November 15th, 2018

Facebook AI Research

Armand Joulin, FAIR Paris

facebook
Artificial Intelligence Research

Facebook AI Research

- fundamental, open and collaborative research
- **160+ people:** 80/60/20 scientists/engineers/students

facebook
Artificial Intelligence Research

Our mission

advancing the state-of-the-art in artificial intelligence through open research for the benefit of all

facebook.ai / developers

VISION

Detectron | DensePose | DeepMask | House3D | ResNetXt 3D | WSL

LANGUAGE

FastText | VoiceLoop | ParlAI | Wav2letter | Translate | MUSE

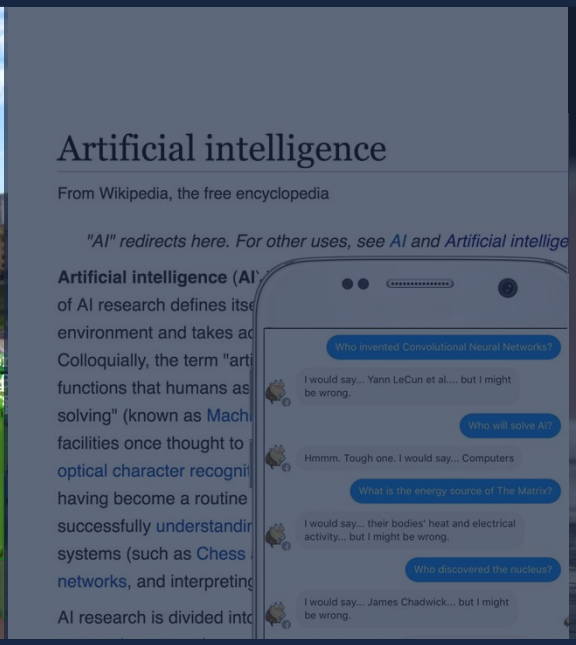
REASONING

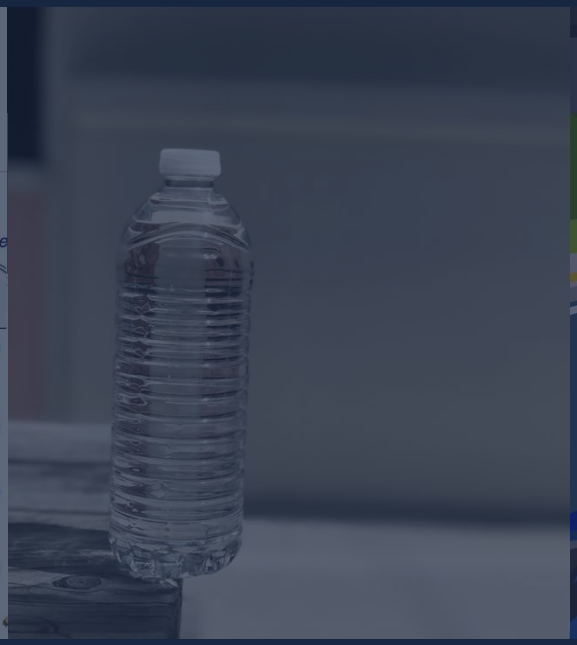
DrQA | ELF Reinforcement Learning | bAbi | MemNets | StarCraft | CommNet

TOOLS

FAISS | Tensor Comprehensions | TorchMPI | Visdom | StarSpace | Glow

PERCEPTION UNDERSTANDING & LEARNING PREDICTION PLANNING



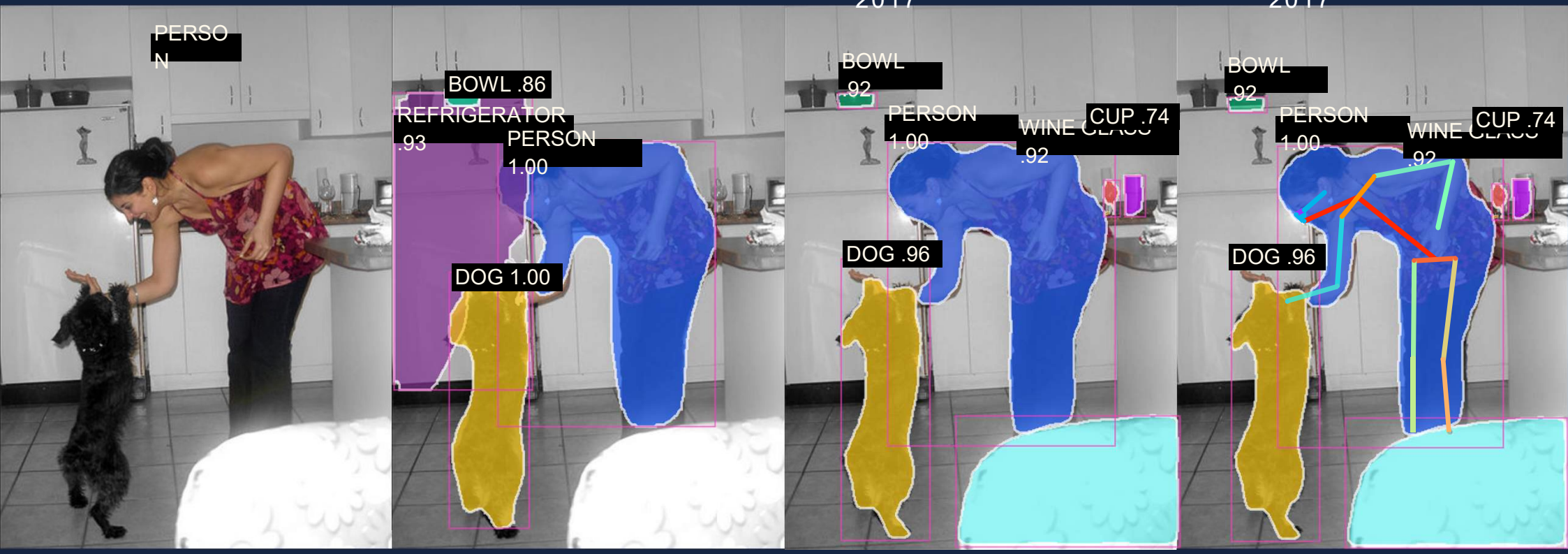


ALEXNET | 2012

MSRA_2015 | 2015

MASK R-CNN | 2017

MASK R-CNN| 2017



He et al. | 2017

DensePose

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Guler et al. | 2018

training set

Food

Tea

Dog

Landmark

test set

?

Tea

Dog

?

facebook
Artificial Intelligence Research

Joulin et al. | 2016

#instastyle
#pet
#lovepuppies
#mypet
#cat
#pets
#instacat
#iloveny
#adorable
#meow
#dogstagram
#puppy
#usa
#kittens
#newyorkcity
#catofinstagram
#doggo
#newyorkcityfeelings
#cutecat
#instapet
#instagood
#wander
#ilovenewyorkcity
#instadog
#mynyc
#sand
#cutedogs
#pup
#green
#puppyoftheday
#libertyisland
#pic
#Instapuppies
#catlover
#cutedog
#cateyes
#cutecats
#weeklyfluff
#doggylove
#lovedogs
#adventure
#puppy
#photographers
#adorable
#dogsofinstagram
#dogstagram
#wintertime
#watercolor
#animals
#cloudyday
#wander
#perfect
#shotoftheday
#awesome
#sketch
#nyc
#catlove
#dogstagram
#ilovenyc
#white
#city
#cloud
#jade
#lovedogs
#newyork
#beautiful
#bracelet
#hound
#lovepuppies
#birds
#dog
#selfie
#followme
#snow
#us
#pretty
#doglover
#ny
#america
#travel
#instakitty
#tbt
#puppylove
#manhattan
#food
#cute
#nice
#winter
#lifestyle
#doglovers
#dogs
#instapuppy
#photo
#tree
#picture
#peace
#photograph
#puppylover
#forests
#sky
#love
#doggy
#catoftheday
#instadogbreeds
#trees

before

Food

Food

Landmark

???

after

Cupcake

Apple Pie

Statue of Liberty

Taj Mahal

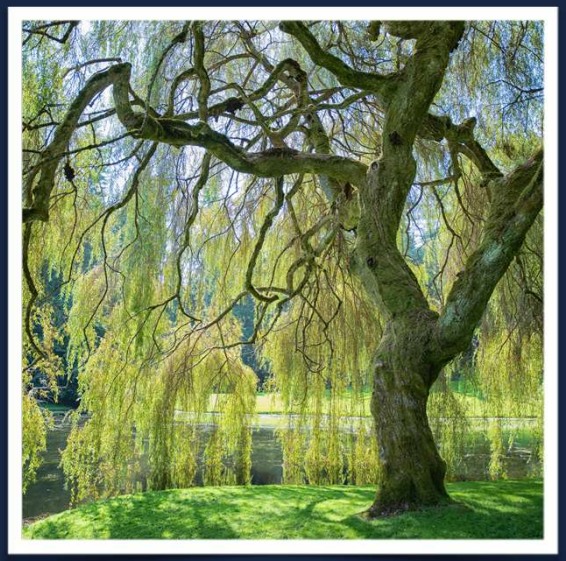
Flower

Bird of Paradise
Strelitzia

Bird

Eastern Meadowlark
Snow

Tree



Willow Tree
Salicaceae

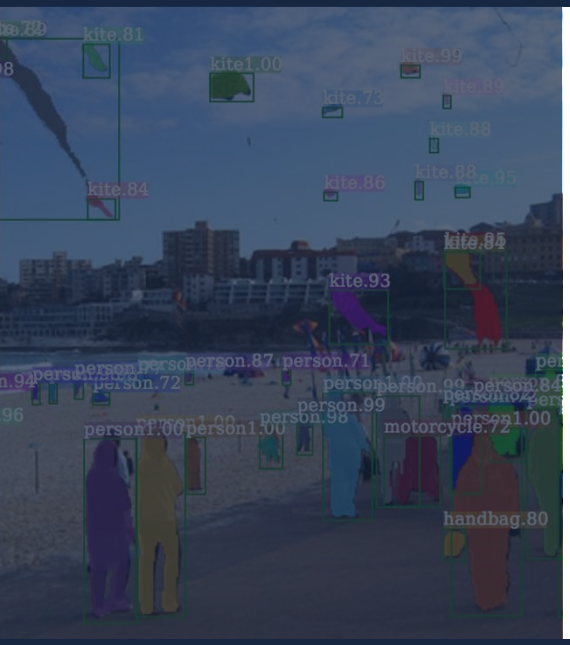
Applications: Augmented and Virtual reality

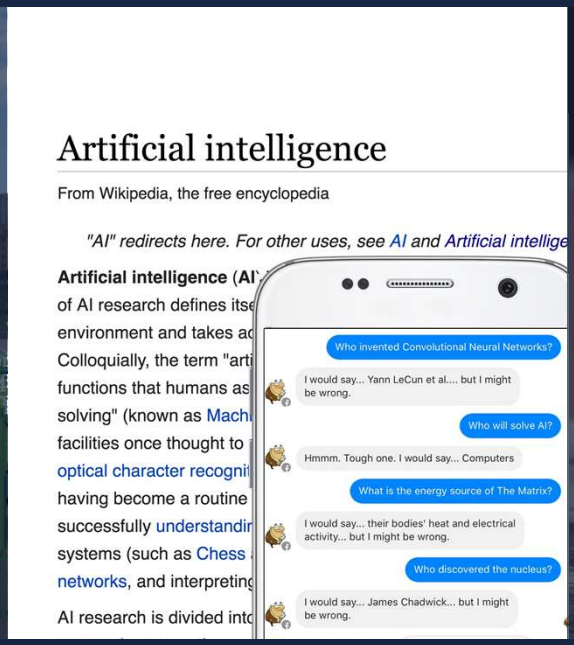
Facebook Reality labs & AI teams

Plant

IT'S
FEEDING
TIME!
Aa

PERCEPTION UNDERSTANDING & LEARNING PREDICTION PLANNING





Artificial intelligence

From Wikipedia, the free encyclopedia

"AI" redirects here. For other uses, see AI and Artificial intellige

Artificial intelligence (AI
of AI research defines itse
environment and takes ac
Colloquially, the term "arti
functions that humans as
solving" (known as Machi
facilities once thought to
optical character recogni
having become a routine
successfully understandi
systems (such as Chess
networks, and interpretin

AI research is divided into

Who invented Convolutional Neural Networks?

I would say... Yann LeCun et al.... but I might be wrong.

Who will solve AI?

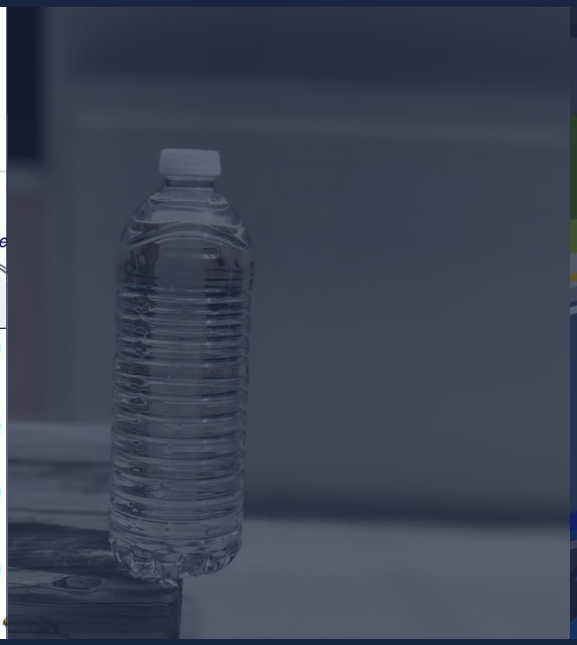
Hmmm. Tough one. I would say... Computers

What is the energy source of The Matrix?

I would say... their bodies' heat and electrical activity... but I might be wrong.

Who discovered the nucleus?

I would say... James Chadwick... but I might be wrong.



Language translation

5.95B

translations a day

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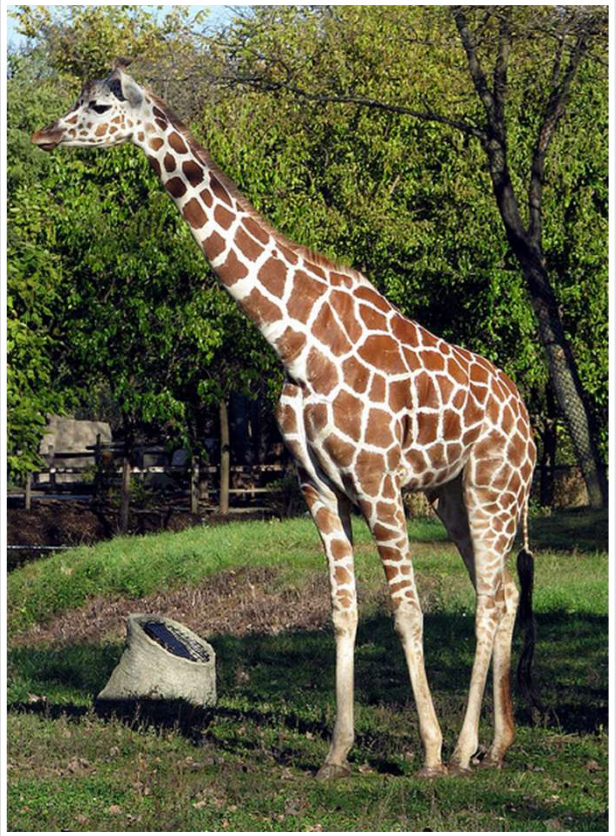
Image -> caption?

A man riding a wave on a surfboard in the water.



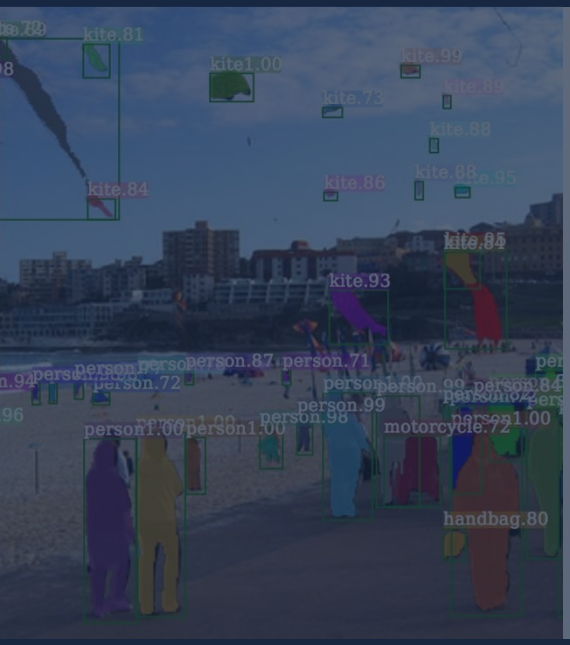
A giraffe standing on the grass next to a tree.

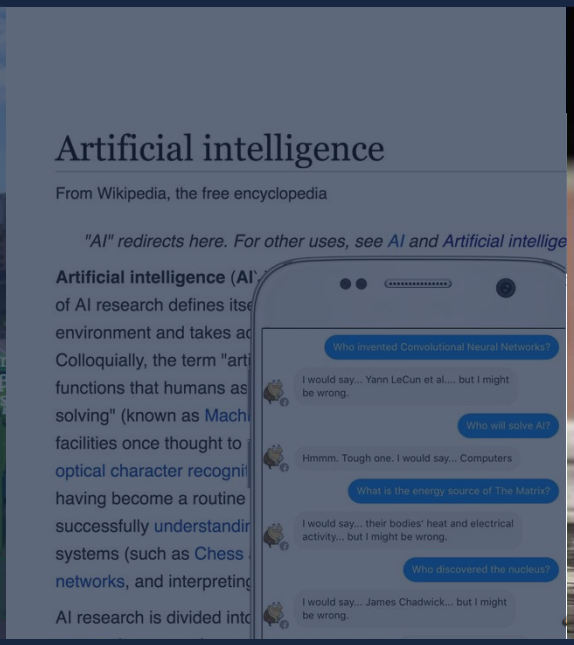
work in progress

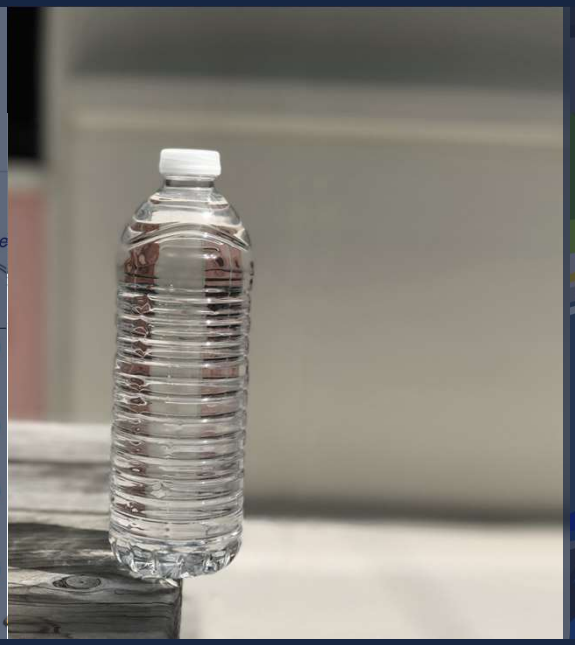
An airplane is parked on the tarmac at an airport.

A man riding a motorcycle on a beach.

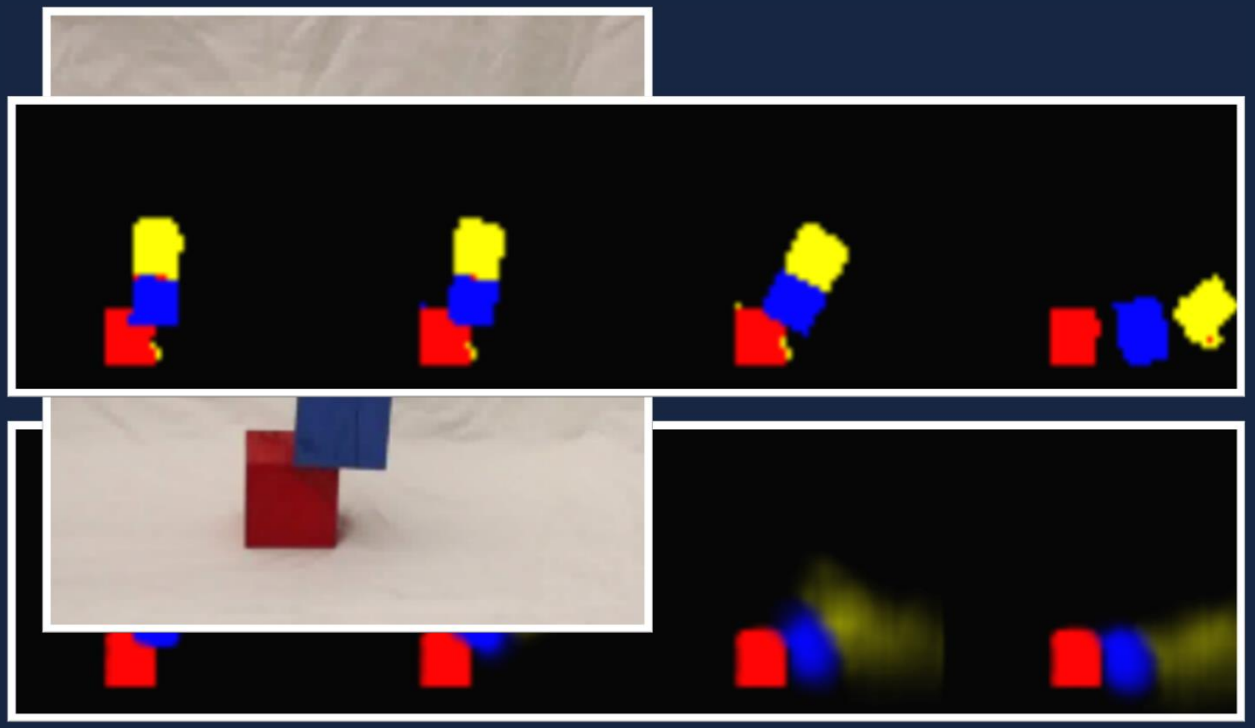
PERCEPTION UNDERSTANDING & LEARNING PREDICTION PLANNING







Learning intuitive physics



Lerer et al. | 2016

predictive learning

input

Barnes et al. | 2009

Darabi et al. | 2012

Huang et al. | 2014

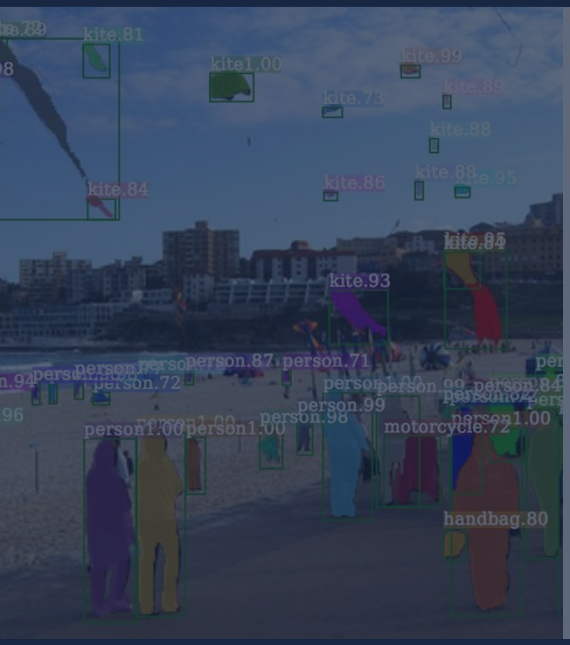
Pathak et al. | 2016

Iizuka et al. | 2017

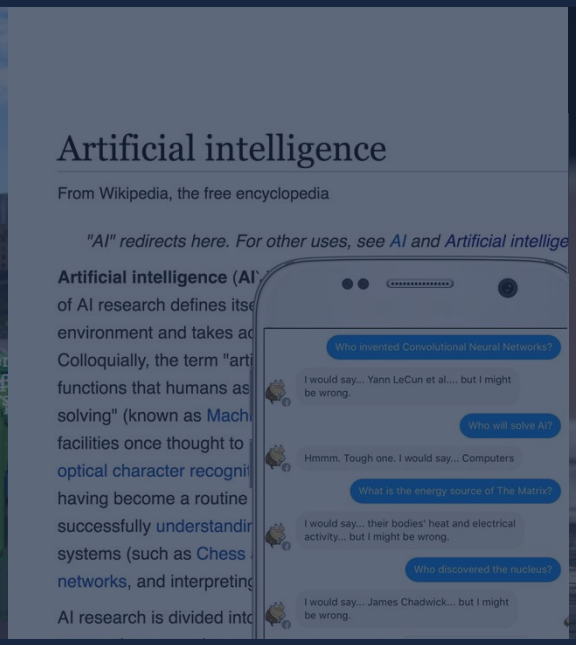
Learning to predict the future

Mathieu et al. | 2015

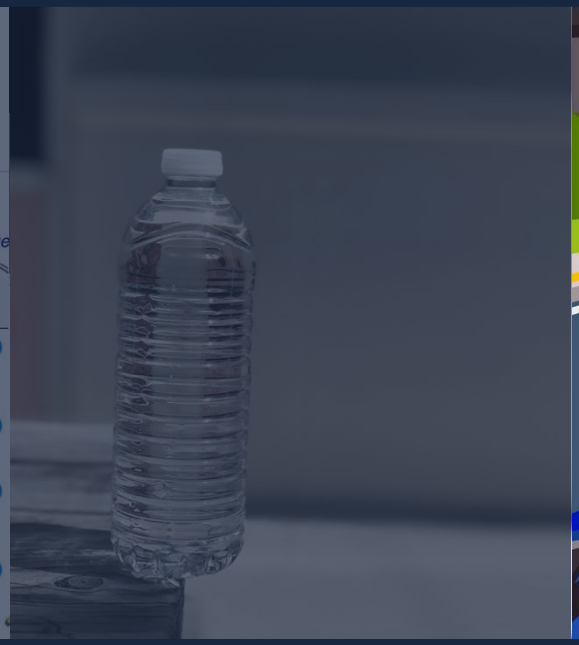
PERCEPTION



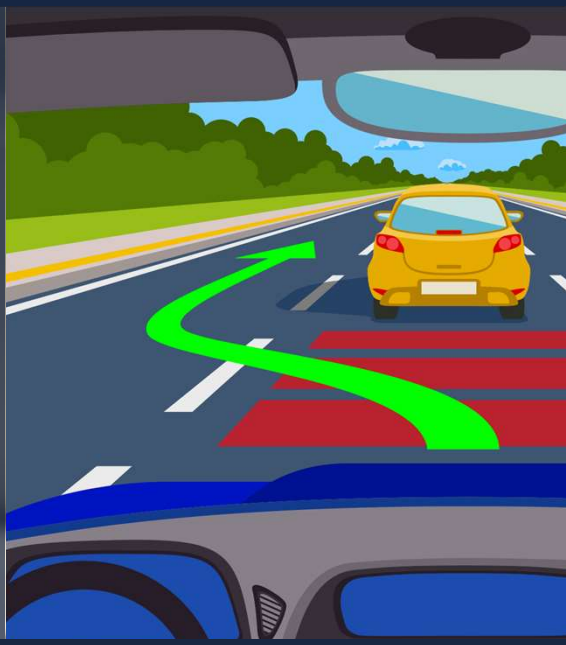
UNDERSTANDING & LEARNING



PREDICTION

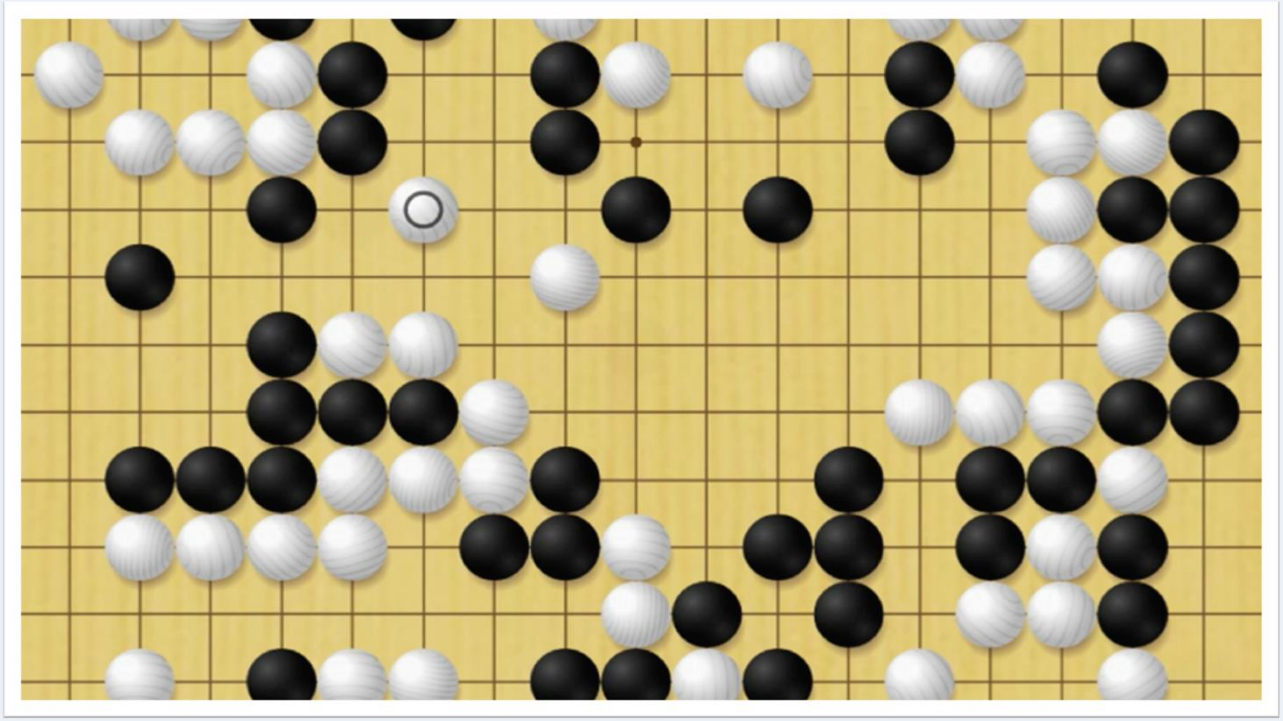


PLANNING



Game AI

ELF OpenGo:
open source platform



BEFORE TRAINING

AFTER TRAINING

StarCraft

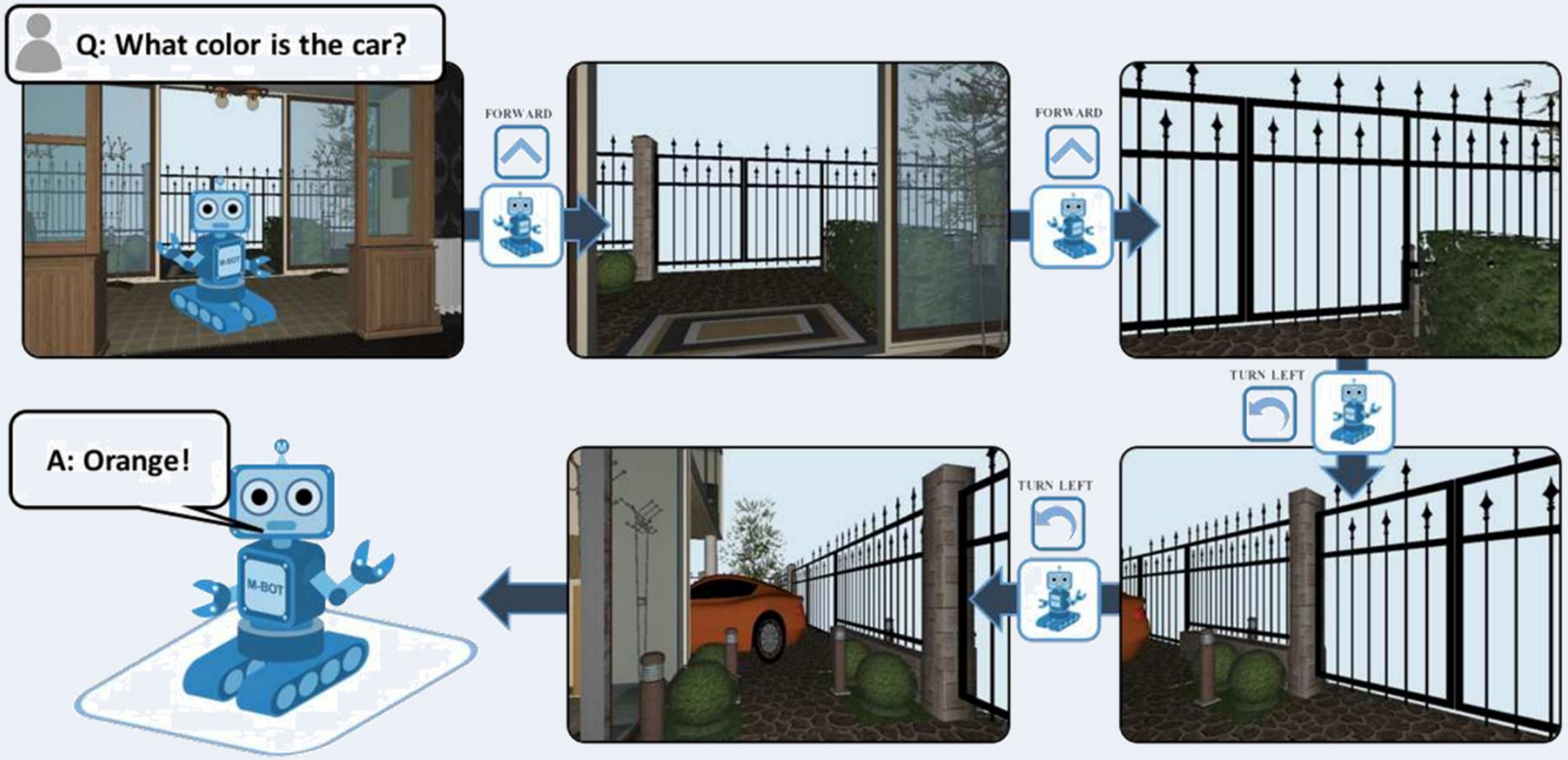
Towards human-like AI

Learning by interacting with the physical world

Embodied Agents

Learning by solving tasks in virtual environments

House 3D: virtual environment for embodied agents



Das et al. | 2018

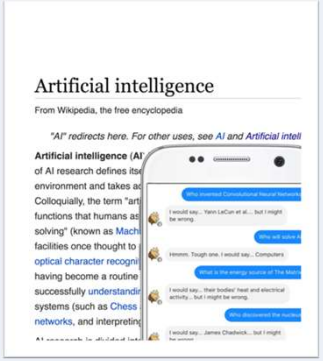
A path toward solving AI?

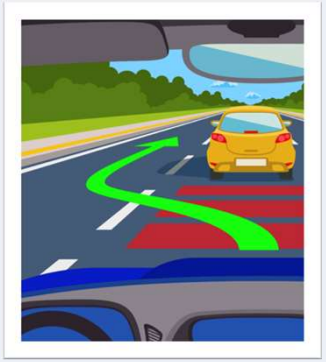
perception: strong performance on core tasks (cornerstone of AI models)

reasoning: bringing reasoning capabilities to machines

prediction: progressing on predictive / unsupervised learning

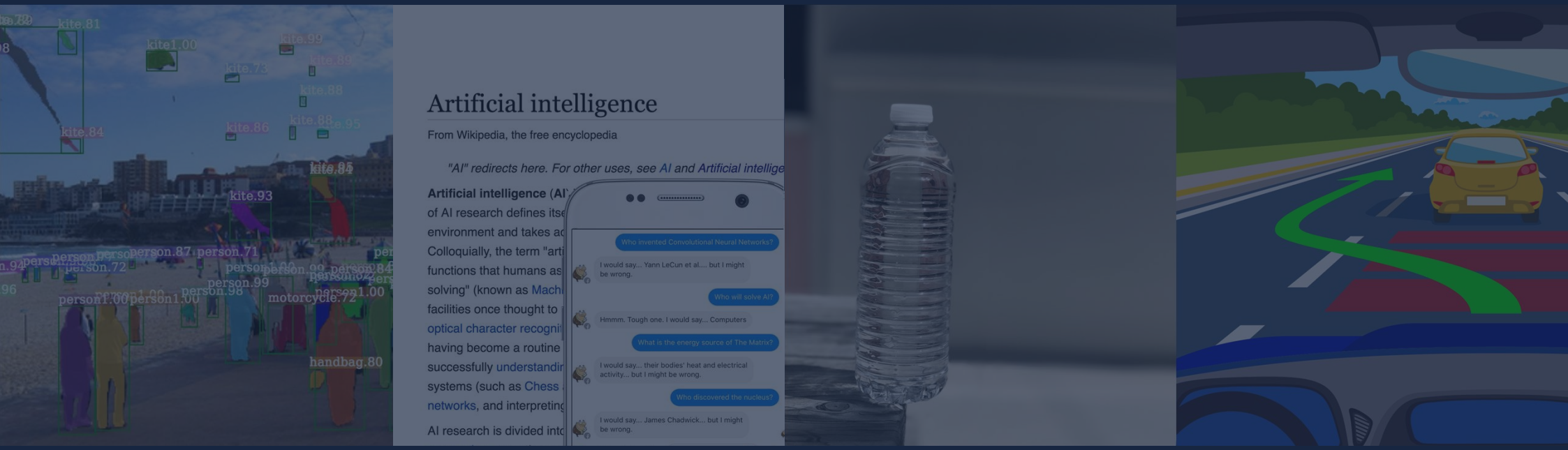
planning: investigating how machines could define strategies





Learning to generate new concepts (*Creative* AI)

Sbai et al. | 2018



ARMAND JOULIN– FACEBOOK AI RESEARCH, 2018