DEEP LEARNING FOR BEGINNERS

Startup Thailand (May 20, 2018)

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Education:

University of California, Berkeley

B.A. Statistics

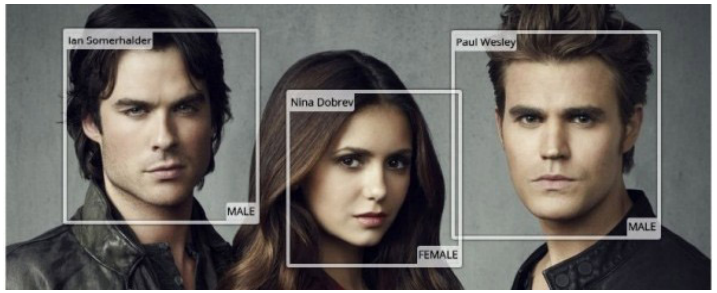
B.A. Economics

Minor Computer Science

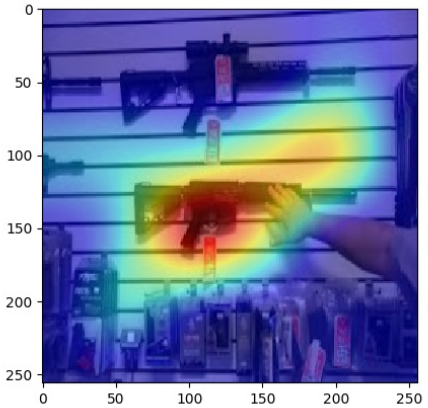
Work Experiences:

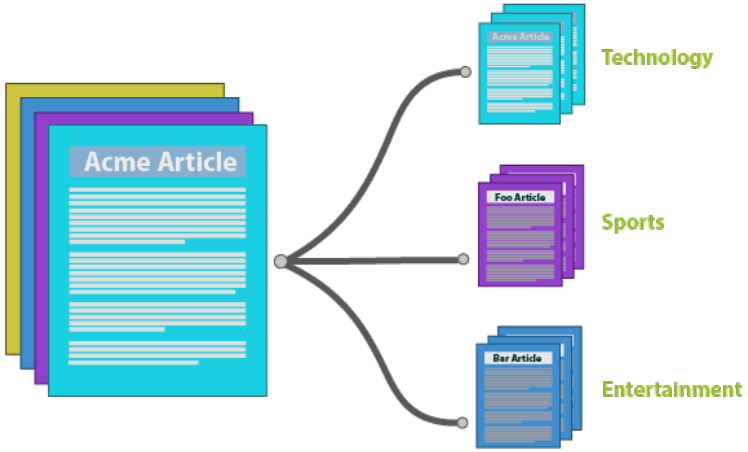
- Data Scientist at Krungsri Consumer
- Machine Learning Engineer at Data Wow Co., Ltd

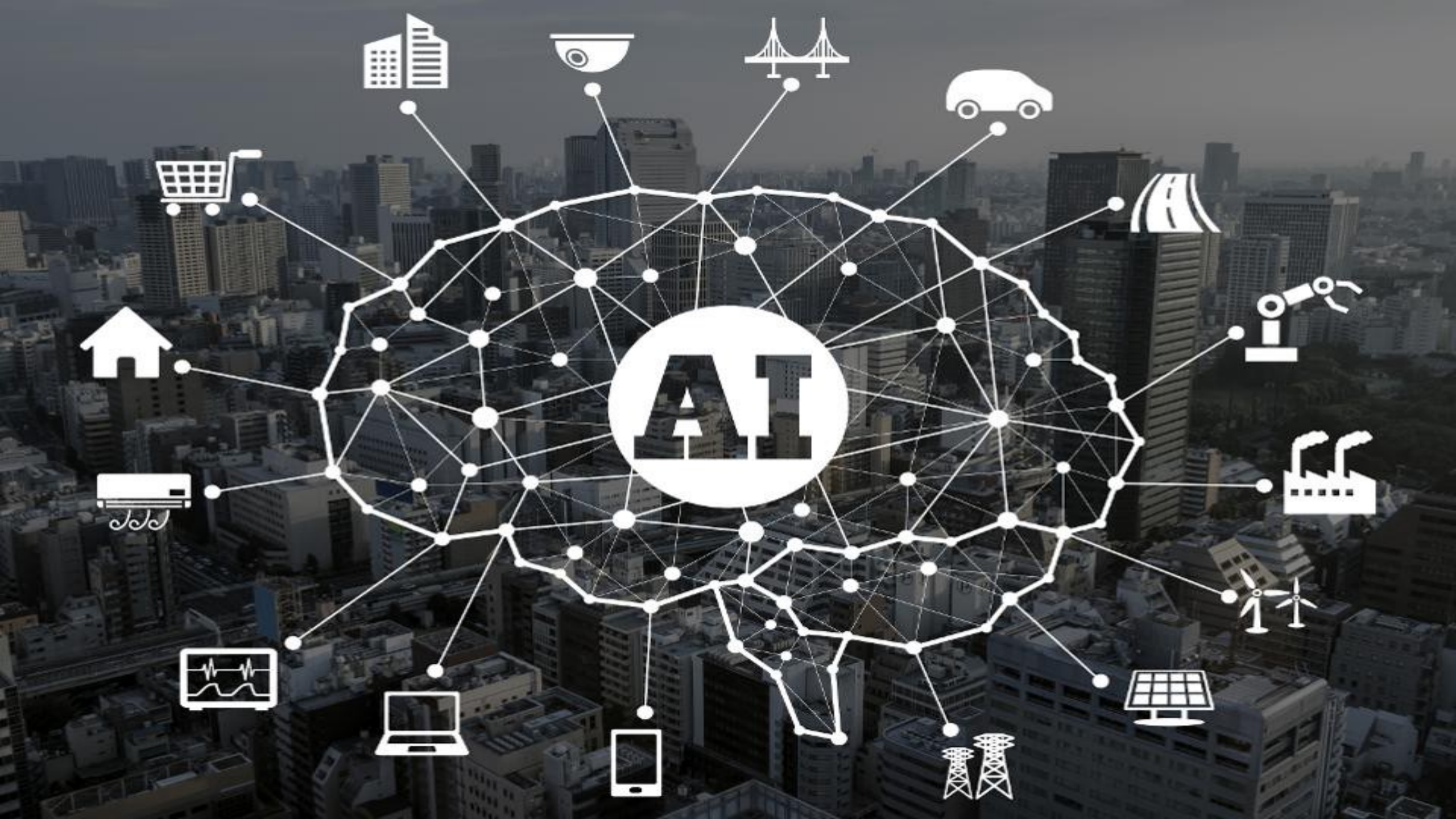
DEEP LEARNING PROJECTS



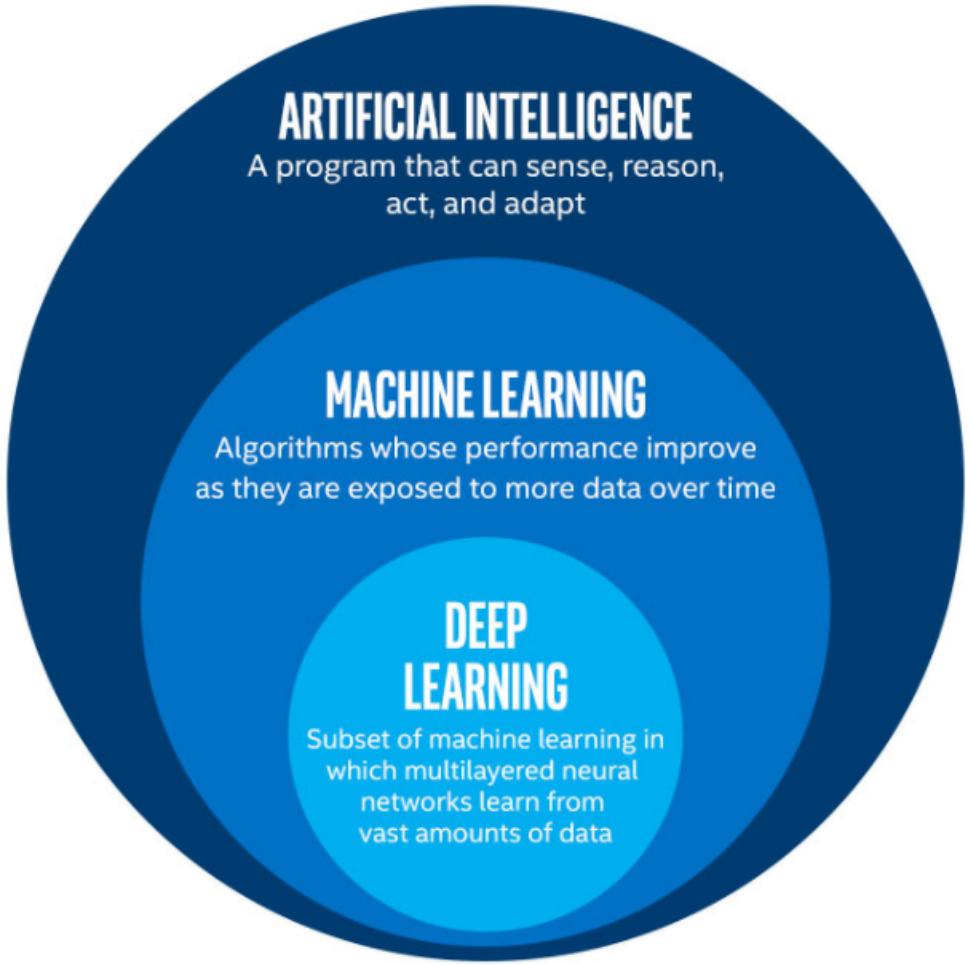
- Face detection + gender classification of each face
- Face recognition of celebrities
- Object detection
- Image classification for an online platform
  - Nude or not
  - Violent or not
  - Contains drugs/alcohol/smoke or not
  - Customizable specifications
- Text classification of English, Thai, and Japanese
- Text generation from a learned corpus






AI

AI VS. MACHINE LEARNING VS. DEEP LEARNING



AI:

- The ability for a computer to exhibit human intelligence in doing some tasks

Machine Learning:

- A set of algorithms that allow the computer to learn without being explicitly programmed

Deep Learning:

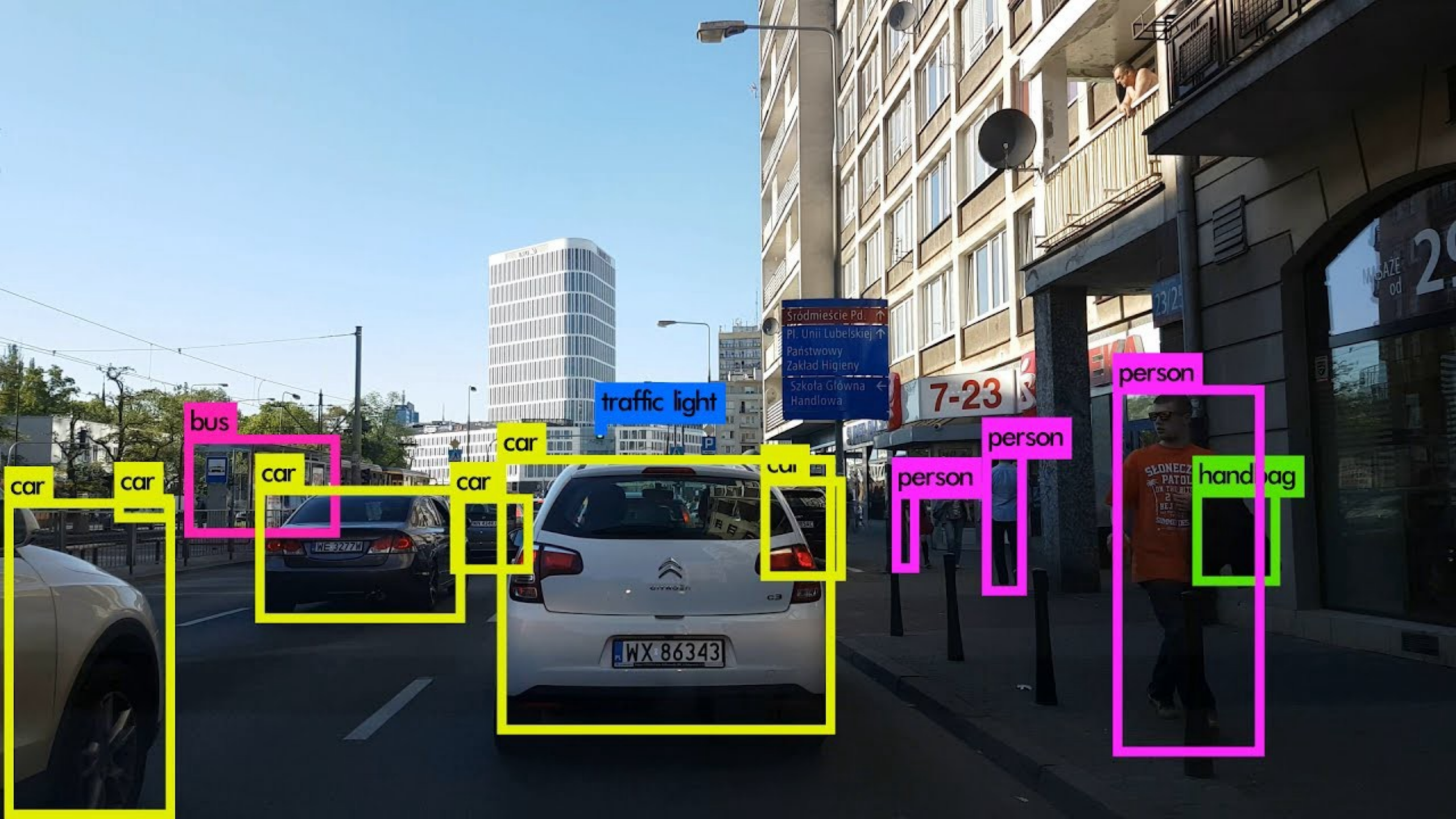
- Simply said, the world of neural networks
- A set of algorithms that allow computers to learn complex relationships and different levels of abstraction in data

WHAT HAVE DEEP LEARNING ACHIEVED?

- Speech recognition
- Text understanding (e.g. Man is to king, as woman is to queen)
- Optical character recognition (OCR)
- Question-answering bots
- Bots that can call someone for you (Google)
- Image classification
- Object detection in images
- Face recognition
- Image/video augmentation (e.g. Deep Fakes)
- Question-answering *from images*

ALPHAGO
00:00:48
LEE SEDOL
00:01:00
AlphaGo
Google DeepMind

K/D/A 0/0/0
LH/DN 2/0
(F) LAST HITS/DENIES
3/0
1/0
0
0:48
0
OpenAI
OpenAI (Bot)
COURIER
75/75
HEALING SALVE
Stack Count: 1
Use: Salve
Restores 400 health to the target unit over 8 seconds.
If the unit is attacked by an enemy hero or Roshan, the effect is lost.
Range: 250
Owned by: OpenAI (Bot)
Drag items to add to quick buy
63
132


car
car
bus
car
car
traffic light
car
car
person
person
person
handbag
Śródmieście Pd.
Pl. Unii Lubelskiej
Państwowy
Zakład Higieny
Szkoła Główna
Handlowa
7-23
WX 86343

Task 1: Single Supporting Fact

Mary went to the bathroom.
John moved to the hallway.
Mary travelled to the office.
Where is Mary? A:office

Task 2: Two Supporting Facts

John is in the playground.
John picked up the football.
Bob went to the kitchen.
Where is the football? A:playground

Task I: path finding

1.The office is east of the hallway.
2.The kitchen is north of the office.
3.The garden is west of the bedroom.
4.The office is west of the garden.
5.The bathroom is north of the garden.
How do you go from the kitchen to the garden? south, east, relies on 2 and 4
How do you go from the office to the bathroom? east, north, relies on 4 and 5

Task II: positional reasoning

1.The triangle is above the pink rectangle.
2.The blue square is to the left of the triangle.
Is the pink rectangle to the right of the blue square? Yes, relies on 1 and 2
Is the blue square below the pink rectangle? No, relies on 1 and 2

For $\bigoplus_{n=1,\ldots,m}$ where $\mathcal{L}_{m_\bullet} = 0$, hence we can find a closed subset $\mathcal{H}$ in $\mathcal{H}$ and any sets $\mathcal{F}$ on X, U is a closed immersion of S, then $U \to T$ is a separated algebraic space.

Proof. Proof of (1). It also start we get

$$S = \mathrm{Spec}(R) = U \times_X U \times_X U$$

and the comparicoly in the fibre product covering we have to prove the lemma generated by $\coprod Z \times_U U \to V$. Consider the maps M along the set of points Sch_{fppf} and $U \to U$ is the fibre category of S in U in Section, **??** and the fact that any U affine, see Morphisms, Lemma **??**. Hence we obtain a scheme S and any open subset $W \subset U$ in $Sh(G)$ such that $\mathrm{Spec}(R') \to S$ is smooth or an

$$U = \bigcup U_i \times_{S_i} U_i$$

which has a nonzero morphism we may assume that f_i is of finite presentation over S. We claim that $\mathcal{O}_{X,x}$ is a scheme where $x, x', s'' \in S'$ such that $\mathcal{O}_{X,x'} \to \mathcal{O}'_{X',x'}$ is separated. By Algebra, Lemma **??** we can define a map of complexes $\mathrm{GL}_{S'}(x'/S'')$ and we win. $\square$

To prove study we see that $\mathcal{F}|_U$ is a covering of $\mathcal{X}'$, and $\mathcal{T}_i$ is an object of $\mathcal{F}_{X/S}$ for $i > 0$ and $\mathcal{F}_p$ exists and let $\mathcal{F}_i$ be a presheaf of $\mathcal{O}_X$-modules on $\mathcal{C}$ as a $\mathcal{F}$-module. In particular $\mathcal{F} = U/\mathcal{F}$ we have to show that

$$\widetilde{M}^\bullet = \mathcal{I}^\bullet \otimes_{\mathrm{Spec}(k)} \mathcal{O}_{S,s} - i_X^{-1}\mathcal{F})$$

is a unique morphism of algebraic stacks. Note that

$$\mathrm{Arrows} = (Sch/S)^{opp}_{fppf}, (Sch/S)_{fppf}$$

and

$$V = \Gamma(S, \mathcal{O}) \longmapsto (U, \mathrm{Spec}(A))$$

is an open subset of X. Thus U is affine. This is a continuous map of X is the inverse, the groupoid scheme S.

Proof. See discussion of sheaves of sets. $\square$

The result for prove any open covering follows from the less of Example **??**. It may replace S by $X_{spaces,\acute{e}tale}$ which gives an open subspace of X and T equal to S_{Zar}, see Descent, Lemma **??**. Namely, by Lemma **??** we see that R is geometrically regular over S.

Lemma 0.1. *Assume (3) and (3) by the construction in the description.*

Suppose $X = \lim |X|$ *(by the formal open covering* X *and a single map* $\underline{Proj}_X(\mathcal{A}) = \mathrm{Spec}(B)$ *over* U *compatible with the complex*

$$Set(\mathcal{A}) = \Gamma(X, \mathcal{O}_{X,\mathcal{O}_X}).$$

When in this case of to show that $\mathcal{Q} \to \mathcal{C}_{Z/X}$ *is stable under the following result in the second conditions of (1), and (3). This finishes the proof. By Definition* **??** *(without element is when the closed subschemes are catenary. If* T *is surjective we may assume that* T *is connected with residue fields of* S*. Moreover there exists a closed subspace* $Z \subset X$ *of* X *where* U *in* X' *is proper (some defining as a closed subset of the uniqueness it suffices to check the fact that the following theorem*

(1) f *is locally of finite type. Since* $S = \mathrm{Spec}(R)$ *and* $Y = \mathrm{Spec}(R)$.

CHAPTER THIRTEEN

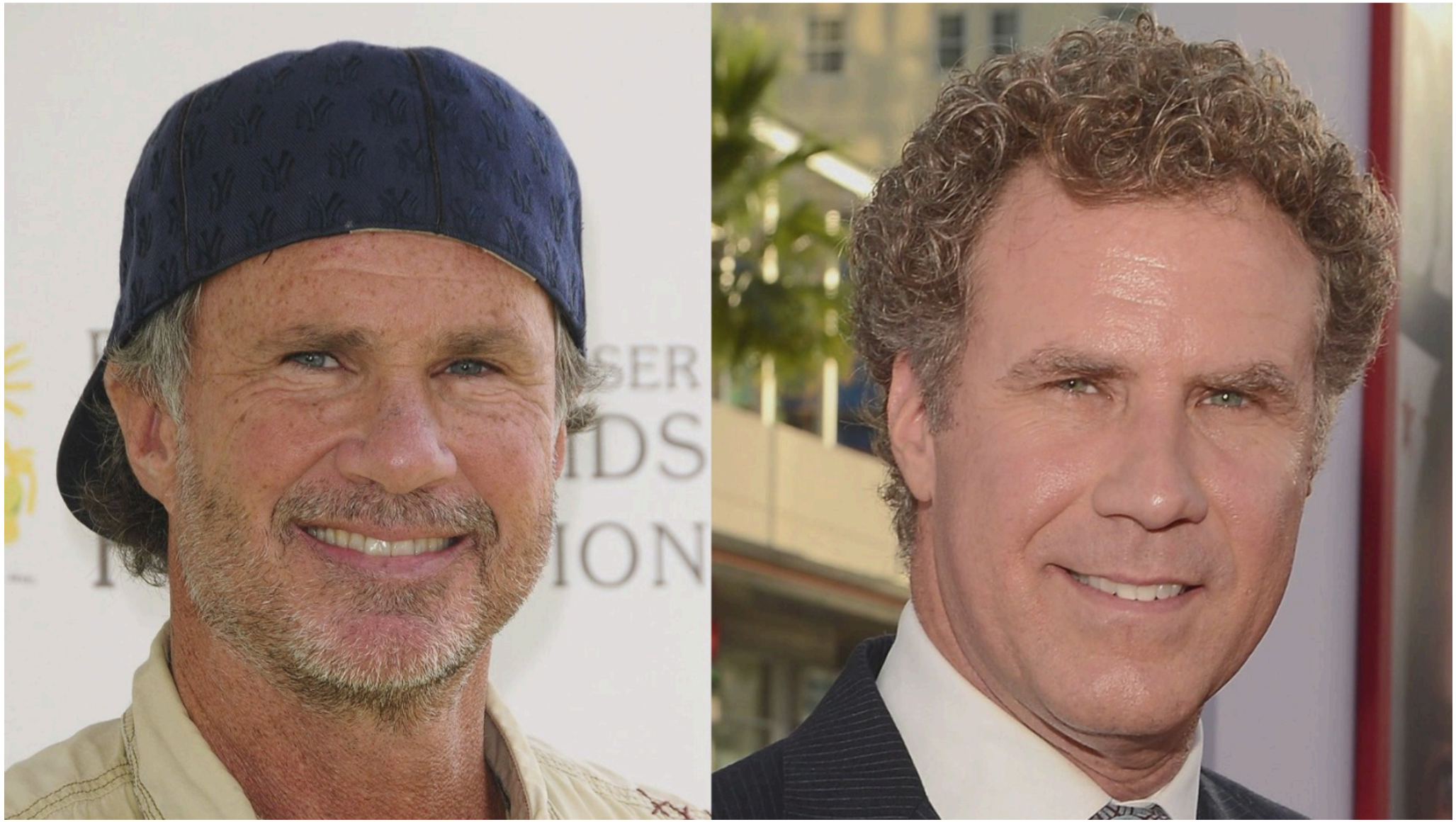
THE HANDSOME ONE

The castle grounds snarled with a wave of magically magnified wind. The sky outside was a great black ceiling, which was full of blood. The only sounds drifting from Hagrid's hut were the disdainful shrieks of his own furniture. Magic: it was something that Harry Potter thought was very good.

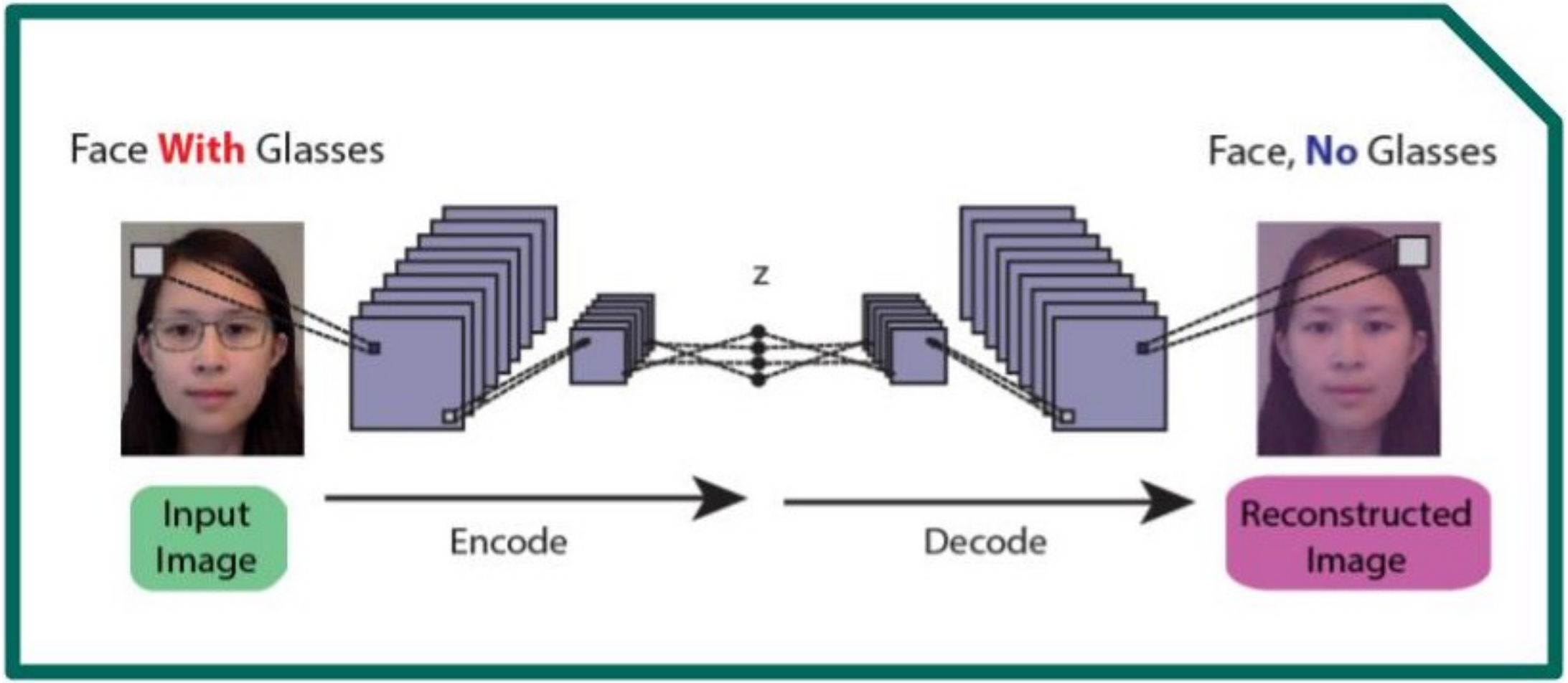
Leathery sheets of rain lashed at Harry's ghost as he walked across the grounds toward the castle. Ron was standing there and doing a kind of frenzied tap dance. He saw Harry and immediately began to eat Hermione's family.

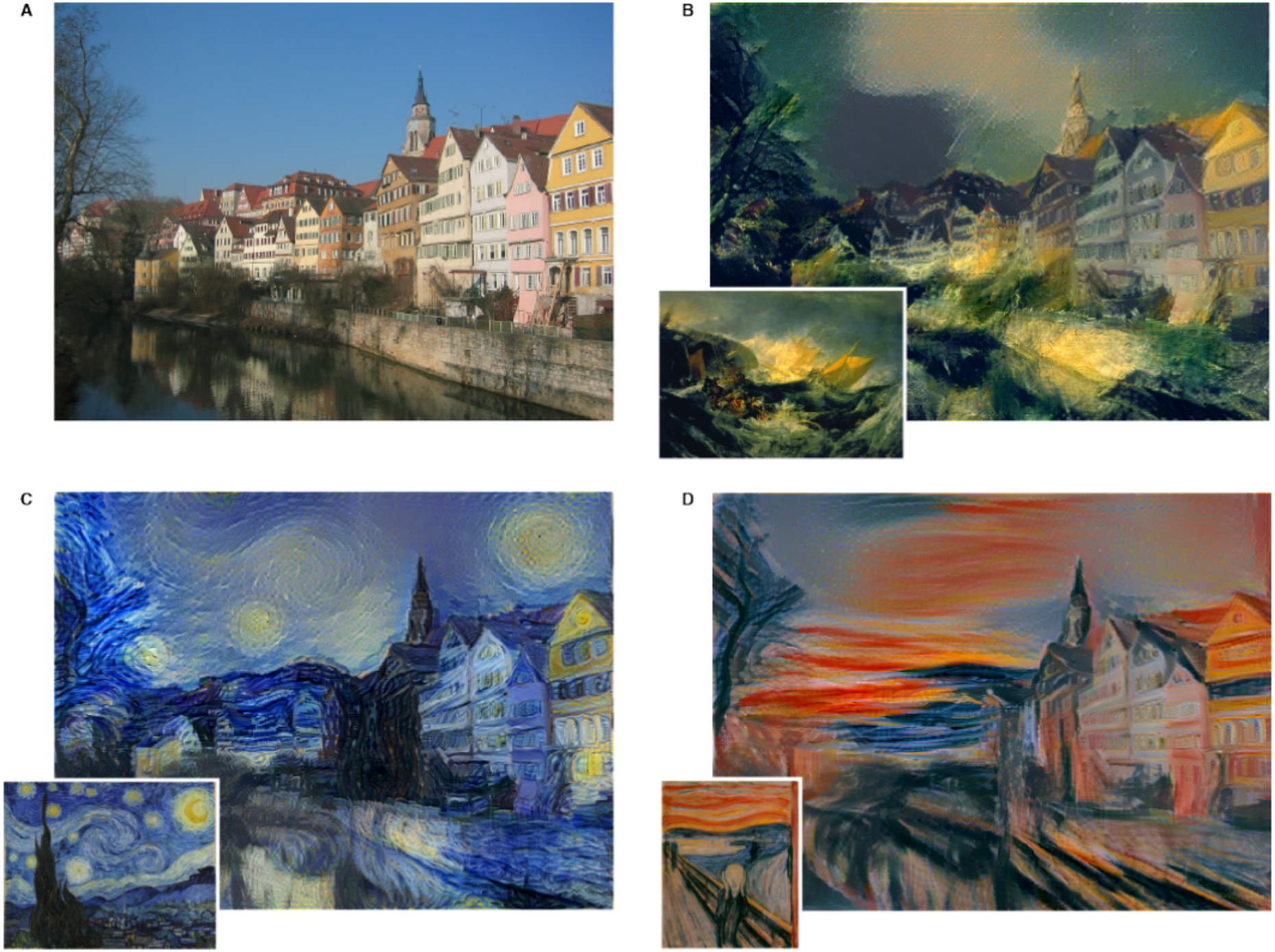
Ron's Ron shirt was just as bad as Ron himself.

"If you two can't clump happily, I'm going to get aggressive," confessed the reasonable Hermione.

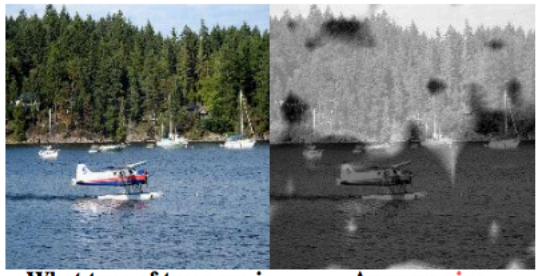

SER
IDS
ION

Will Ferrell (93%)
Chad Smith (56%)
Jimmy Fallon (83%)

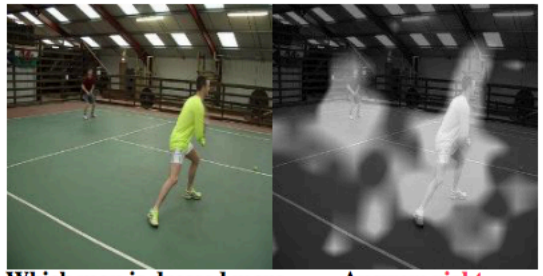

Face With Glasses
Face, No Glasses
z
Input Image
Encode
Decode
Reconstructed Image


A
B
C
D

What is the main color on the bus ? Answer: blue



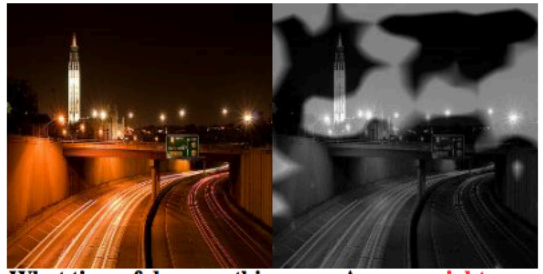
What type of trees are in the background ? Answer: pine



Which man is dressed more flamboyantly ? Answer: right

How many pink flags are there ? Answer: 2

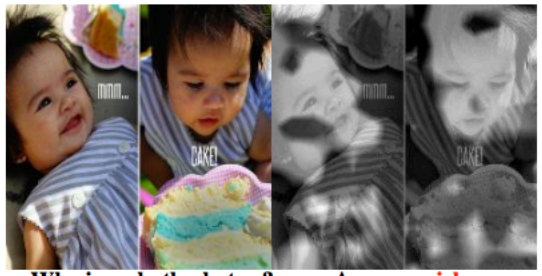
Is this in the wild ? Answer: no



What time of day was this picture taken ? Answer: night

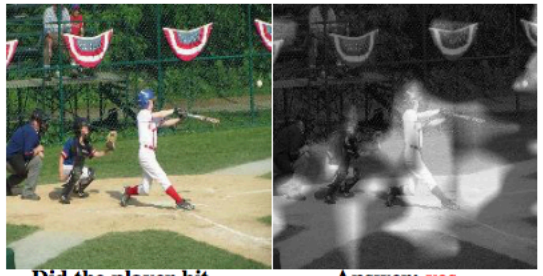
What is this sculpture made out of ? Answer: metal

What color are the bananas ? Answer: green



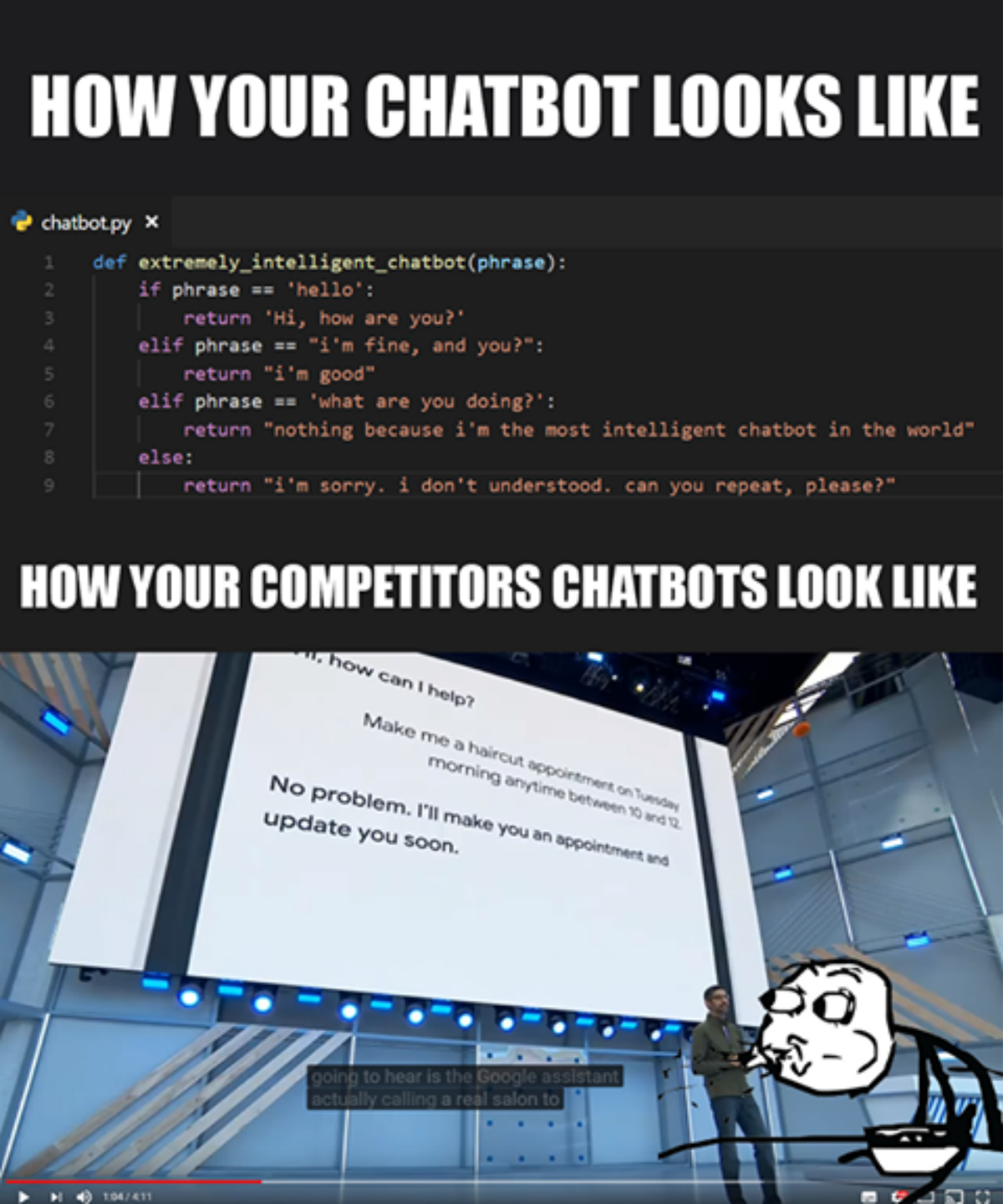
Who is on both photos ? Answer: girl

What is the pattern on the cat ' s fur on its tail ? Answer: stripes



Did the player hit the ball ? Answer: yes

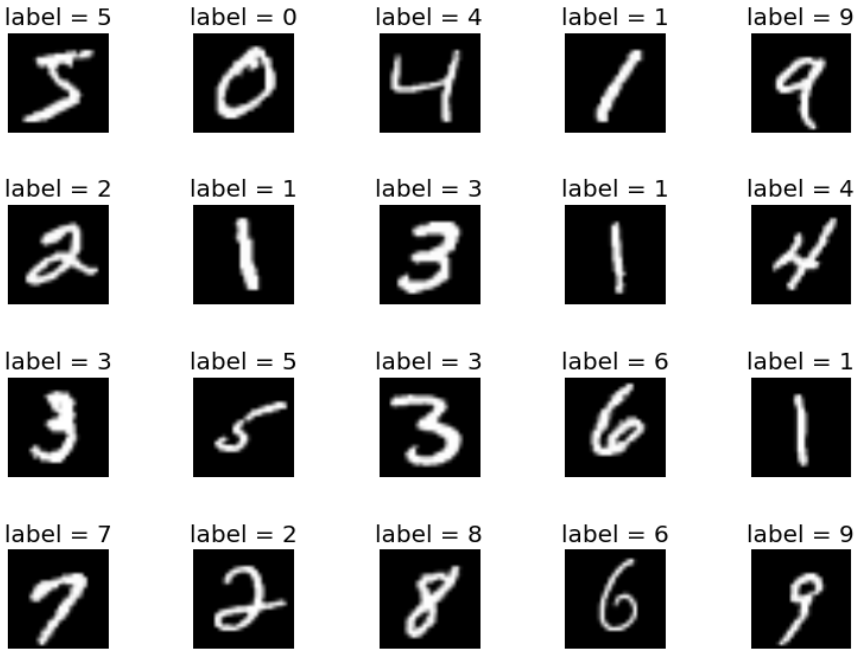
What is the boy holding ? Answer: surfboard



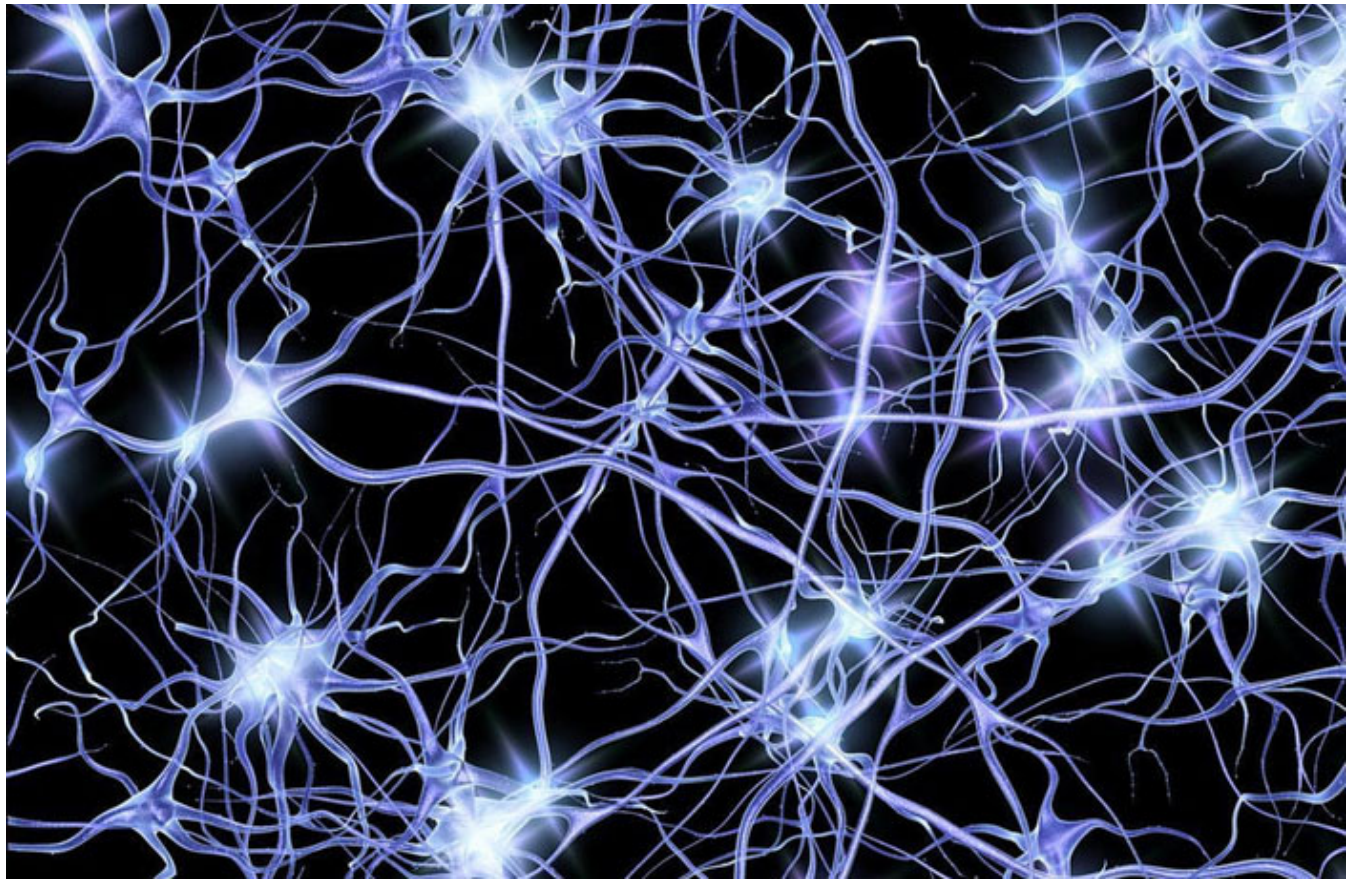
Snapshot:

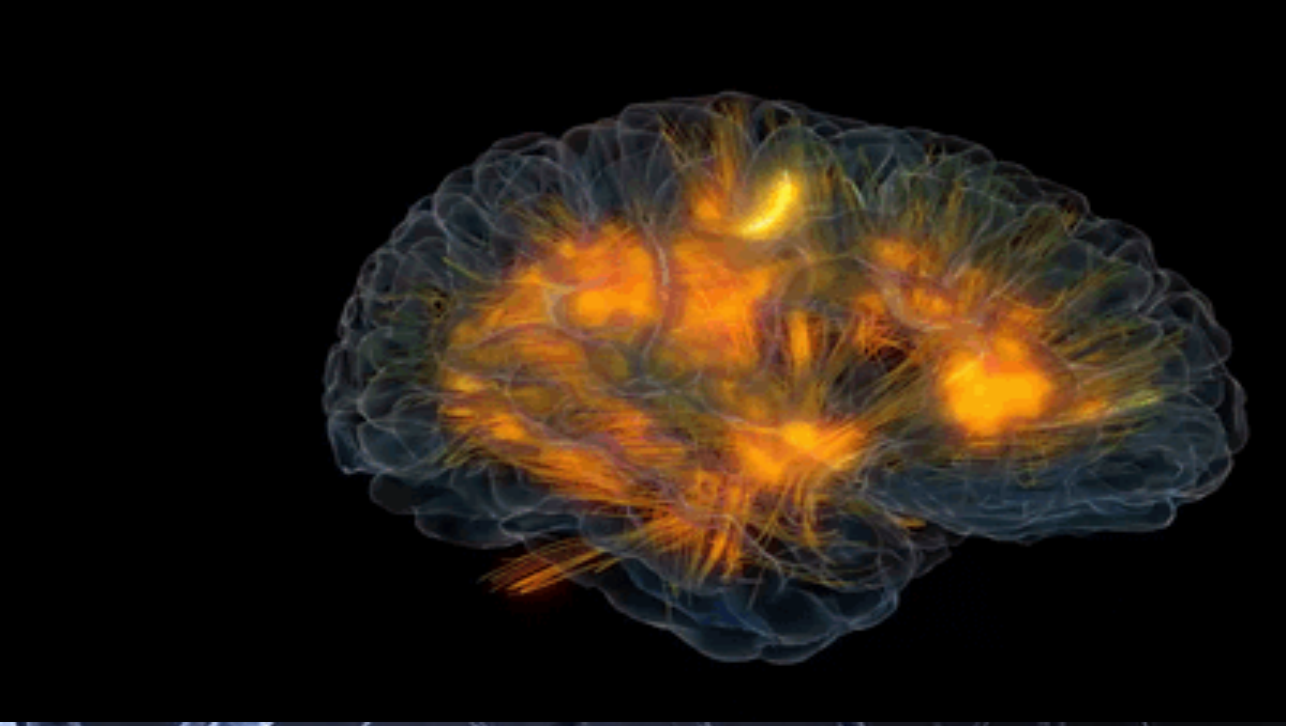
https://www.youtube.com/watch?v=D5VN56jQMWM

WHAT ARE WE GOING TO LEARN?

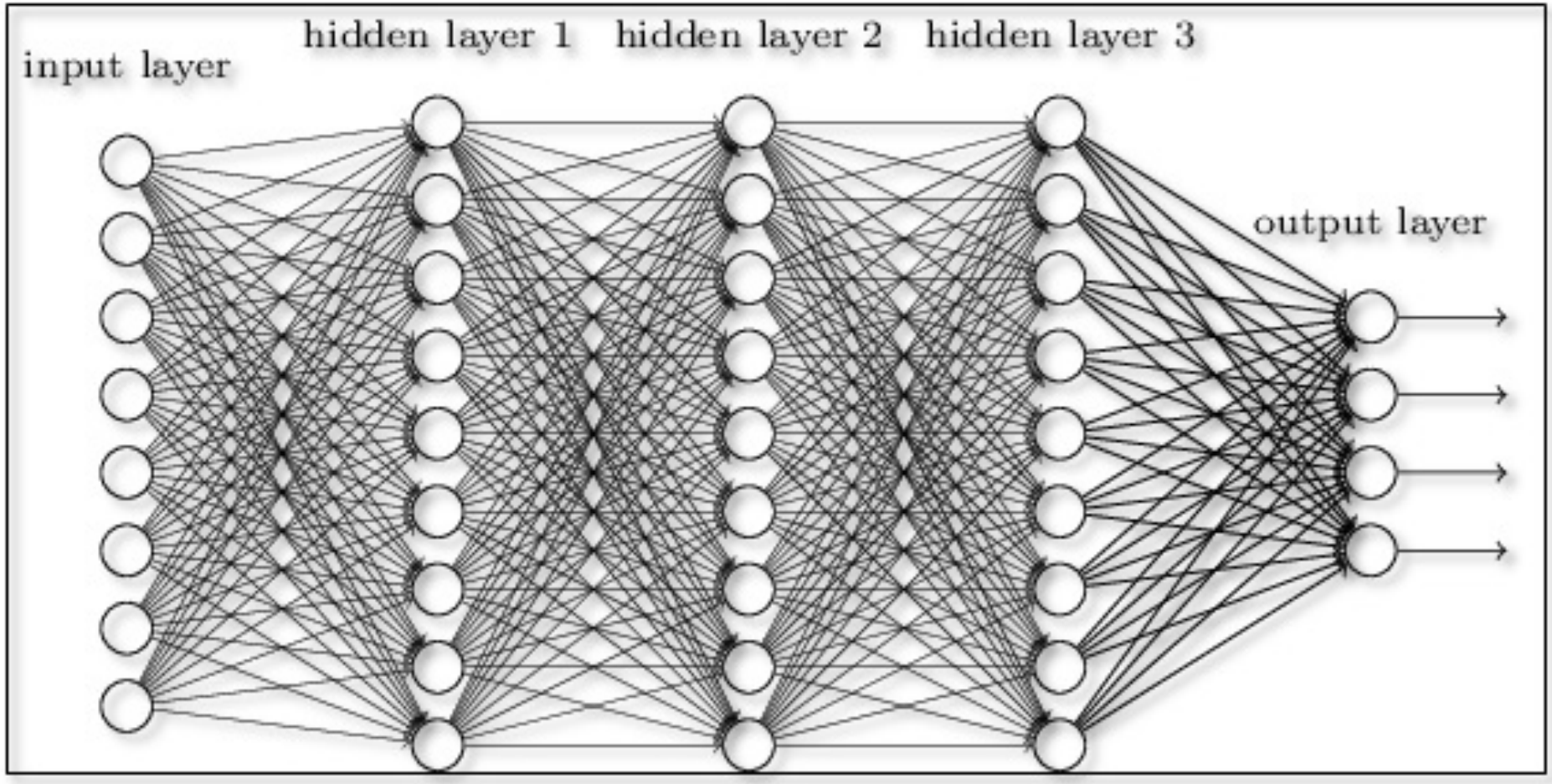


WHAT IS A NEURAL NETWORK?





"This is a dog"


input layer
hidden layer 1
hidden layer 2
hidden layer 3
output layer

NEURAL NETWORK PLAYGROUND

- Gradient Descent
  - https://bit.ly/2IxX3ls

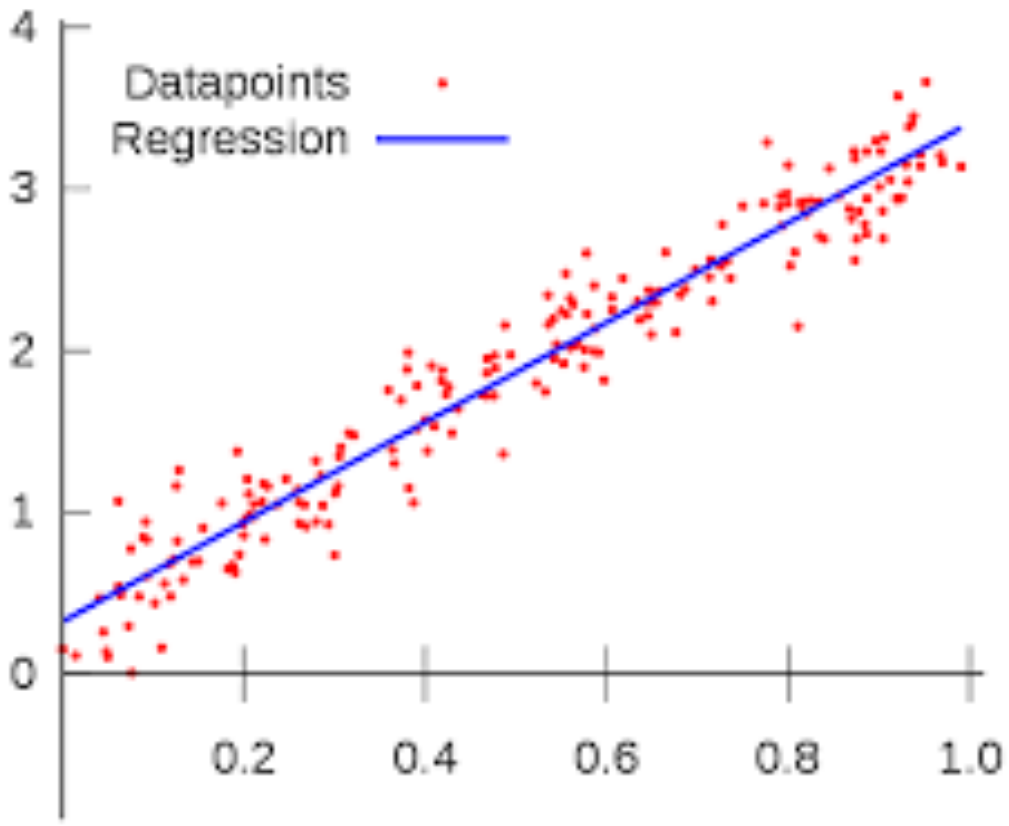
UNIVERSAL APPROXIMATION THEOREM

In the mathematical theory of artificial neural networks, the **universal approximation theorem** states[1] that a feed-forward network with a single hidden layer containing a finite number of neurons (i.e., a multilayer perceptron), can approximate continuous functions on compact subsets of $\mathbf{R}^n$, under mild assumptions on the activation function. The theorem thus states that simple neural networks can *represent* a wide variety of interesting functions when given appropriate parameters; however, it does not touch upon the algorithmic learnability of those parameters. (Wikipedia)

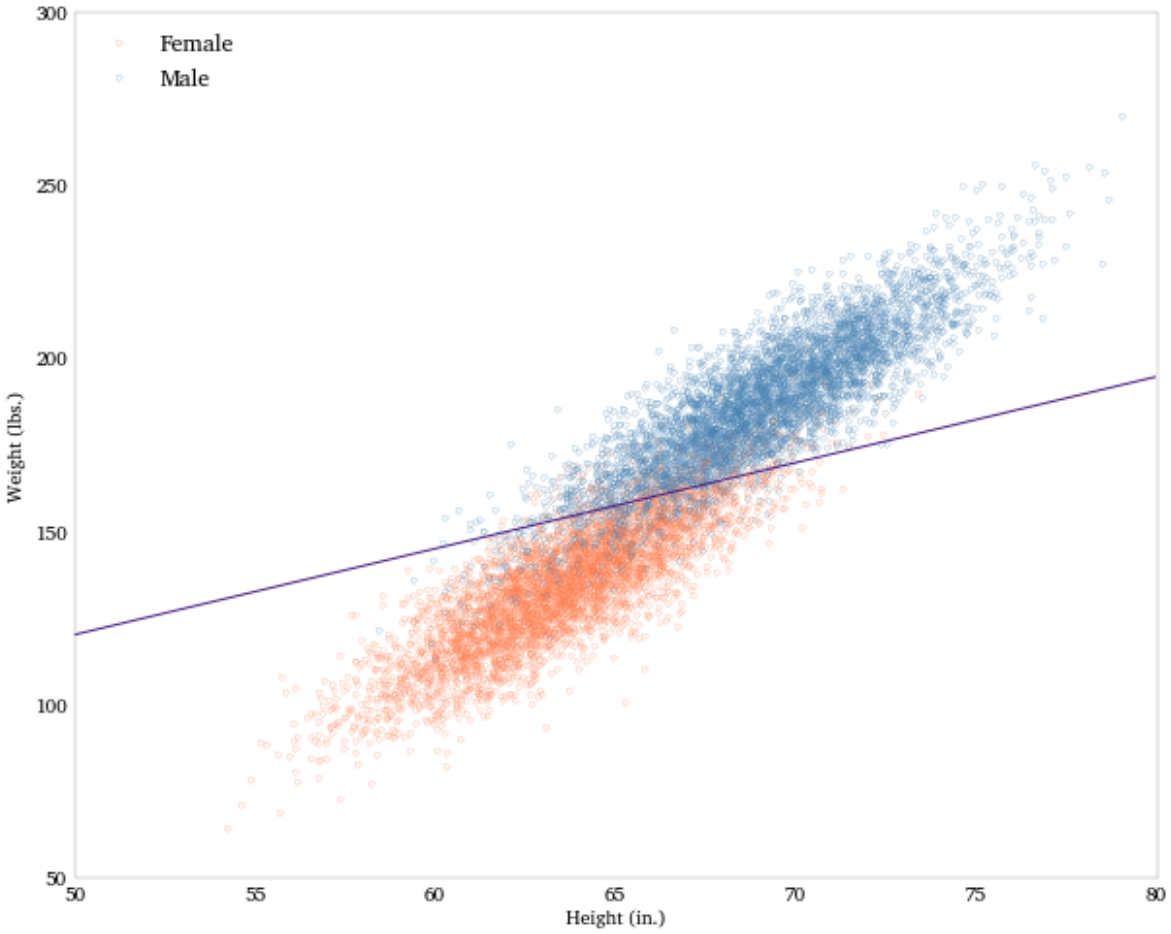
GOOGLE COLAB

https://colab.research.google.com/

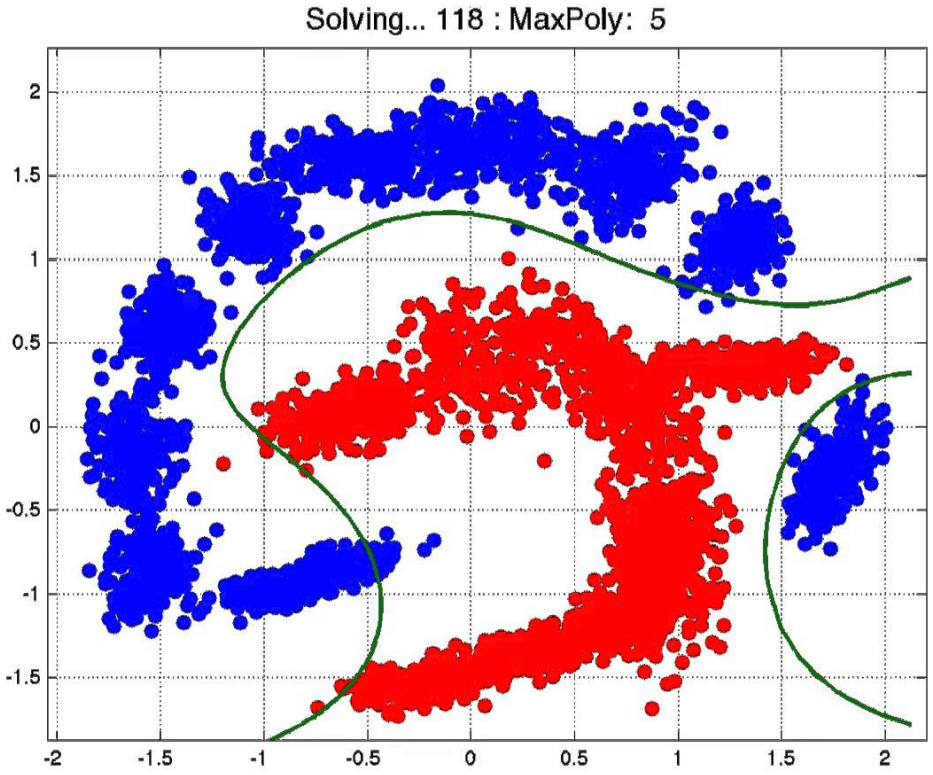
REGRESSION

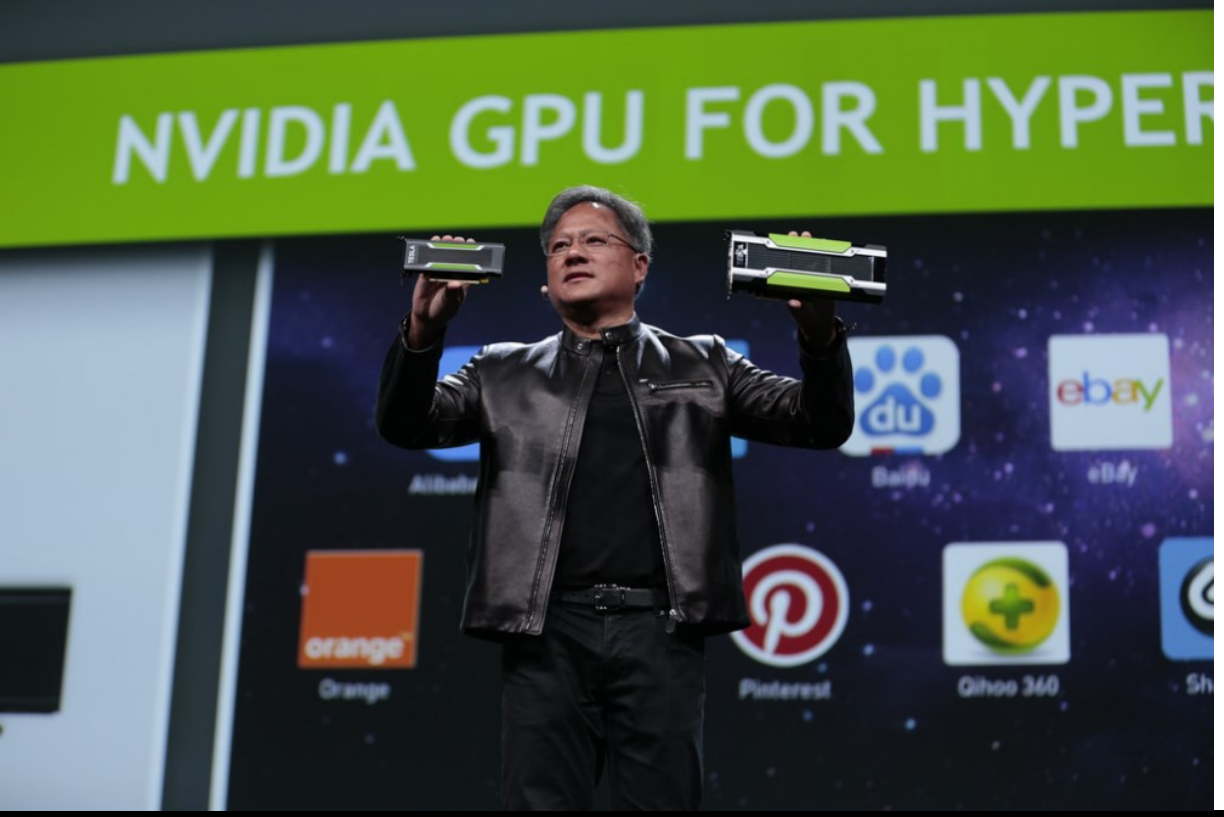


LOGISTIC REGRESSION

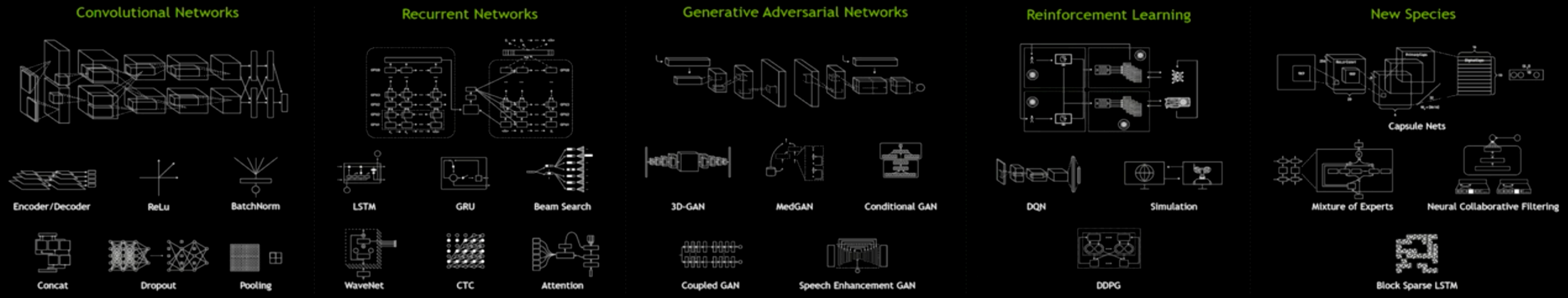


NEURAL NETWORK





CAMBRIAN EXPLOSION

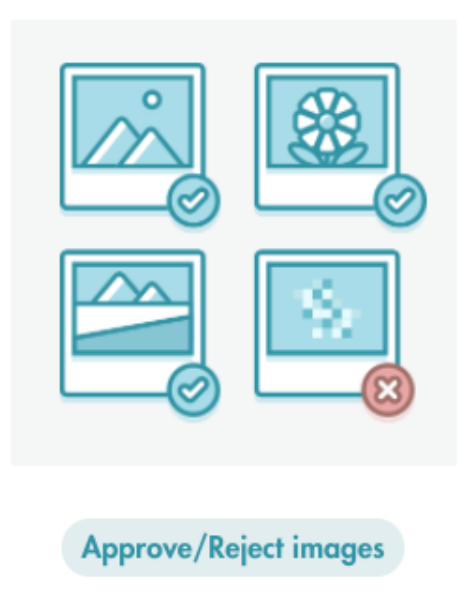


Deep Learning Computers

Services

- Image Annotation
- OCR Transcription
- Categorization
- Comparison
- Data Collection
- Content Moderation
- Other data tasks

Languages we are supporting:
Thai, English, and Japanese



REST API with libraries available in these programming languages:

datawowio

We are looking for:

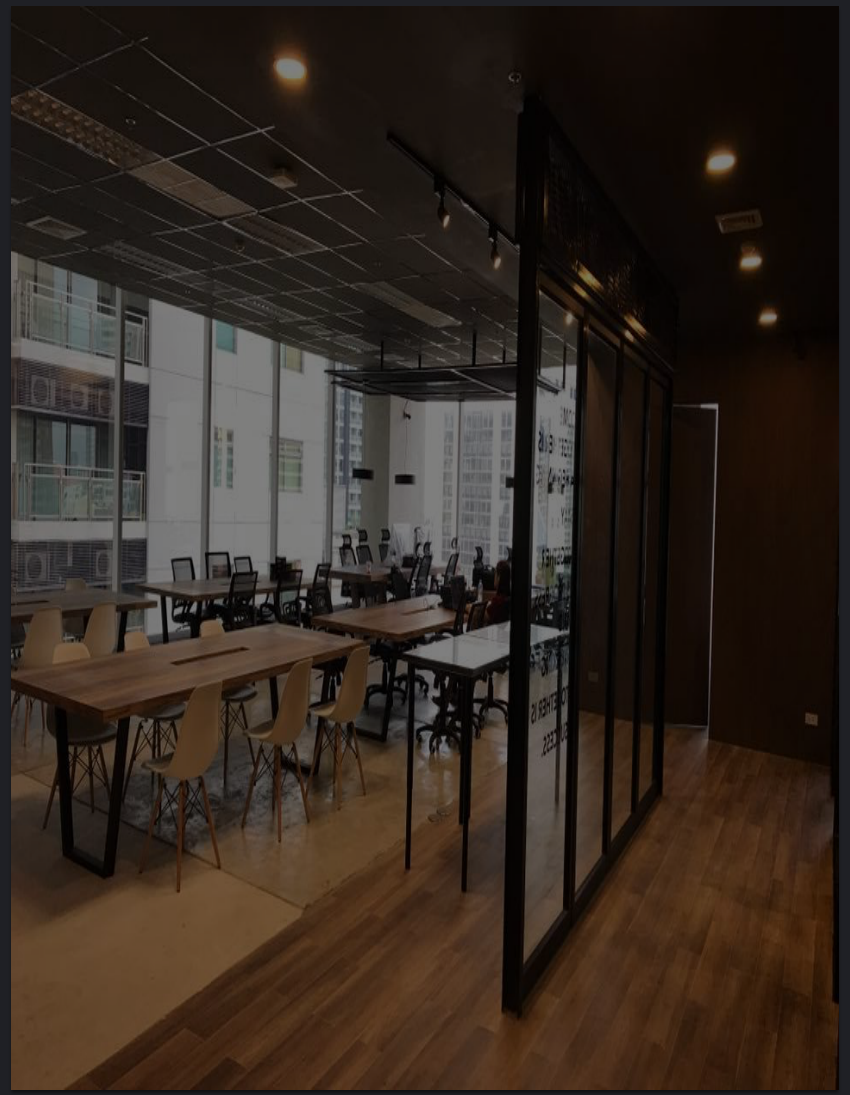
- Data Scientist
- Machine Learning Engineer
- Web Developer
- Sales Executive

Visit us:

https://datawow.io

info@datawow.io

+662 024 9119



GOOGLE FORM

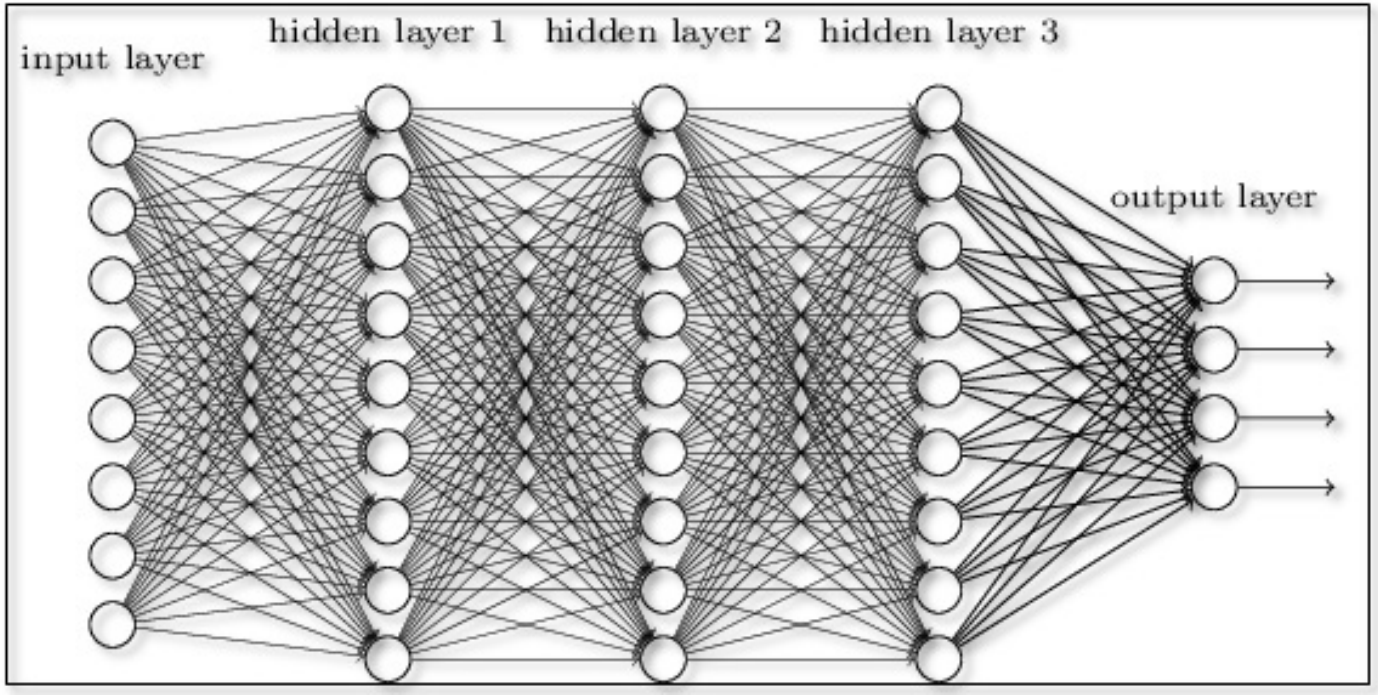
- https://bit.ly/2GwHubH

APPENDIX

MATHEMATICAL POINT OF VIEW

F(x) = f1(f2(f3(……(fn(x))))

A **composite function**…! Cost function, a sum of loss functions. A loss function, a function of node activations, which, by themselves, are functions of activations from previous layers, ..., a function of our input x.

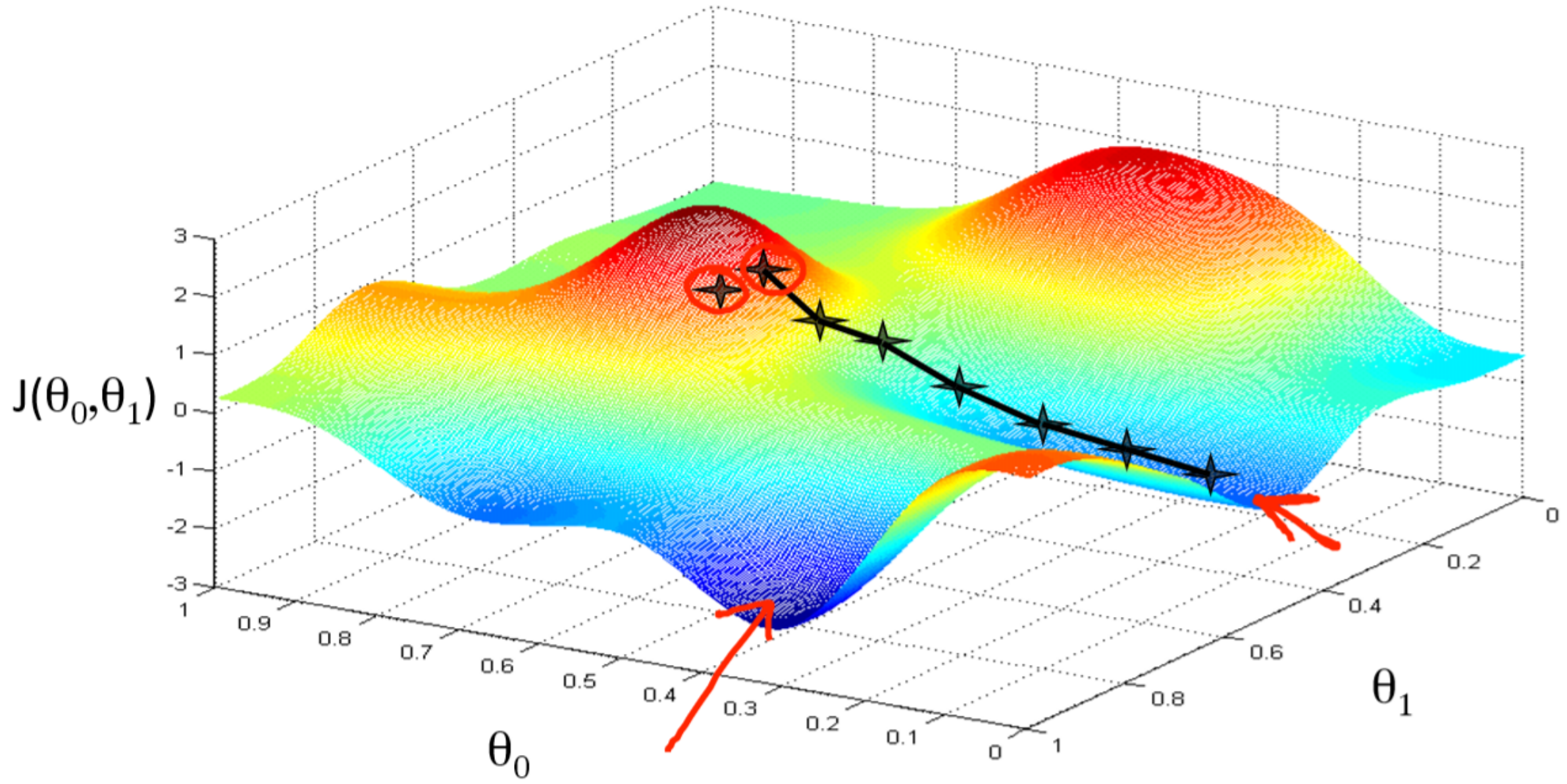


CALCULUS: OUR FRIEND SINCE THE 1700S

- Let's say F(x) = f1(f2(f3(……(fn(x))))) represents how **wrong** we are from the actual labels. How do we minimize F(x)?
- Finding the derivative of F with respect to x requires a lot of chain rule. Find x with respect to fn(x), then find the derivative backwards up until we're at F(X).

F(x) = f1(f2(f3(……(fn(x))))

Bottom-line: we have to take **millions of derivatives** to achieve this.
Lucky us, there's an algorithm to do this. It's called **Backpropagation.** I will show you how.


$J(\theta_0,\theta_1)$
3
2
1
0
-1
-2
-3
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
θ_0
0
0.2
0.4
0.6
0.8
1
θ_1