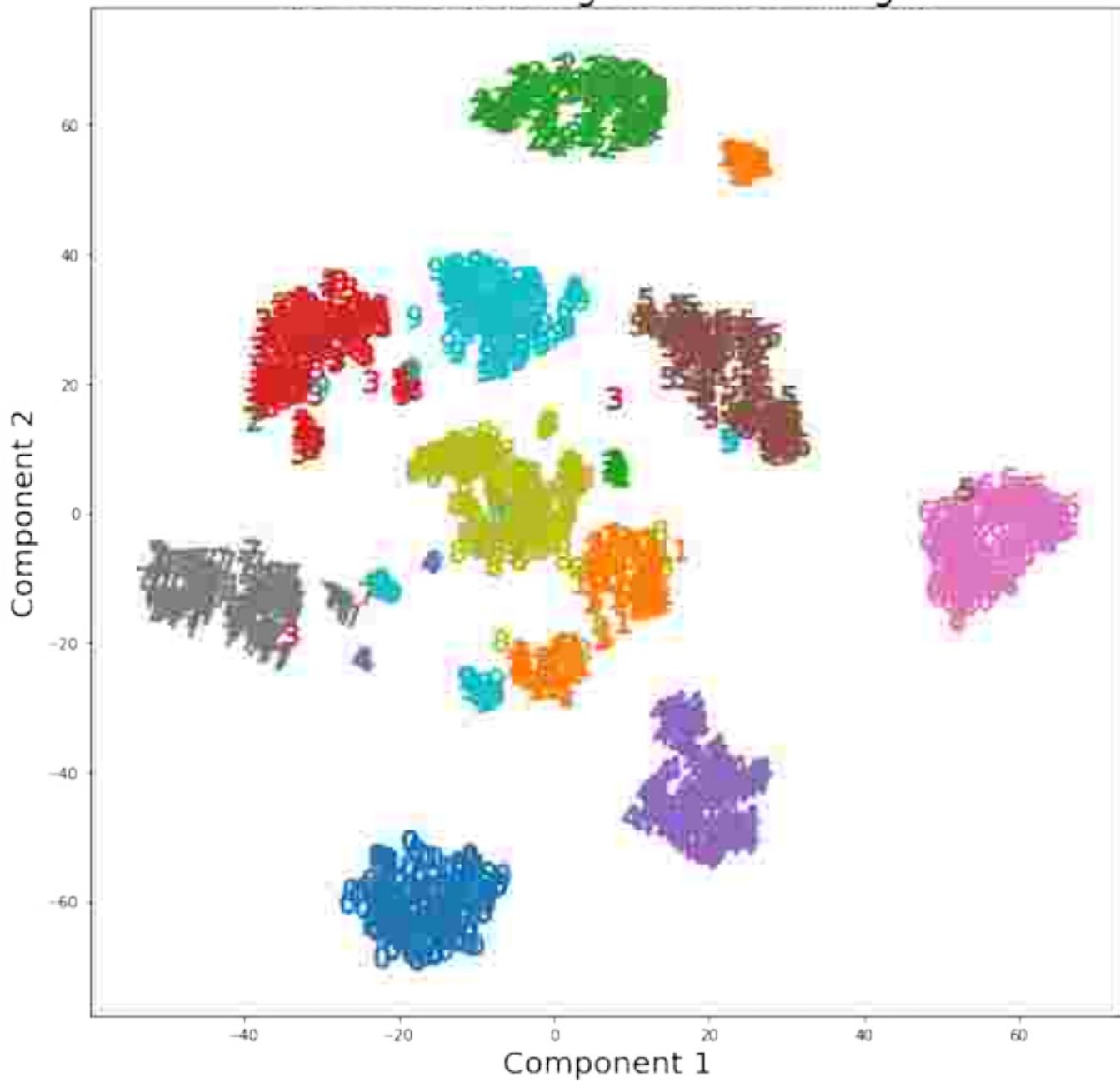
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6986857860279448554082
1070708833174735986321
8344082914714739739882
15402519781047147397396
97025197810471473974458
8180337969637216161379
49129146999362362161431

72104149590690159784964540740131
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14460291474739884712122323239174
90251978104179642681375441813812
78597969637445354787807689733195
81803372362161137908054028729840
44129146993984431318879488797145
672005520220249980994654918349912
79830727945493214023751885031473
33612373320338436350269074693519
04871741097200911878472046031133
69233770015298744266196829083116
14579690615683826507461347323425
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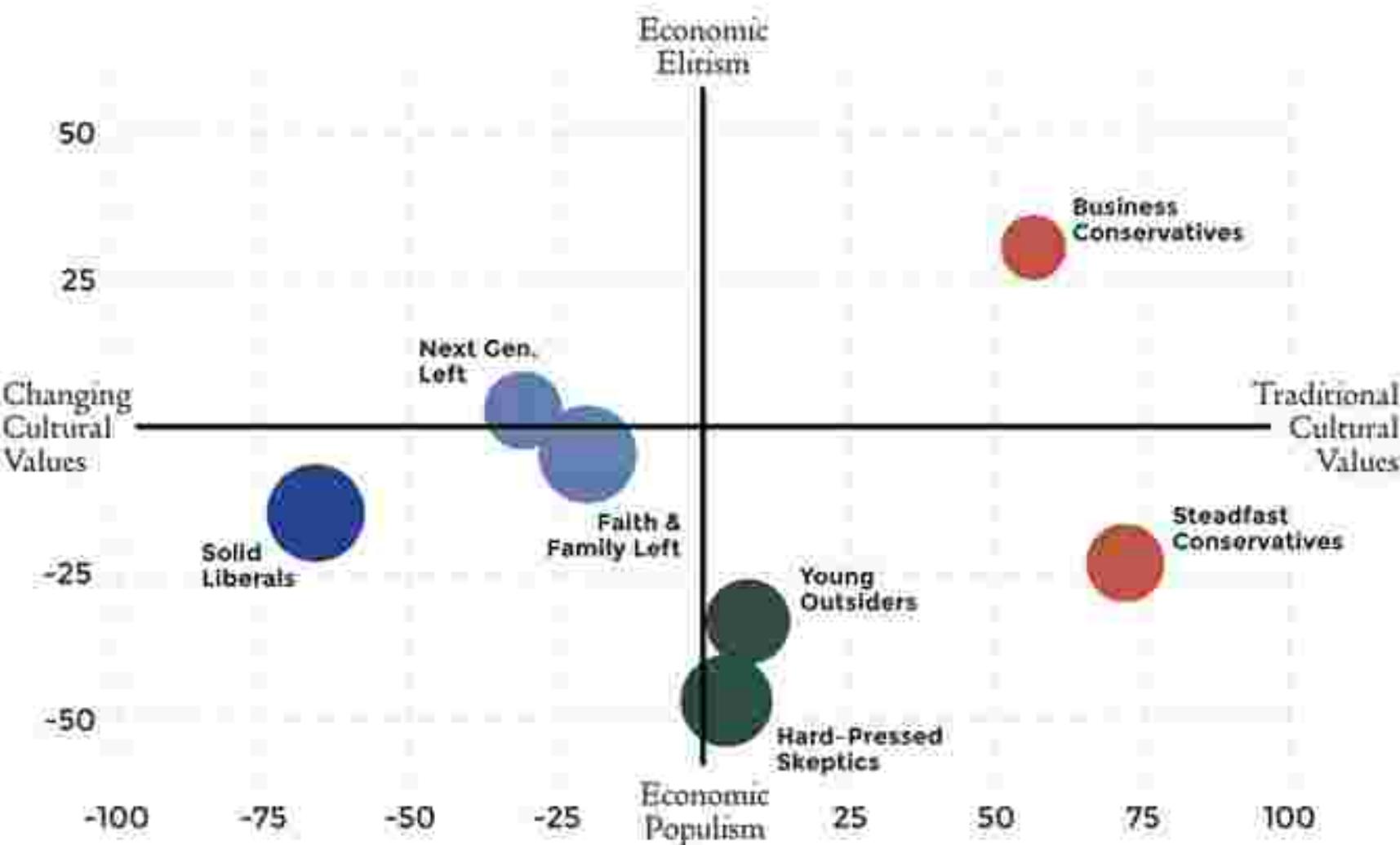
PC1 vs PC2 for MNIST Images



TSNE Embedding for MNIST Images

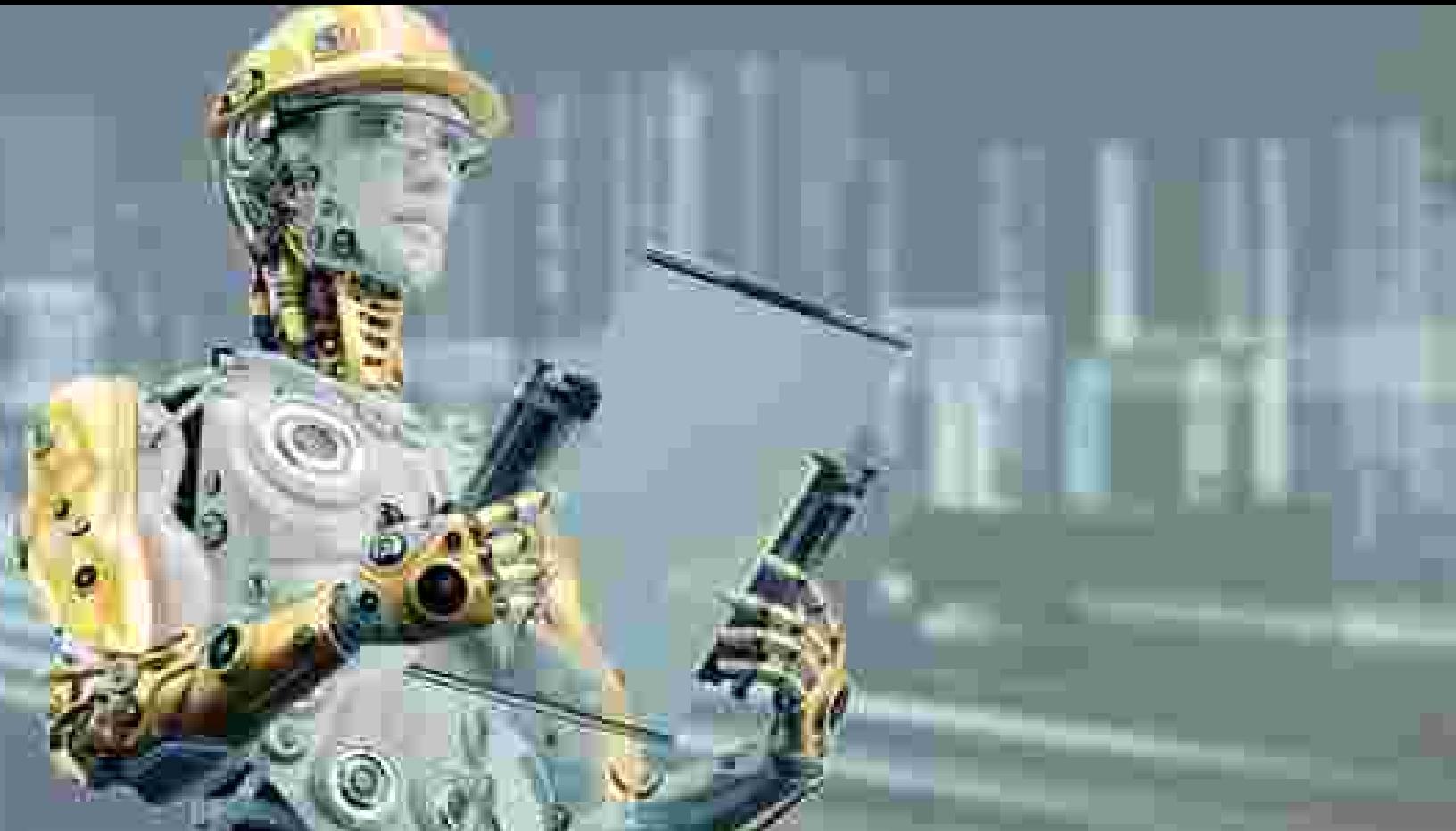


Business Conservatives are the only economically elitist political typology.



Prédiction

Apprentissage automatique



MNIST



60000 exemples d'entraînement

10000 exemples de test

2

2

2

3

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2

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2

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3

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2

2

Classification



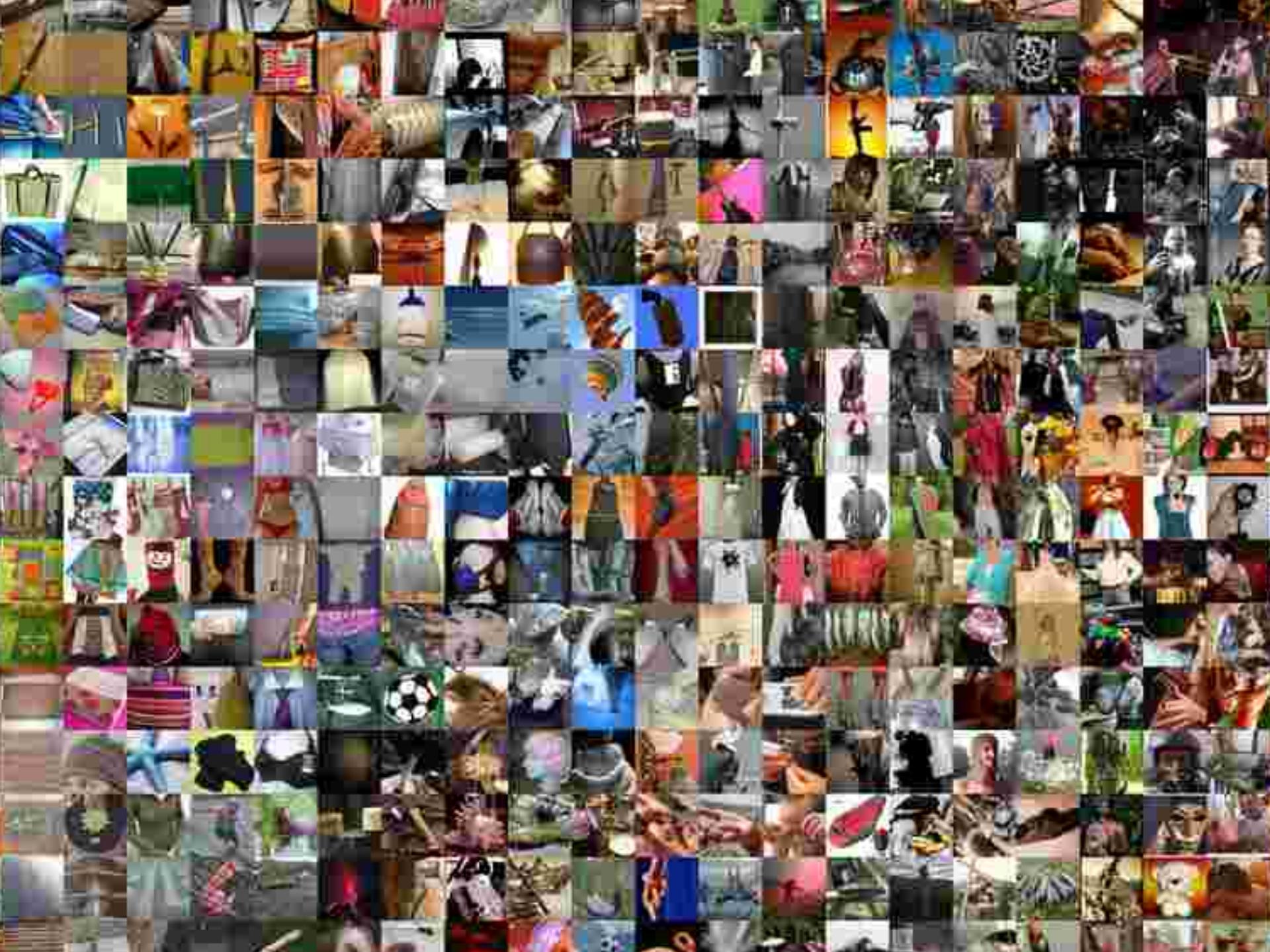
= ?

Large-Scale Visual Recognition Challenge

**1 200 000 images
1000 classes**



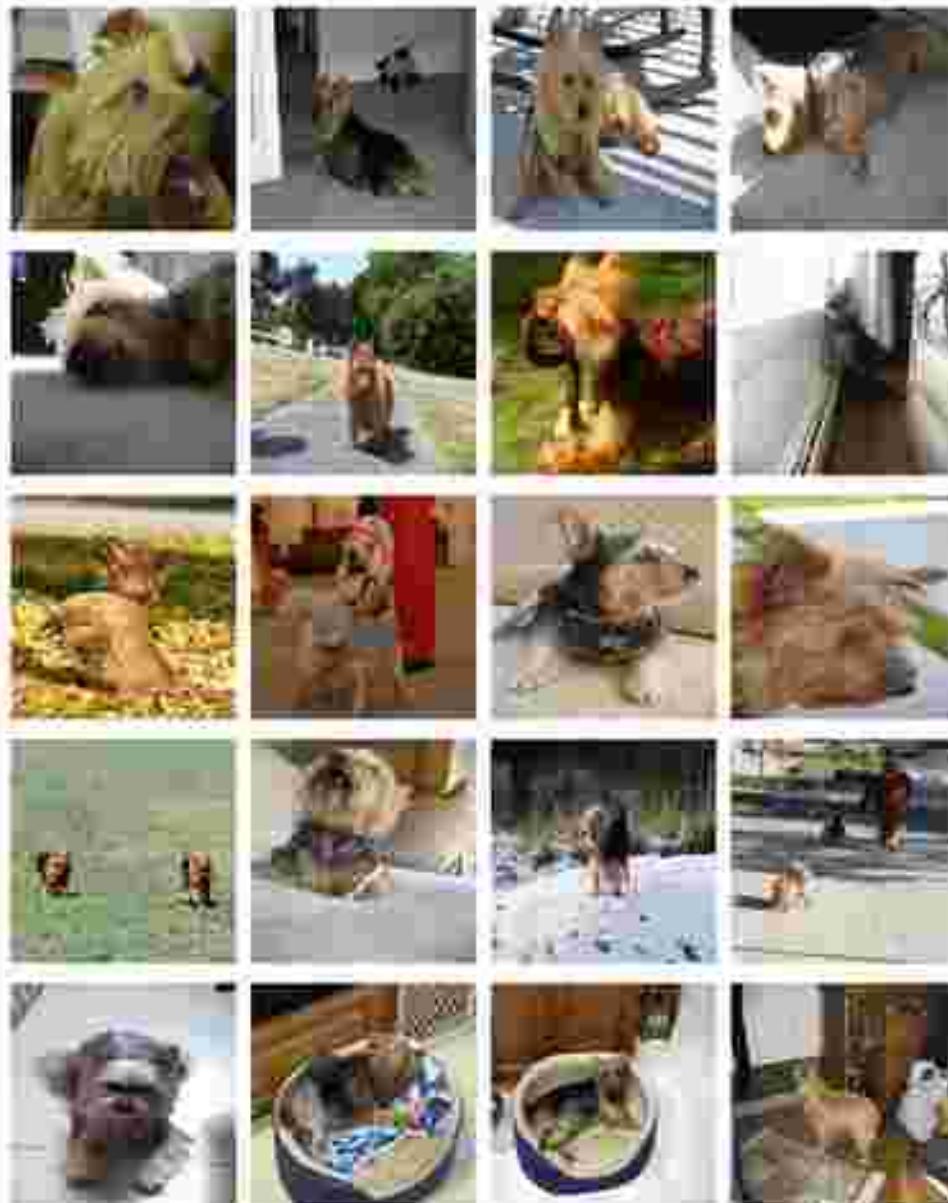




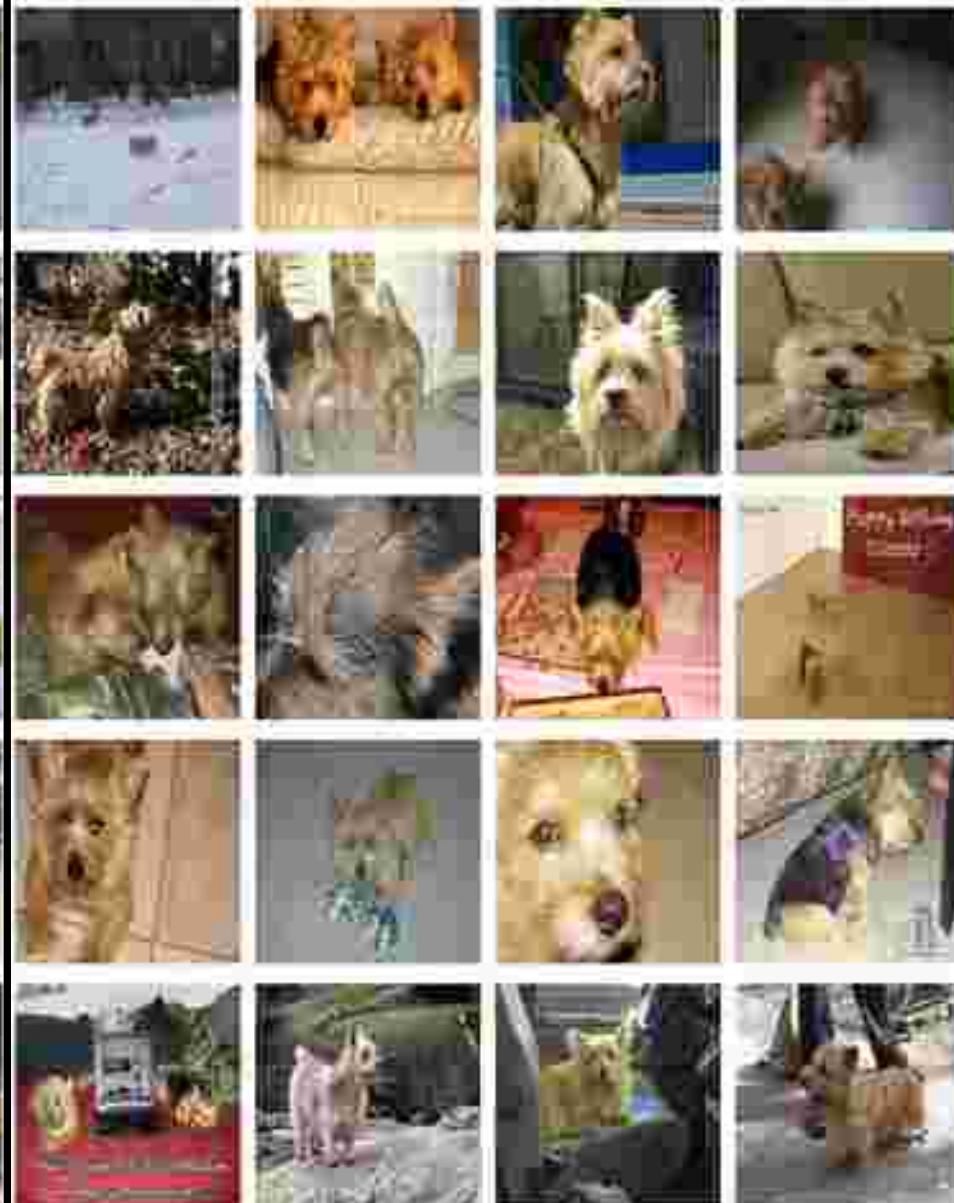




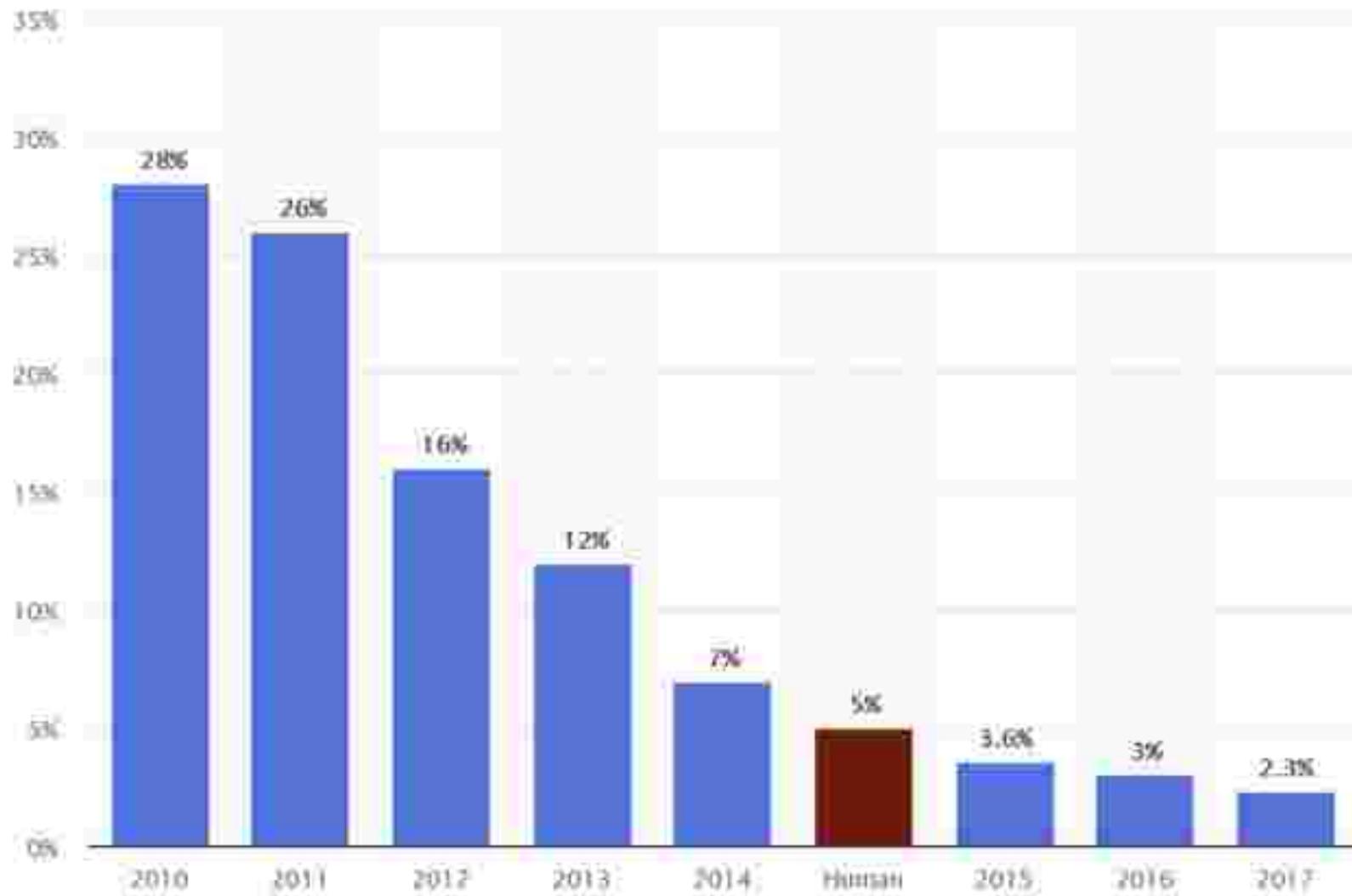
Australien terrier



Norwich terrier



ILSVRC TOP 5



2015

QUARTZ

CLOUD COMPUTING

If you have an evil twin, fear not:
Microsoft's facial recognition can tell
identical twins apart



By Tom Simonite, Associate technology editor, @tom_simonite, +1 (650) 493-3185 | [Daily Brief](#)

JC



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This Story

Photo ID



Download the Free Merlin Bird ID App

Free, instant Bird ID help for
1,500+ North American and
European birds.

Download the
App Store

ANDROID APP ON
Google play



Photo: Tom Schulz © Dan K. Smith

Prédiction

- Fraude
- Diagnostic
- Récidive
- Solvabilité
- Risque
- Compatibilité amoureuse

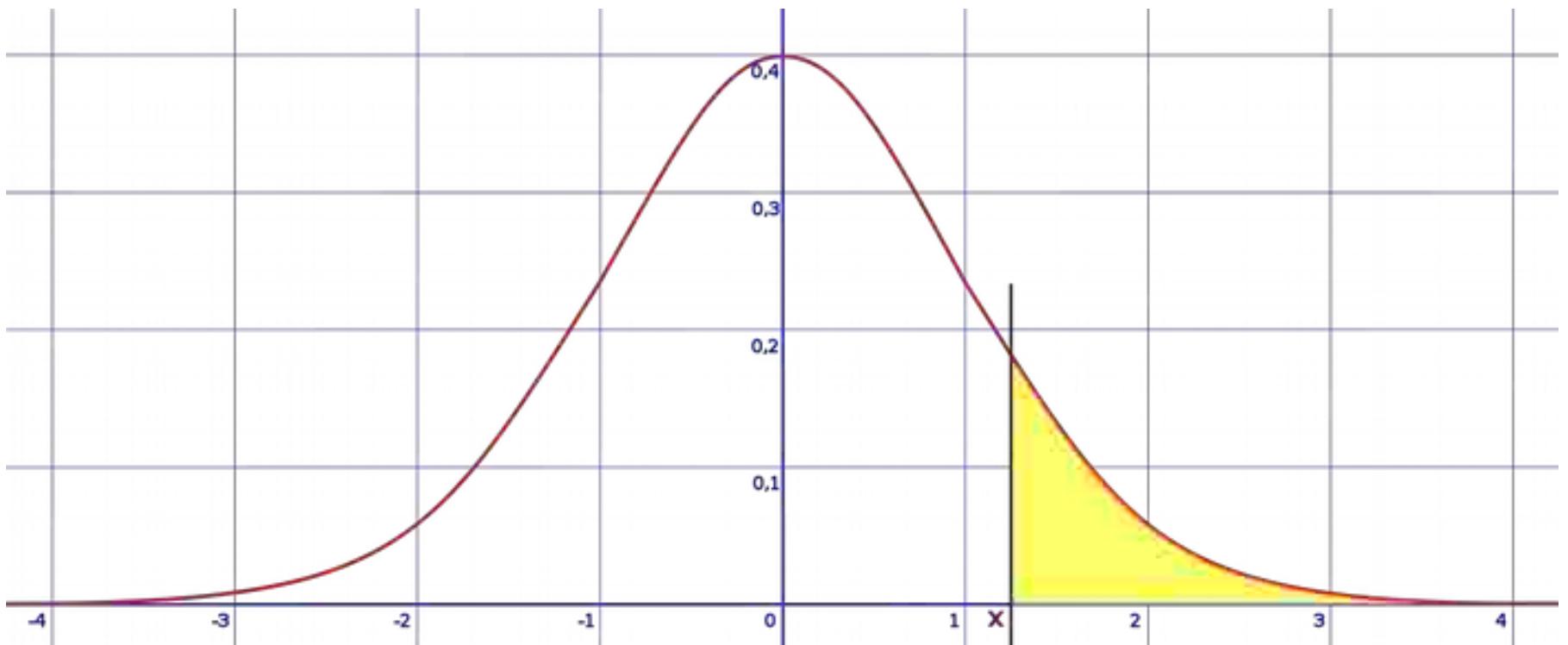
Clinical Versus Mechanical Prediction: A Meta-Analysis

William M. Grove, David H. Zald, Boyd S. Lebow, Beth E. Snitz, and Chad Nelson
University of Minnesota, Twin Cities Campus

The process of making judgments and decisions requires a method for combining data. To compare the accuracy of clinical and mechanical (formal, statistical) data-combination techniques, we performed a meta-analysis on studies of human health and behavior. On average, mechanical-prediction techniques were about 10% more accurate than clinical predictions. Depending on the specific analysis, mechanical prediction substantially outperformed clinical prediction in 33%–47% of studies examined. Although clinical predictions were often as accurate as mechanical predictions, in only a few studies (6%–16%) were they substantially more accurate. Superiority for mechanical-prediction techniques was consistent, regardless of the judgment task, type of judges, judges' amounts of experience, or the types of data being combined. Clinical predictions performed relatively less well when predictors included clinical interview data. These data indicate that mechanical predictions of human behaviors are equal or superior to clinical prediction methods for a wide range of circumstances.

Méthodologie

Valeur-





Les bonbons donnent des boutons?

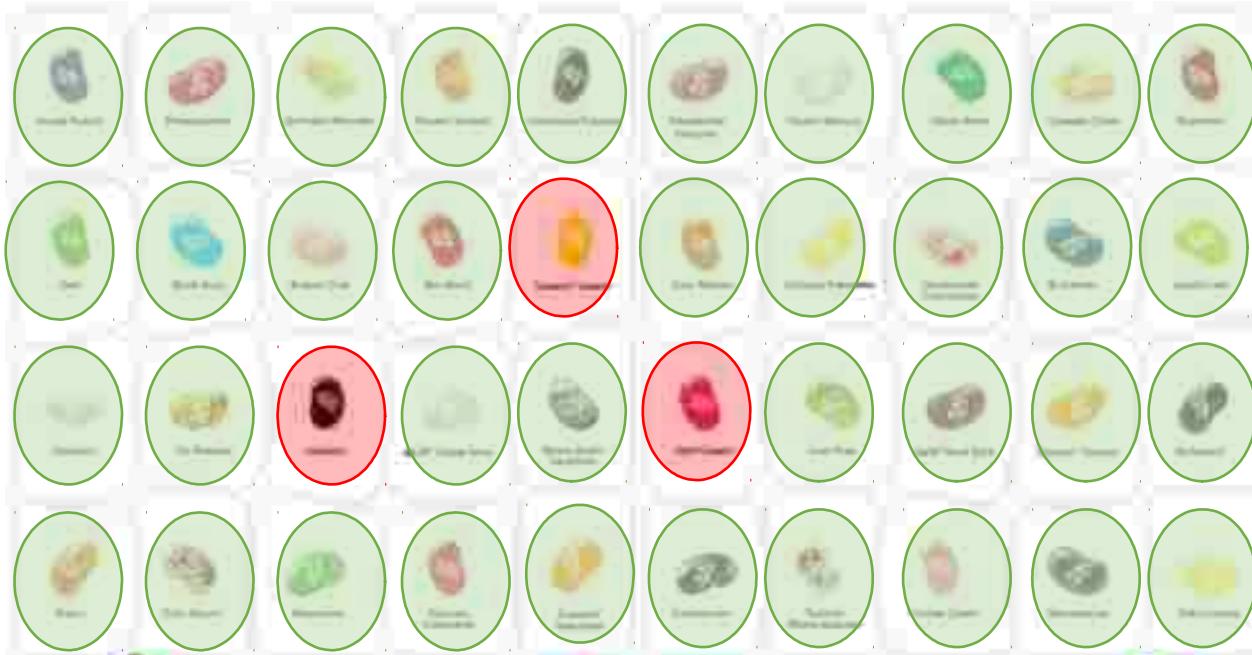


Non!

Peut-être une couleur en particulier?

$p > 0.05$

$p < 0.05$



Election 2016

TIME



Donald Trump

Will make america great again?

New study shows Jelly Beans
gives pimples!

100%

Exemples

85%

15%



Apprentissage

Test

Impacts

Rends la surveillance plus facile

- Prévention du crime
- Big Brother

Remplace des emplois

- Enrichissement de la société
- Chômage

Assistant personnel

- Rends la vie plus facile
- Déshumanise

Rend l'information accessible

- Éducation
- Propagande

Véhicule autonome

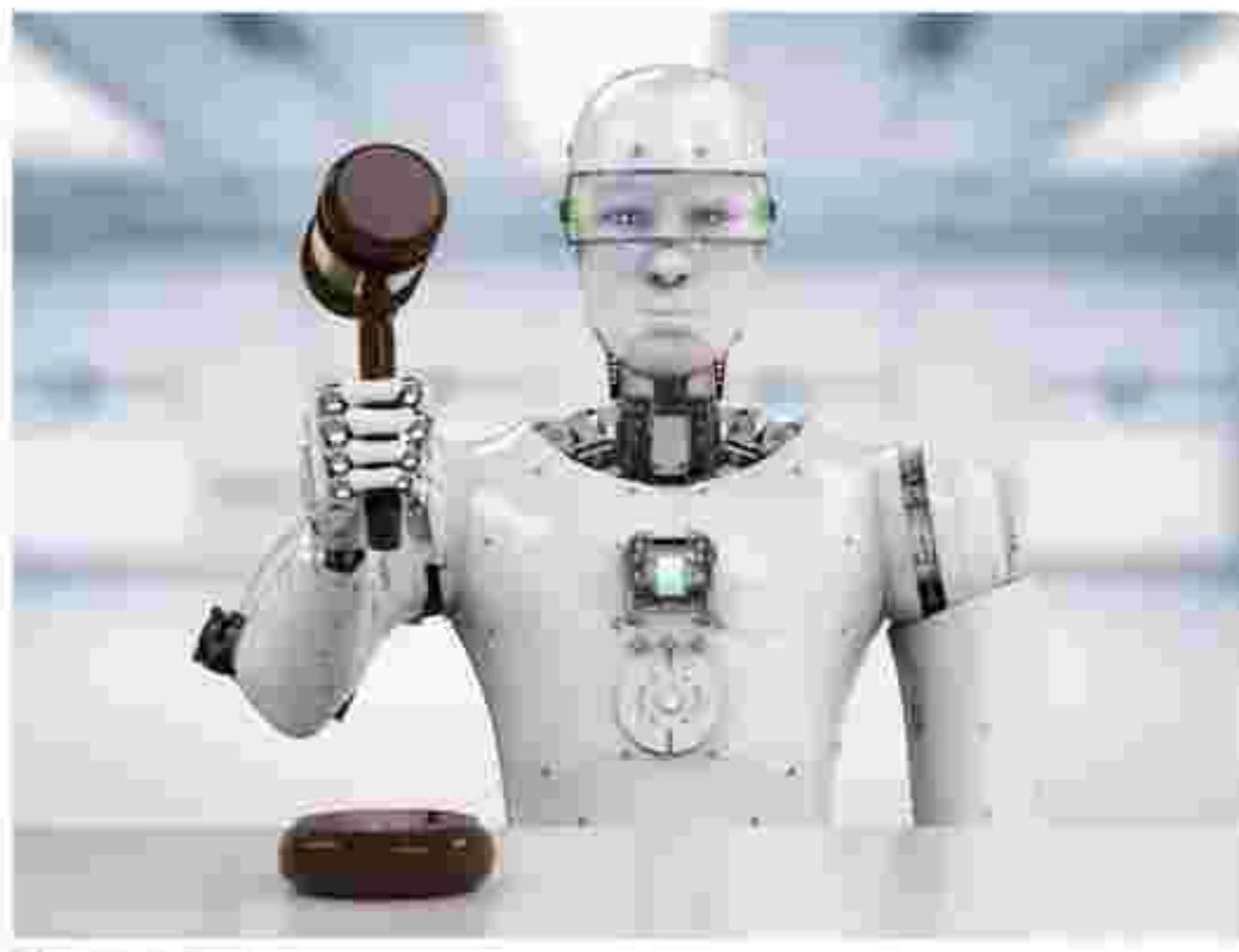
- Sécurité routière, temps gagné, etc.
- Perte d'emploi

Robotique

- Aide aux personnes peu autonomes
- Robot soldat

Why using AI to sentence criminals is a dangerous idea

By Matt Kadey



2016



WEAPONS OF
MATH DESTRUCTION



HOW BIG DATA INCREASES INEQUALITY
AND THREATENS DEMOCRACY

CATHY O'NEIL



Chômage Technologique

JOHN KAY INVENTOR OF THE FLY SHUTTLE AD 1753



John Kay inventor of the Fly Shuttle AD 1753, by Ford Madox Brown, depicting the inventor John Kay kissing his wife goodbye as men carry him away from his home to escape a mob angry about his labour-saving mechanical loom. Compensation effects were not widely understood at this time.

Génération

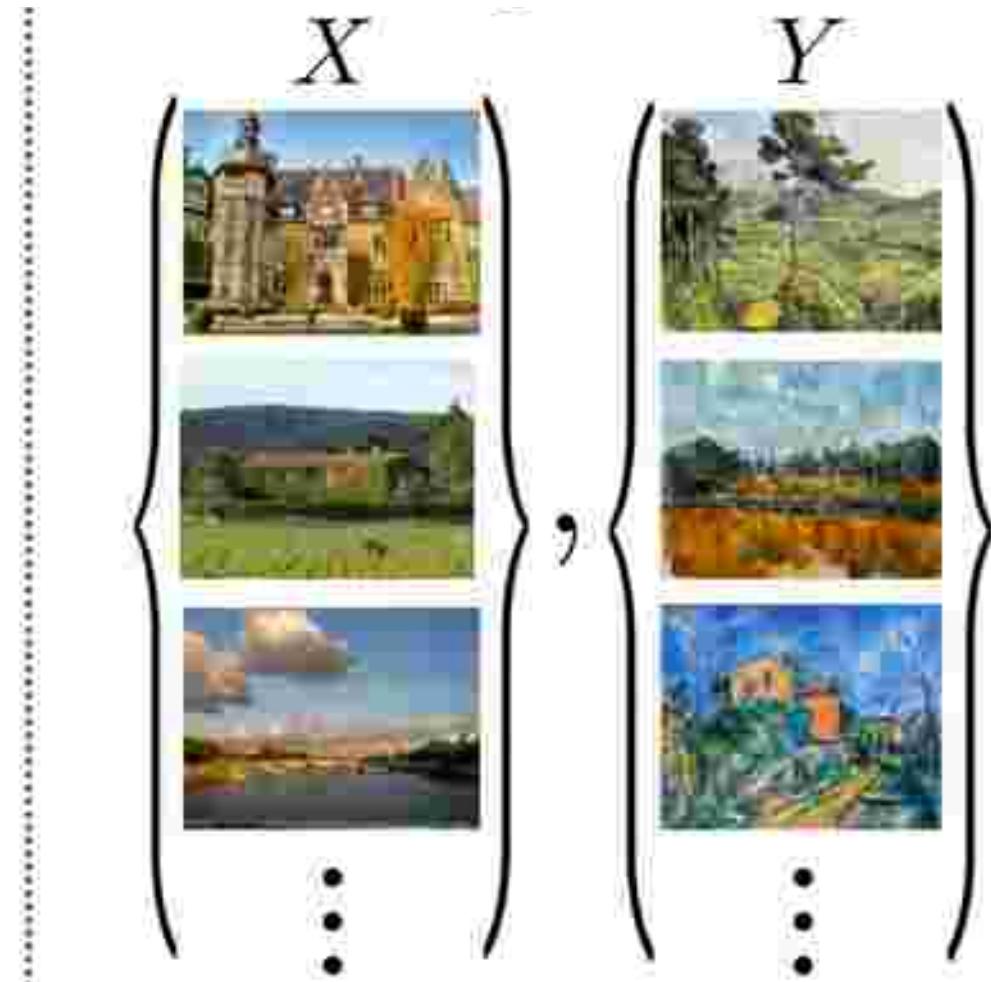
NVIDIA Celebrite GAN

2017





Cycle-GAN



Original



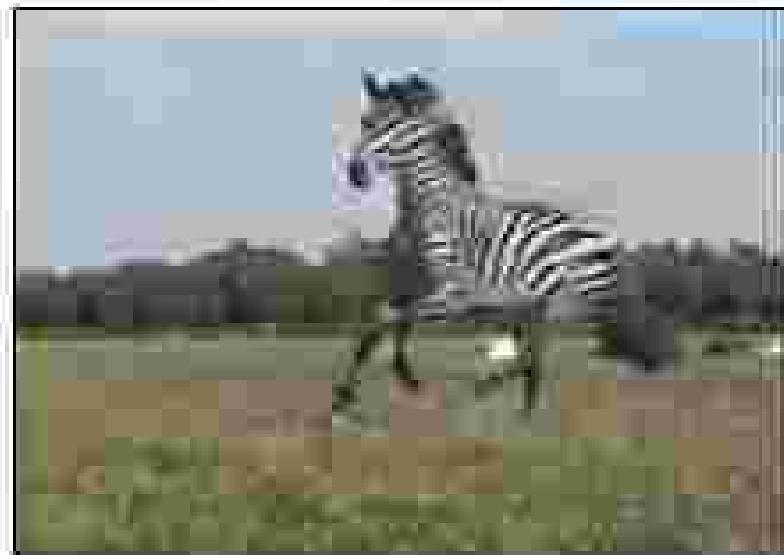
IA



Original



IA



Original



IA



Original



IA





Original



Nearest Neighbor

Super-resolution

8×8 input



32×32 samples



ground truth

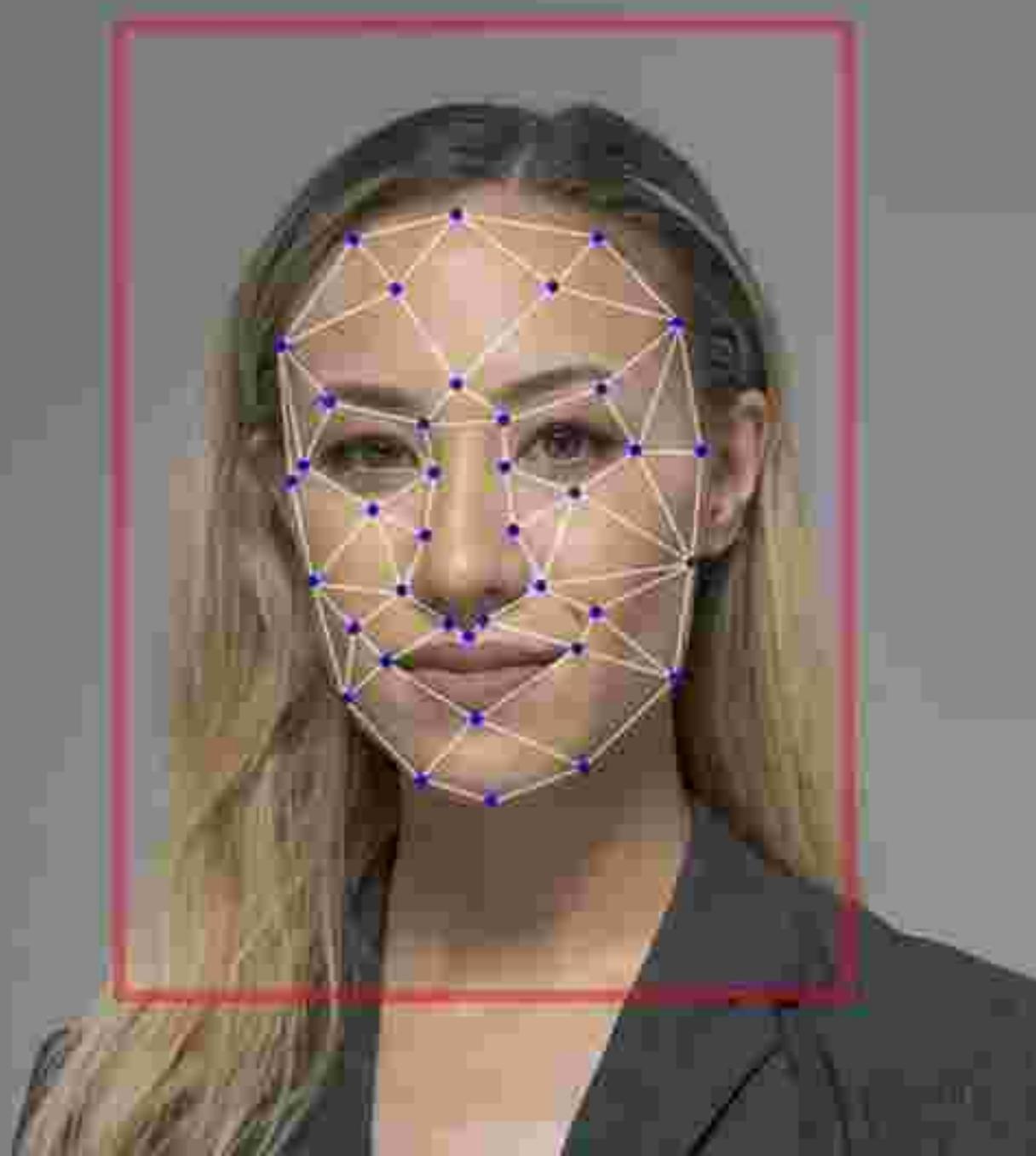


Barack Obama 2018

IA

Stable Multi-Target Tracking in Real-Time Surveillance Video (2011)





Two-Stream RNN/CNN for action recognition in 3D videos (2016)



label: drink water
predict: - -



All

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Images

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Tools

About 159,000 results (0.71 seconds)

5:13 a.m.

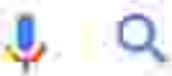
Thursday, April 12, 2018 (GMT+9)
Sunrise in Tokyo, Japan

[Lever et coucher du soleil : Google vous donne l'heure exacte ...](#)

www.astuceshebdo.com/.../lever-et-coucher-du-soleil-google-vous... ▾ [Translate this page](#)

Nov 4, 2017 - [Article mis à jour en novembre 2017] À quelle heure exactement se lève le soleil demain, et à quelle heure se couche-t-il ce soir, ici ou ailleurs ? Grâce à Google, plus besoin de consulter des tables, faire des calculs ou chercher longtemps l'information sur des sites qui affichent les éphémérides.

show me a picture of a cat eating a pizza



All

Images

Maps

Shopping

Videos

More

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Tools

About 55,600,000 results (1.10 seconds)

Images for a cat eating a pizza



→ More images for a cat eating a pizza

Report images



Translate

Turn off instant translation



Spanish French Haitian Creole Detect language



French English Spanish

Translate

Aprender español fue una de las decisiones más importantes de mi vida.

Apprendre l'espagnol a été l'une des décisions les plus importantes de ma vie.



About Google Translate

Community

Mobile

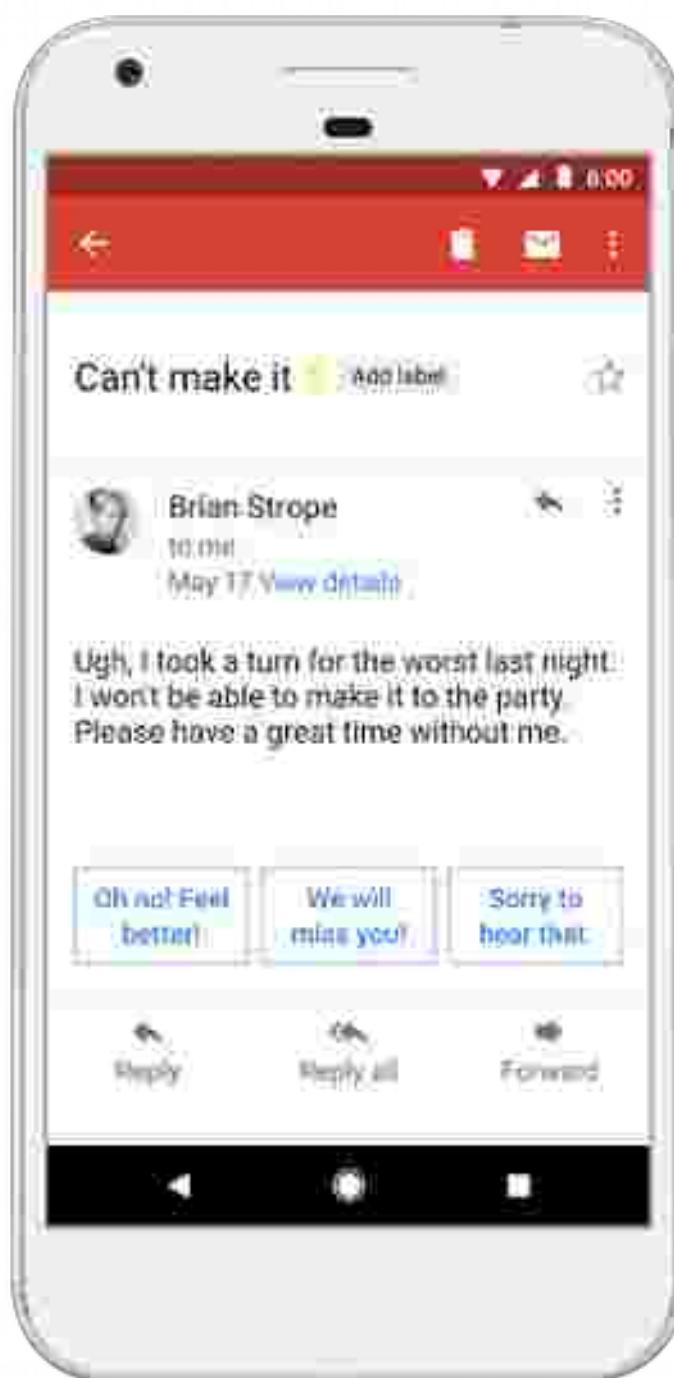
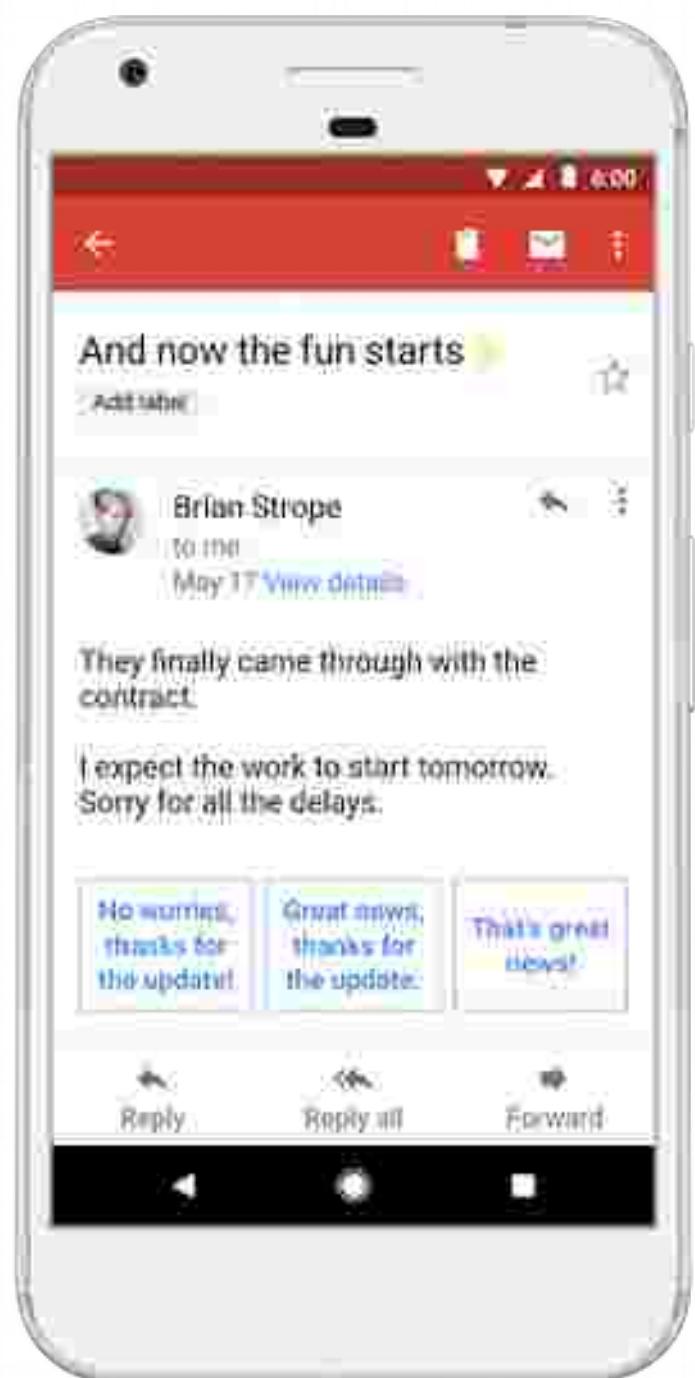


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Google Duplex Demo from Google IO 2018

Assistant personnel



Système de recommandation

NETFLIX Watch Instantly • Just for Kids • Taste Profile • DVDs

Movies, TV shows, scars, directors, genres

TV Shows

Based on your interests:

SHERLOCK

how I met your mother

New Girl

FOLLOWING

The Office

Because you watched DreamWorks Spooky Stories: Volume 2

DreamWorks Spooky Stories: Volume 2

Madagascar

Home on the MOON

ParaNorman

CN COURAGE THE COWARDLY DOG

Vendeur virtuel



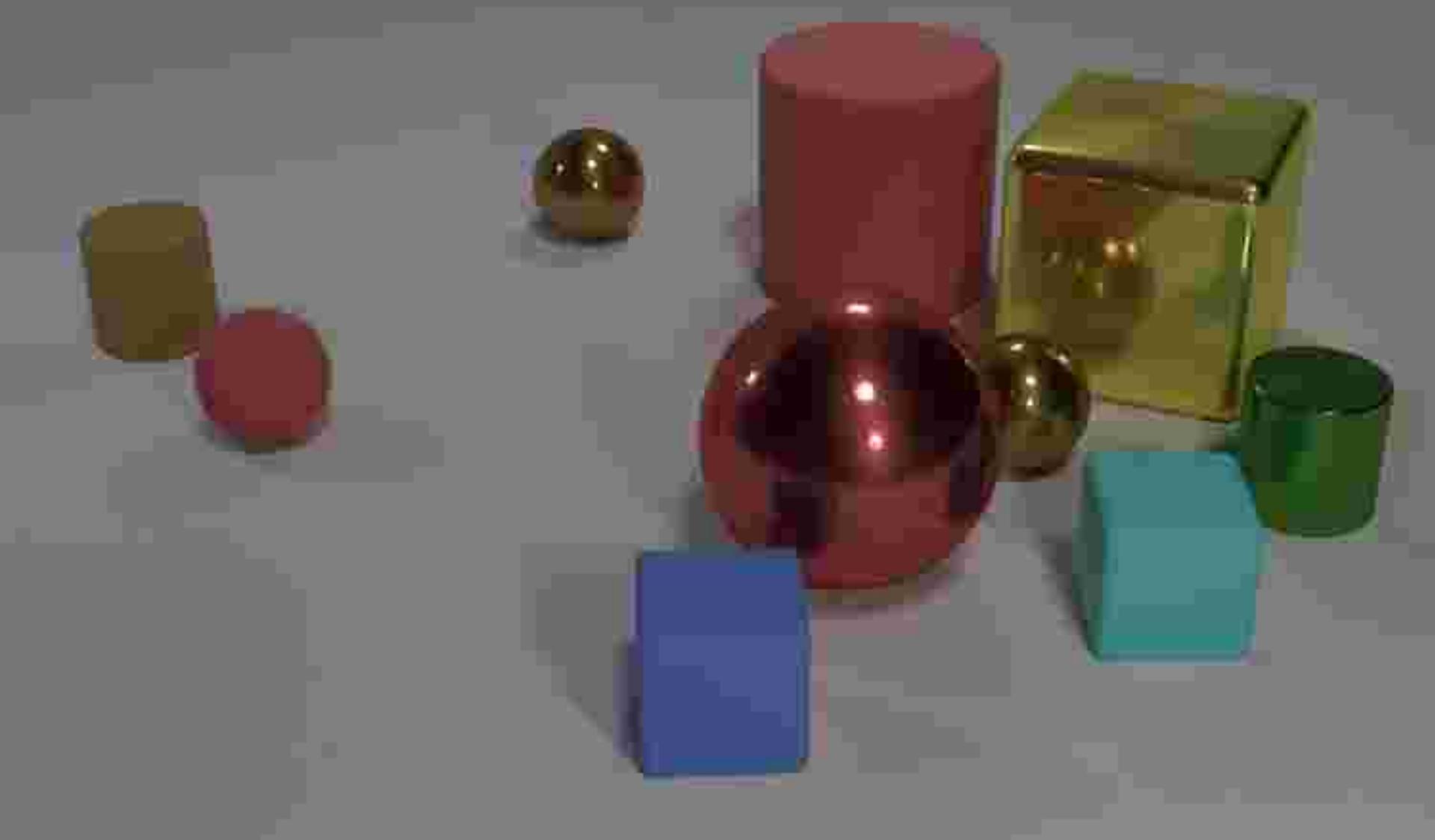
Demonstration of Watson Cancer Care Solution



IBM Watson Oncology Advisor

IBM Confidential: References to potential future products are subject to the Important Disclaimer provided earlier in this presentation

Décembre 2016: CLEVR Visual Q&A





**Proposé en
décembre
2016
Supra-
humain
juin 2017**

Q: Are there an equal number of large things and metal spheres?

Q: What size is the cylinder that is left of the brown metal thing that is left of the big sphere?

Q: There is a sphere with the same size as the metal cube; is it made of the same material as the small red sphere?

Q: How many objects are either small cylinders or red things?