

## AI for Good Workshop

March 2019

Session 1

# Artificial Intelligence for everyone

Be a leader in  
applying Deep Learning

<https://sites.google.com/view/AlforEveryone>

# Workshop goals

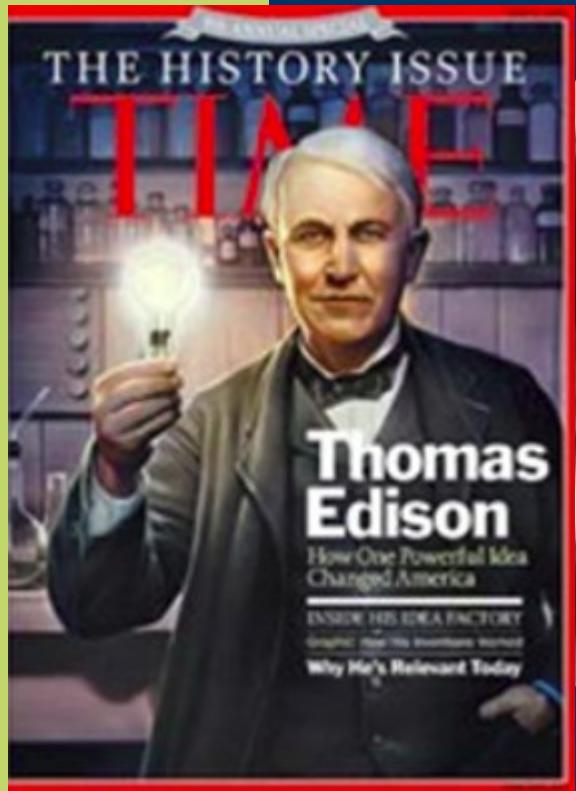
- Day 1: Deep Learning made friendly
  - Special: Activity to learn concepts like SDG & GAN
- Day 2: AI for Social Good
  - Special: Brings out the hidden potential in you !

# Goal

1. What is the future of AI?
2. How can you apply AI?
3. How can you invent AI?

You will be a leader in Deep Learning

# 'AI IS THE NEW ELECTRICITY'



"Just as electricity transformed almost everything 100 years ago, today I actually have a hard time thinking of an industry that I don't think AI will transform in the next several years."

**Andrew Ng**

Former chief scientist at Baidu, Co-founder at Coursera

# Day 2 of this workshop: AI for Good





# SUSTAINABLE DEVELOPMENT GOALS



**1** NO POVERTY



**2** ZERO HUNGER



**3** GOOD HEALTH AND WELL-BEING



**4** QUALITY EDUCATION



**5** GENDER EQUALITY



**6** CLEAN WATER AND SANITATION



**7** AFFORDABLE AND CLEAN ENERGY



**8** DECENT WORK AND ECONOMIC GROWTH



**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE



**10** REDUCED INEQUALITIES



**11** SUSTAINABLE CITIES AND COMMUNITIES



**12** RESPONSIBLE CONSUMPTION AND PRODUCTION



**13** CLIMATE ACTION



**14** LIFE BELOW WATER



**15** LIFE ON LAND



**16** PEACE, JUSTICE AND STRONG INSTITUTIONS



**17** PARTNERSHIPS FOR THE GOALS



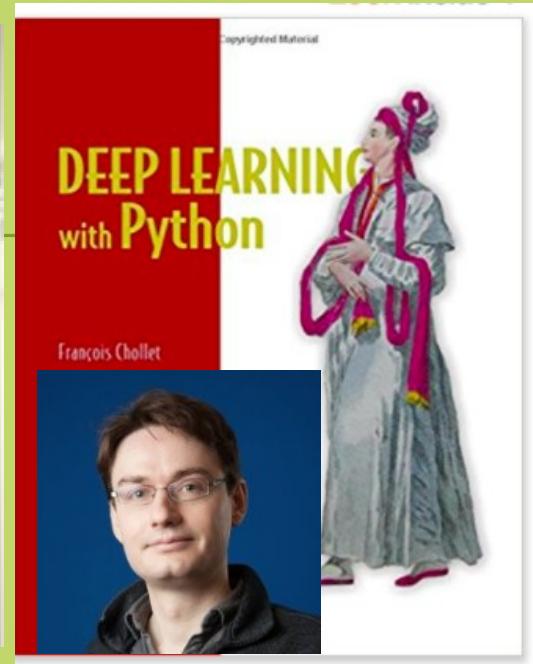
**SUSTAINABLE  
DEVELOPMENT  
GOALS**

# Our inspiration

## Friendly approaches :

### 1) KERAS.io

François Chollet's  
Book on "Deep Learning with Python"



### 2) Deeplearning.ai (Coursera.org)

Andrew Ng

### 3) Fast.ai

Jeremy



# More inspiration

## Excellent Resources

---

- **Stanford cs231 n**

<http://cs231n.stanford.edu>

- **MIT Deep Learning**

<http://introtodeeplearning.com/>

<https://deeplearning.mit.edu>

- **IIT Madras**

my classes notes with Prof. Anurag (**Deep Learning**)

# Why you will be a leader?



Your opportunity  
to be a leader

**“Though AI research is moving  
forward amazingly fast,  
most of the research is  
NOT yet applied”**



François Chollet @fchollet · Feb 11

As of Feb 2019, I think we are still not near peak Deep Learning.

Peak hype? That was around 2016-2017.

Peak applications & deployment? We have a long way to go. W

*Pre-requisites = mathematics / None*

- **Don't worry!**
  - This workshop is for you !!
- **Do you need to have a PhD in Mathematics to learn AI?**
  - **Pre-requisites: None**

# Are you from non-CS branch?



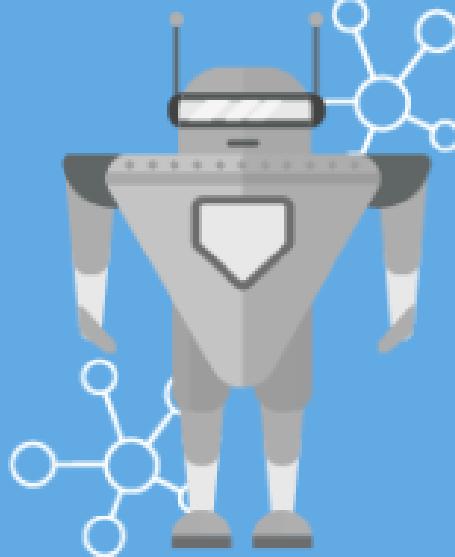
**Method to watch**



# What are coolest jobs for the next 3 years

## ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



1950's

1960's

1970's

1980's

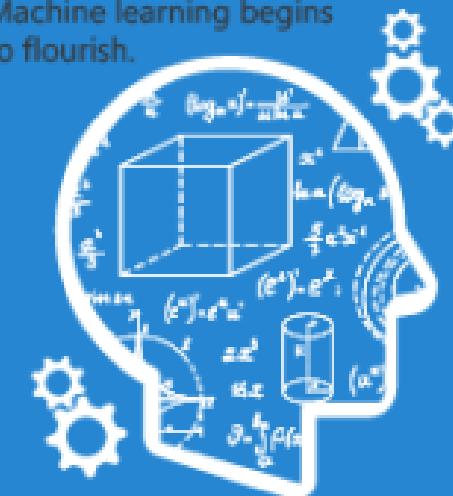
1990's

2000's

2010's

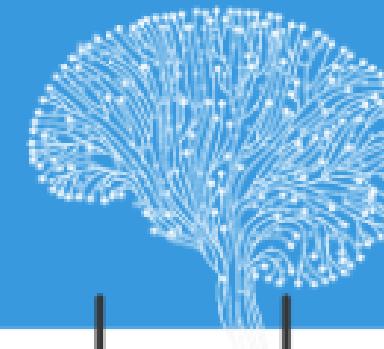
## MACHINE LEARNING

Machine learning begins to flourish.

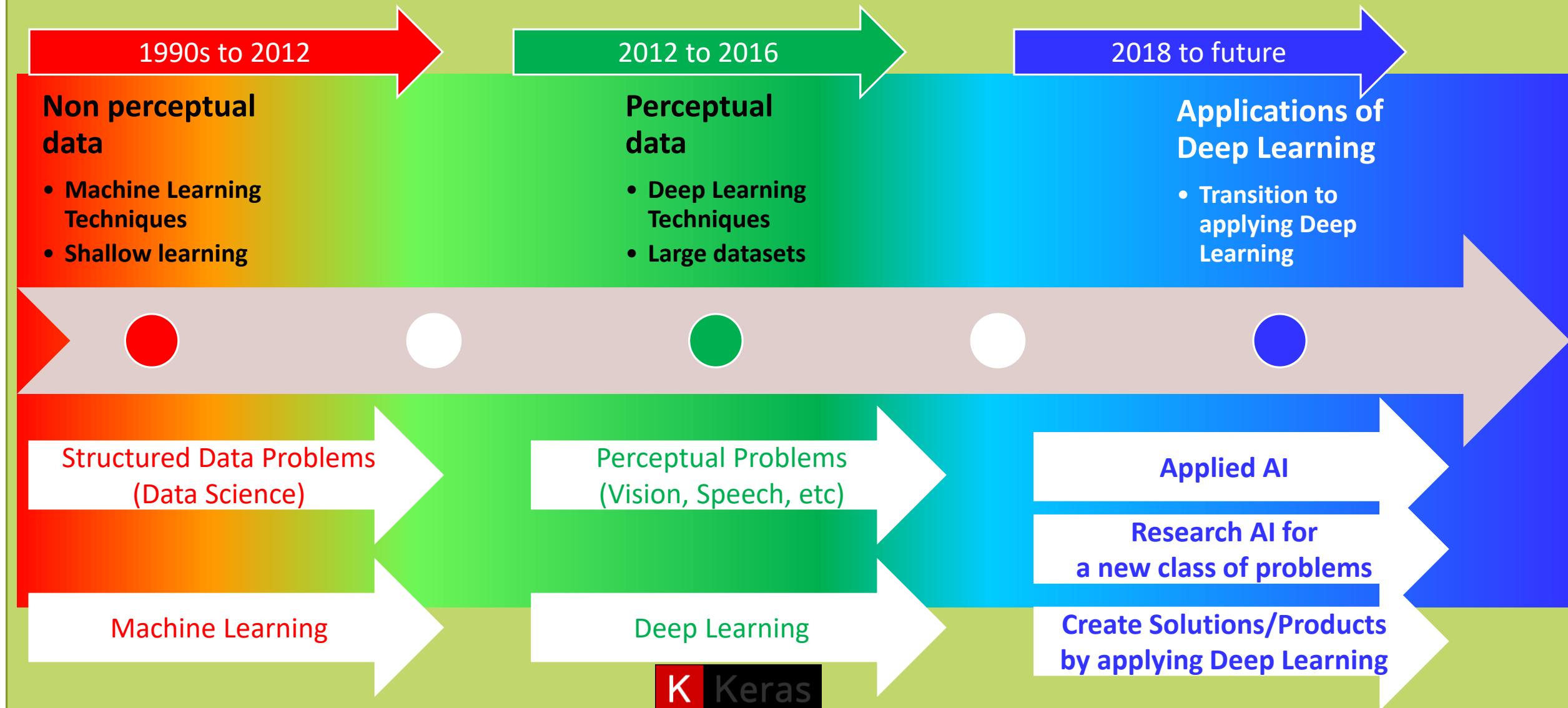


## DEEP LEARNING

Deep learning breakthroughs drive AI boom.



# History of AI



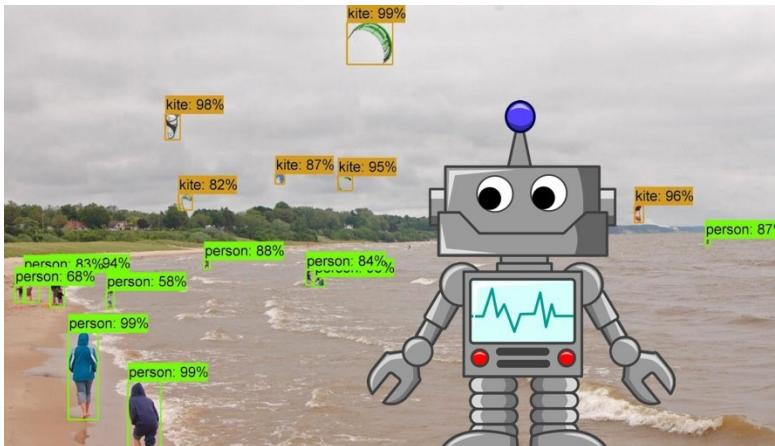
# The future of AI

## 1. Deep Learning



“Biggest leap since invention of computers”

Output of AI: Scalar values (numbers)

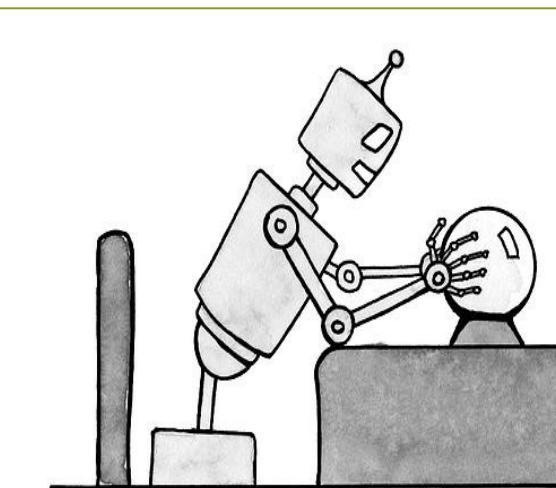


## 2. Generative Deep Learning



GAN “the most interesting idea in the last 10 years in ML.”

Output of AI: Vectors , Images

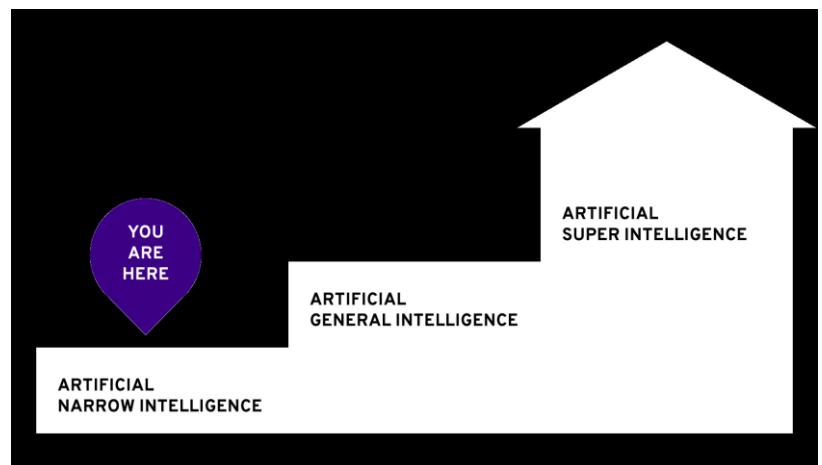


## 3. AI that creates another AI



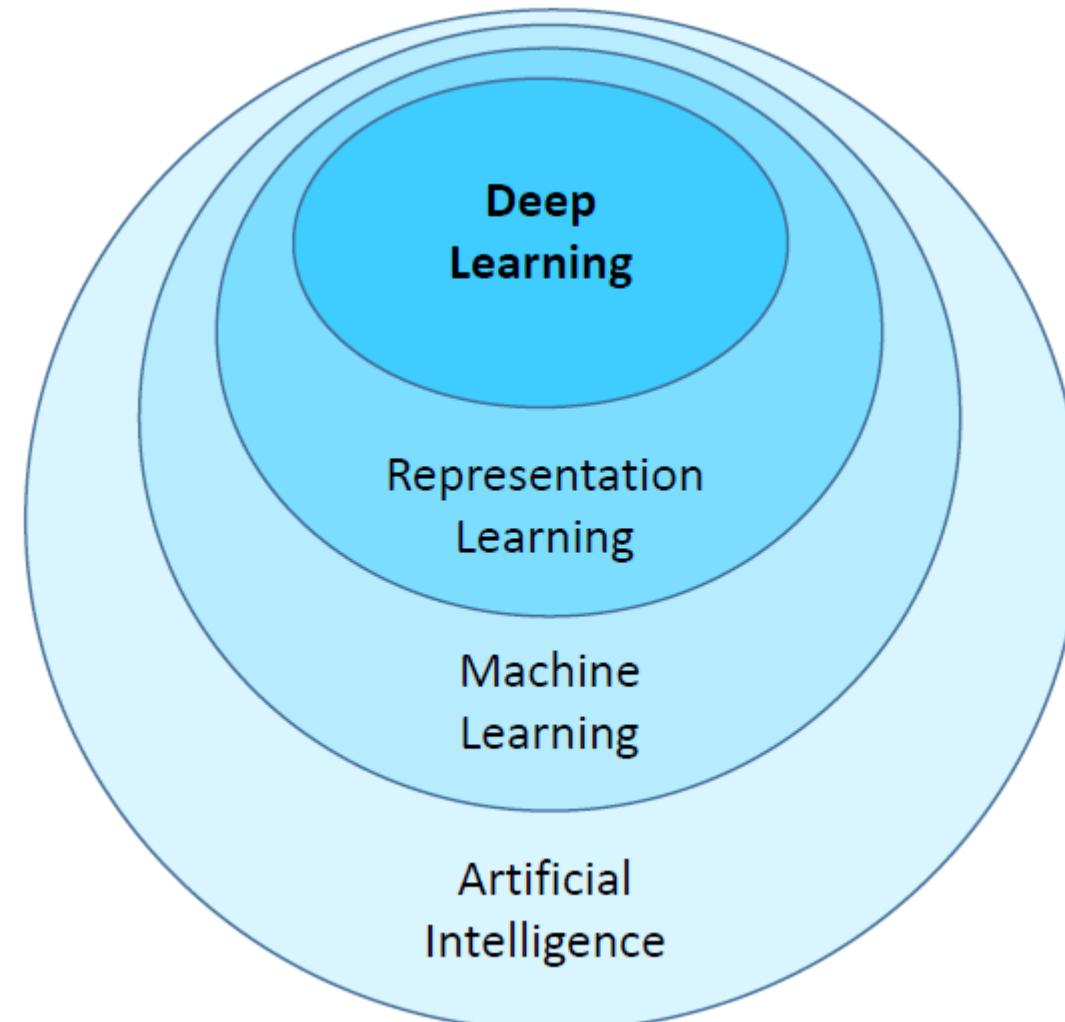
Architecture Search/ Progressive

Output of AI: Neural networks



# AI == Deep Learning ?

- **Artificial Intelligence in last 5 years = Deep Learning**



# The future of AI

## 1. Deep Learning



“Biggest leap since invention of computers”



Output of AI: Scalar values (numbers)

Output = 2

## 2. Generative Deep Learning



GAN “the most interesting idea in the last 10 years in ML.”



Output of AI: Vectors , Images

Output =



## 3. AI that creates another AI



Neural network auto-evolution



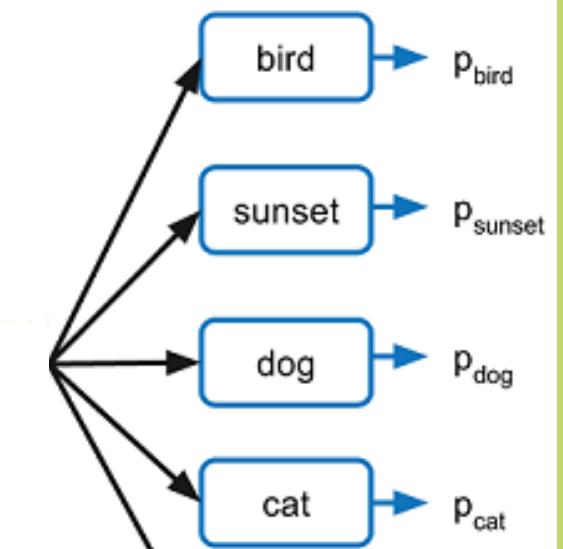
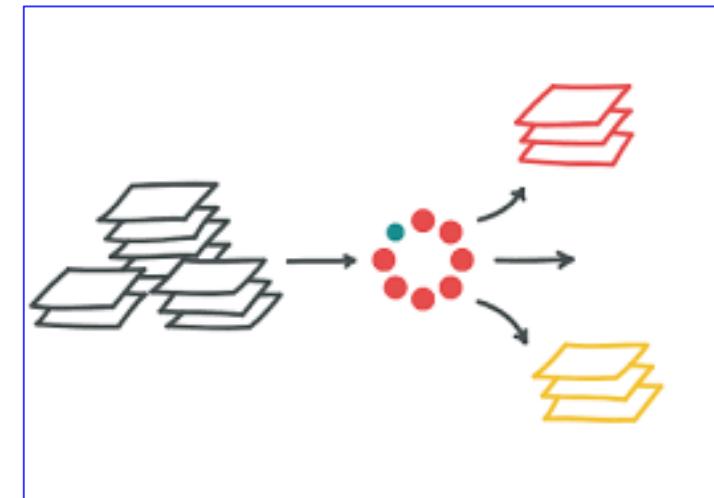
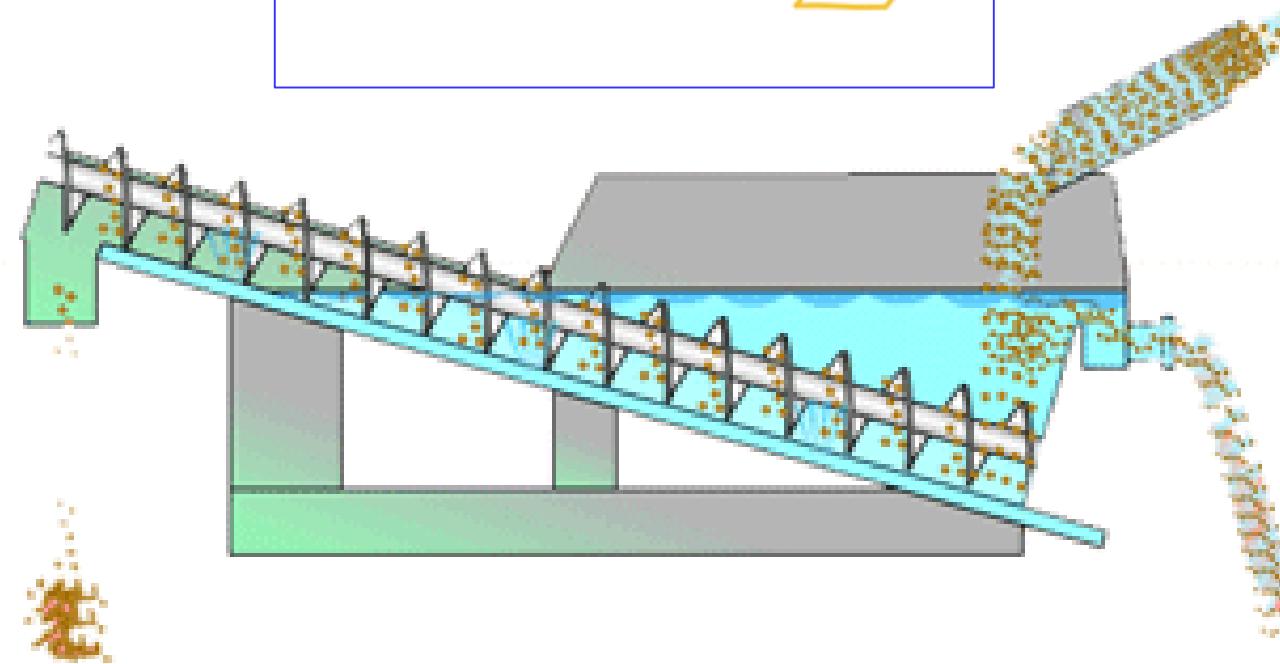
Output of AI: Neural networks

Output =



# 1. Deep Learning

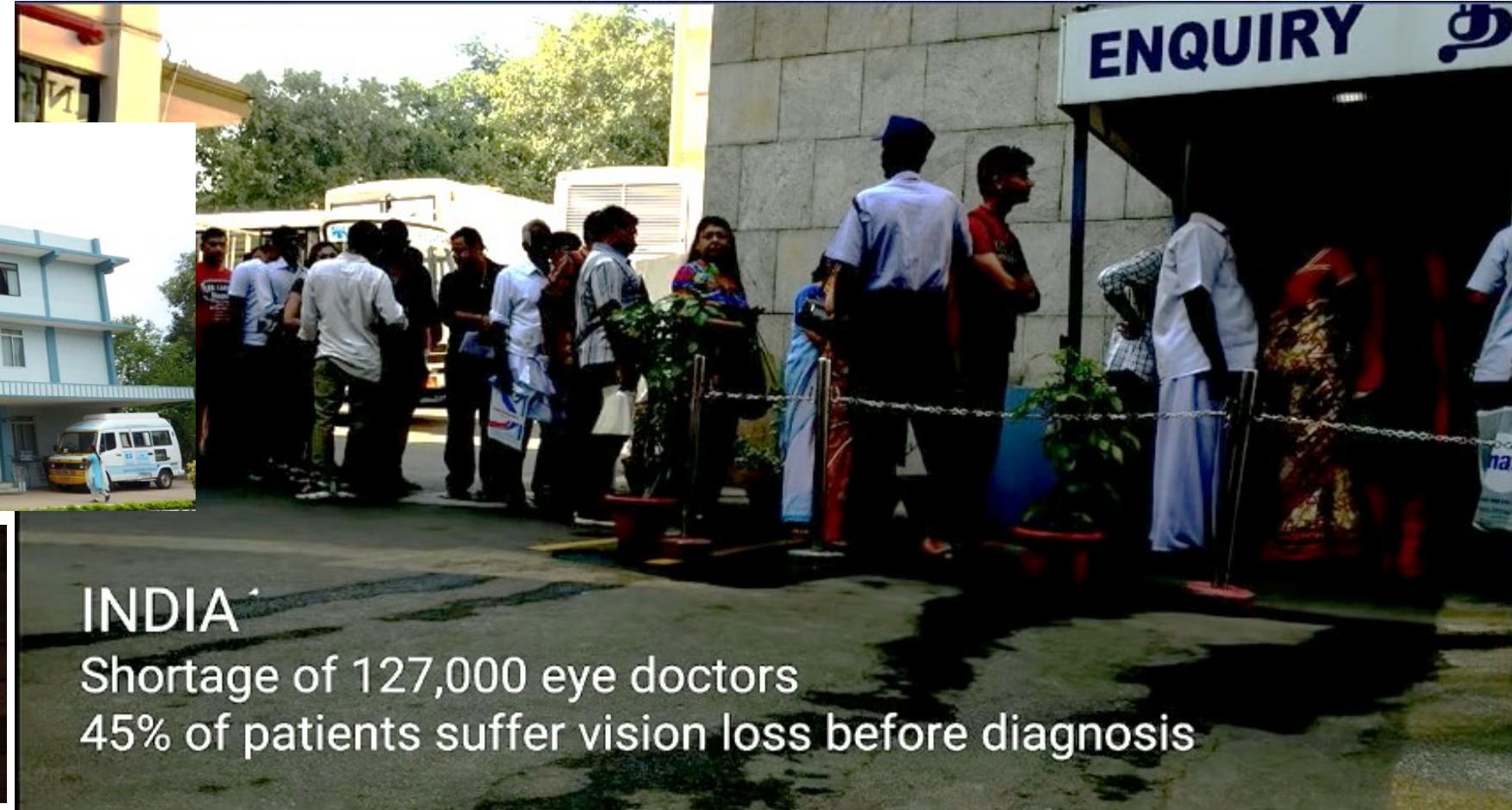
## visual recognition – image classification



# 1. Deep Learning visual recognition – image classification



**Google works with Aravind Eye Hospital to deploy AI that can detect eye disease**



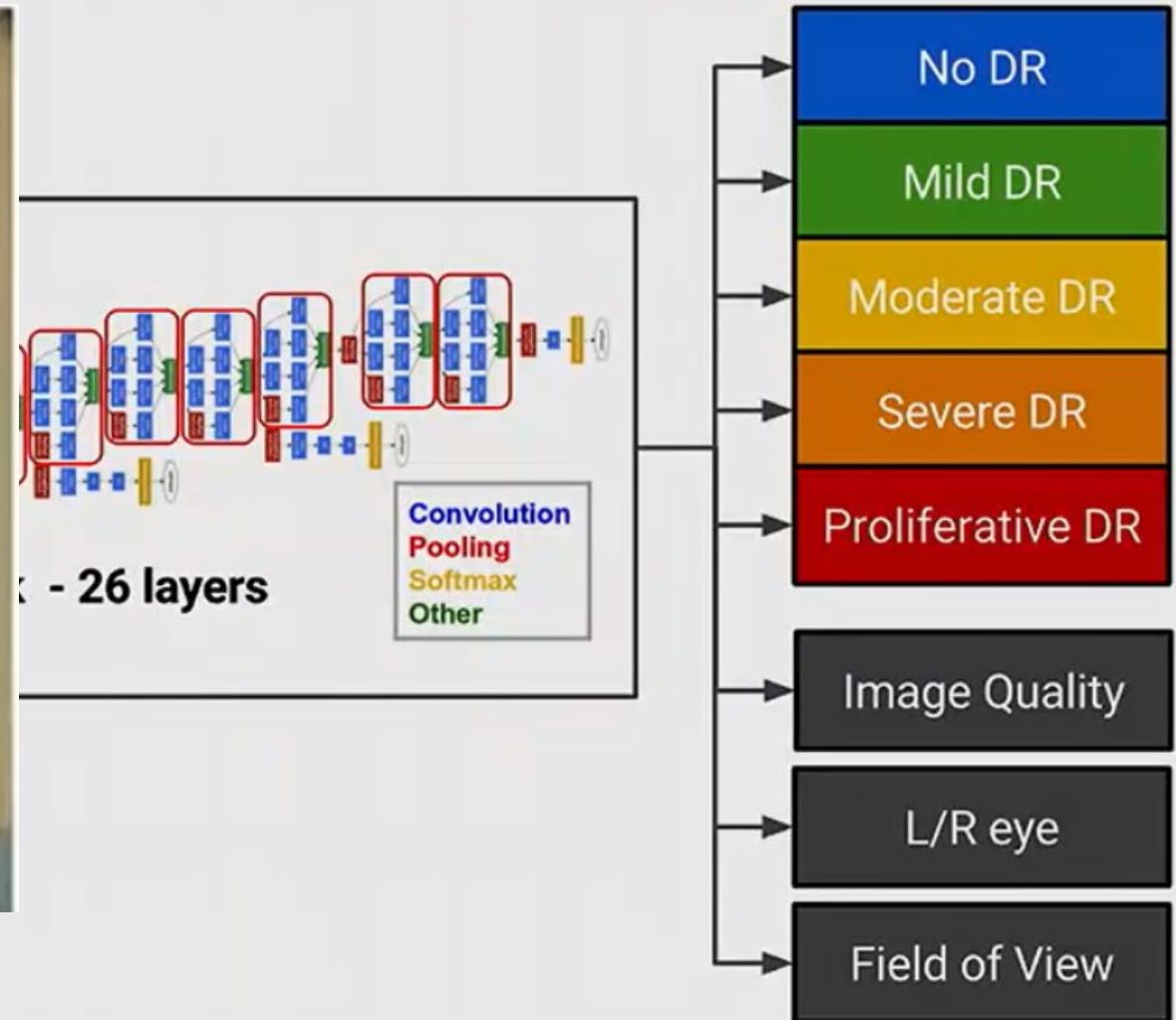
INDIA

Shortage of 127,000 eye doctors

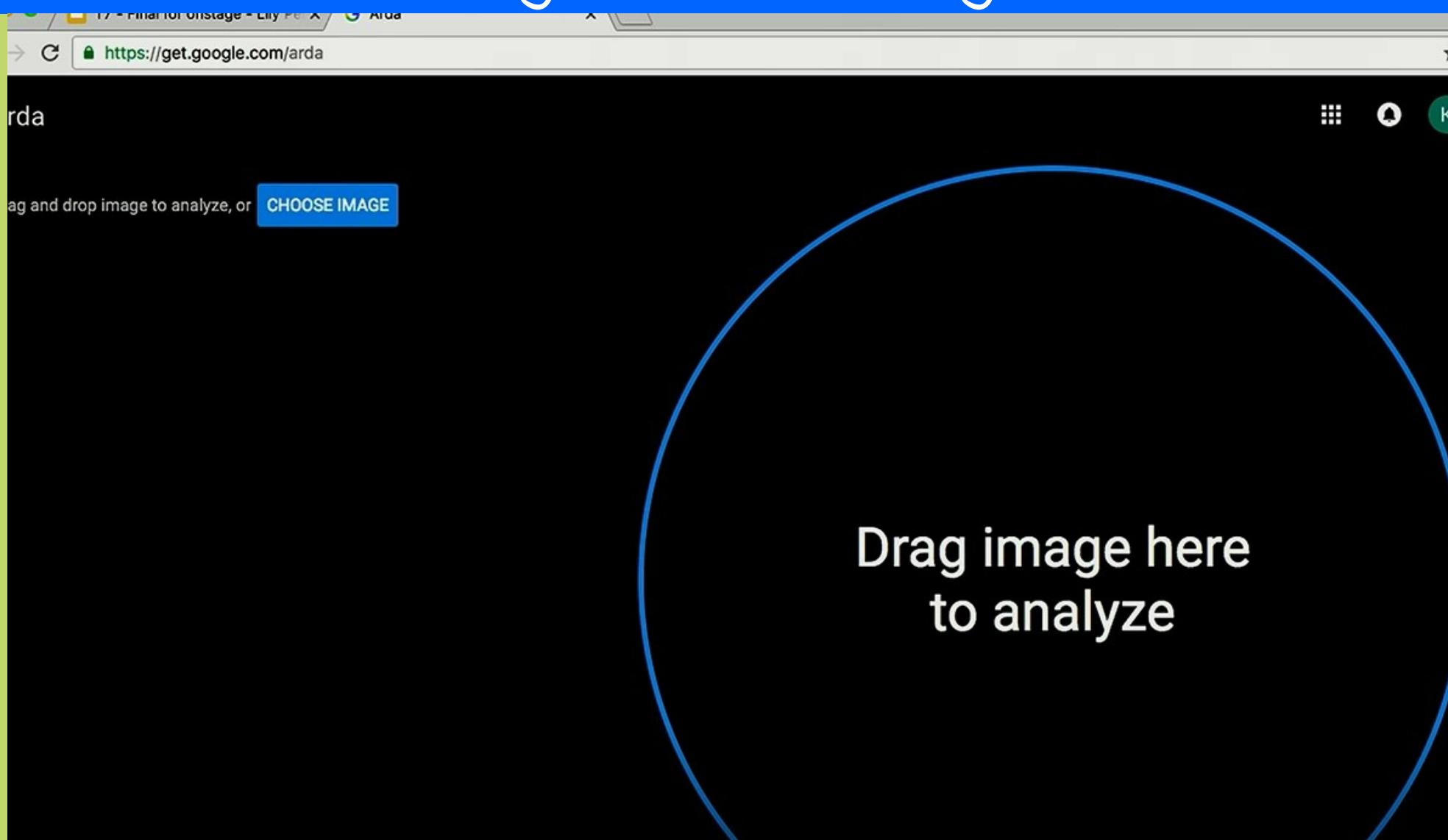
45% of patients suffer vision loss before diagnosis

# 1. Deep Learning visual recognition – image classification

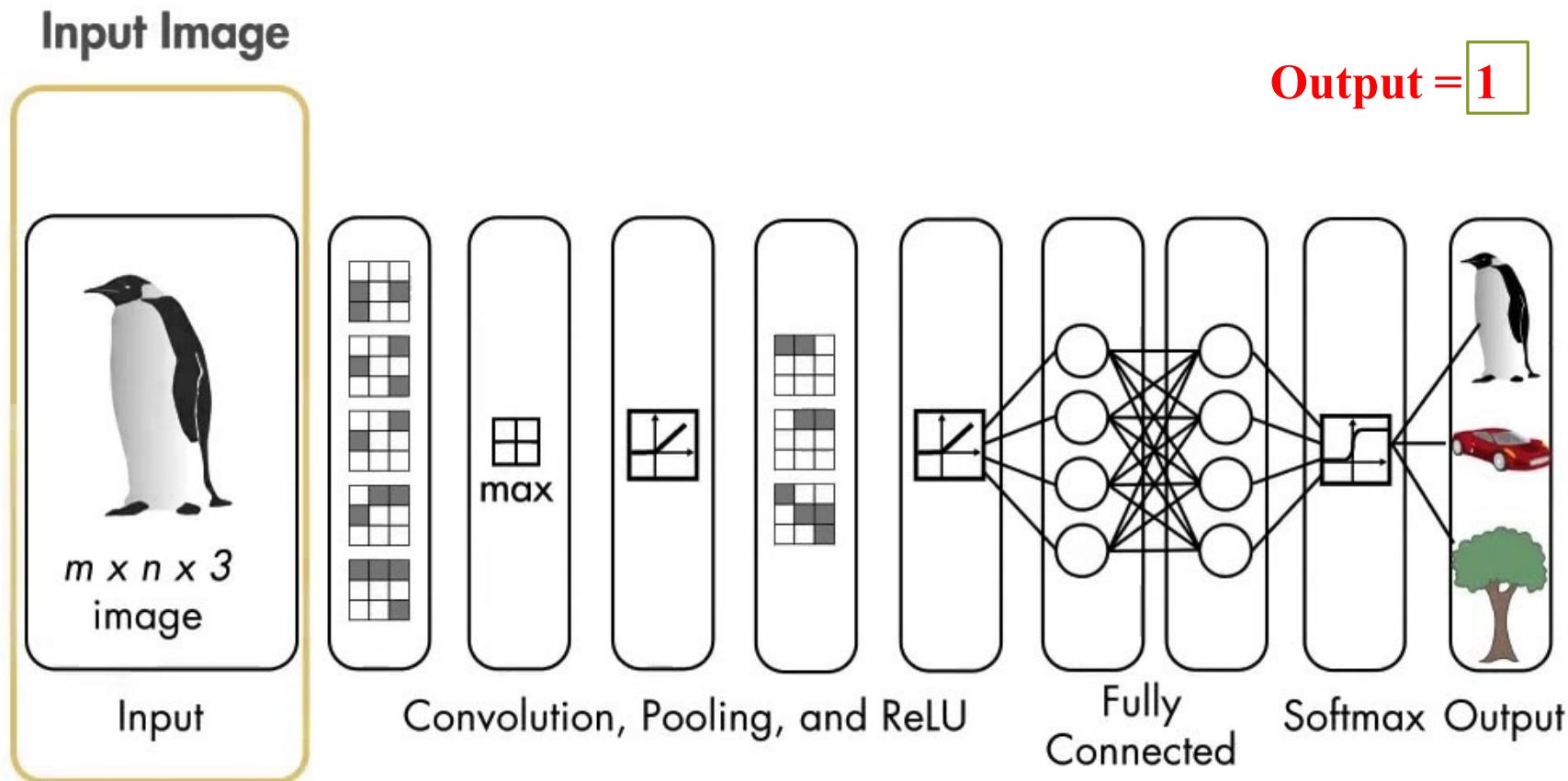
Adapt deep neural network to read fundus images



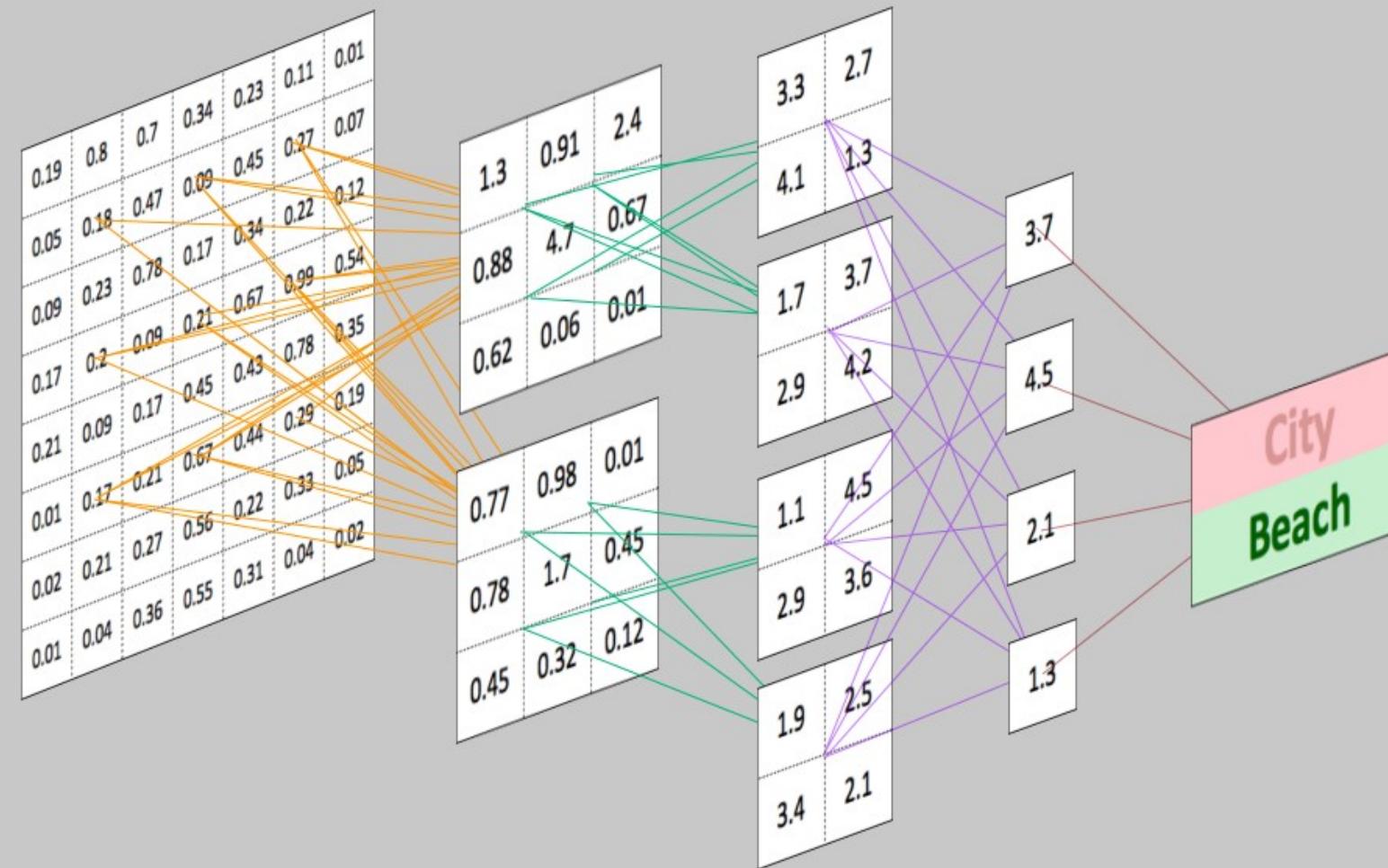
# 1. Deep Learning visual recognition – image classification



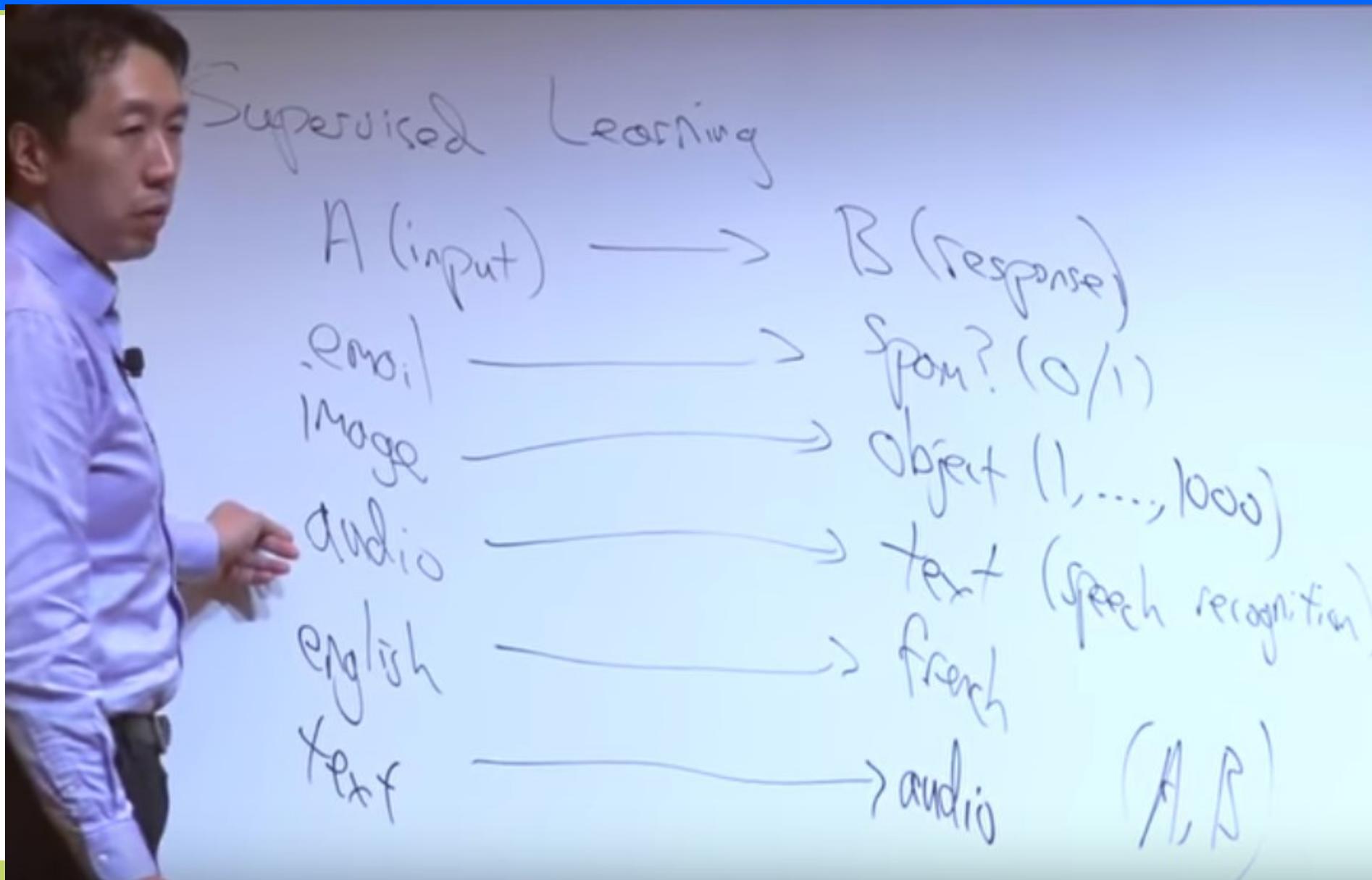
# 1. Deep Learning architecture



# 1. Deep Learning architecture



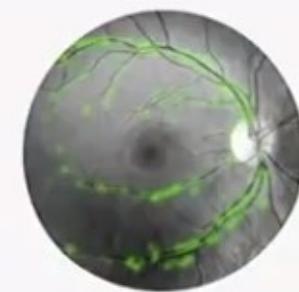
# A → B



# 1. Deep Learning

## Predicting the future

### Predicting cardiovascular risk



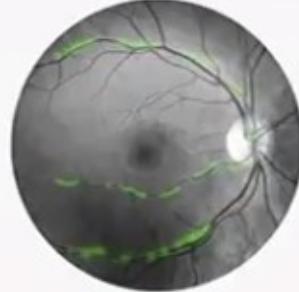
Age

Predicted: 59.1 years  
Actual: 57.6 years



Biological sex

Predicted: Female  
Actual: Female



Smoking

Predicted: Non-smoker  
Actual: Non-smoker



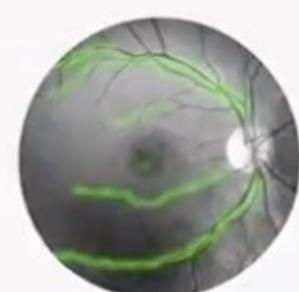
A1C

Predicted: Non-diabetic  
Actual: Non-diabetic



BMI

Predicted: 24.1 kg/m<sup>2</sup>  
Actual: 26.3 kg/m<sup>2</sup>

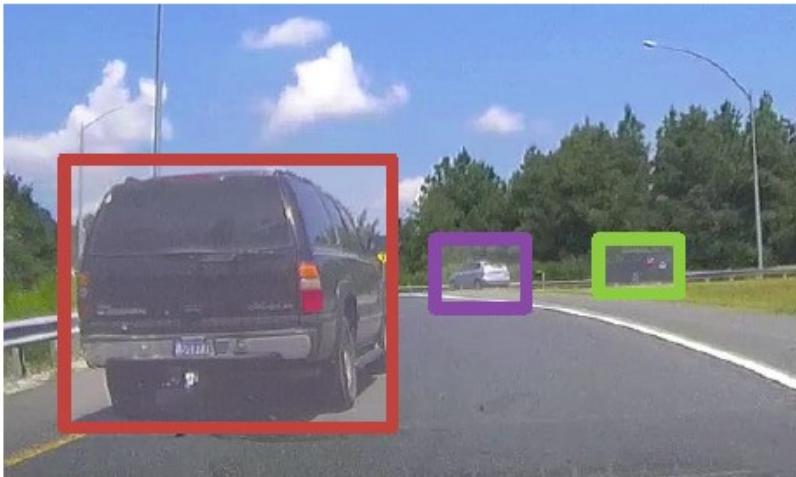


Systolic blood pressure

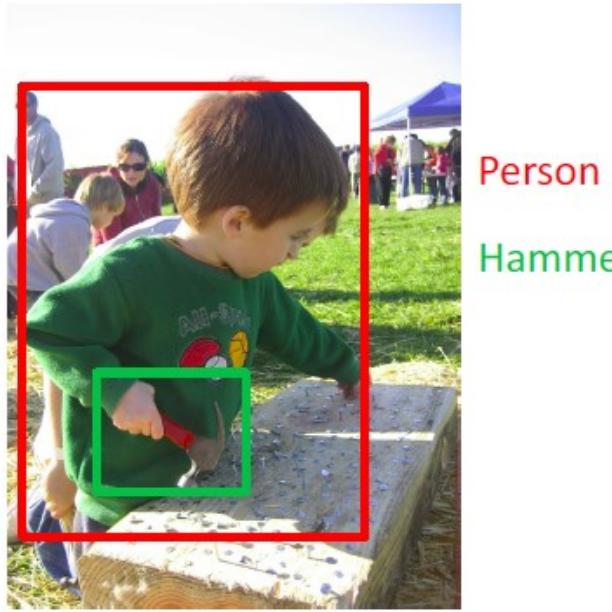
Predicted: 148.0 mmHg  
Actual: 148.5 mmHg

Source: Google

# 1. Deep Learning visual recognition tasks

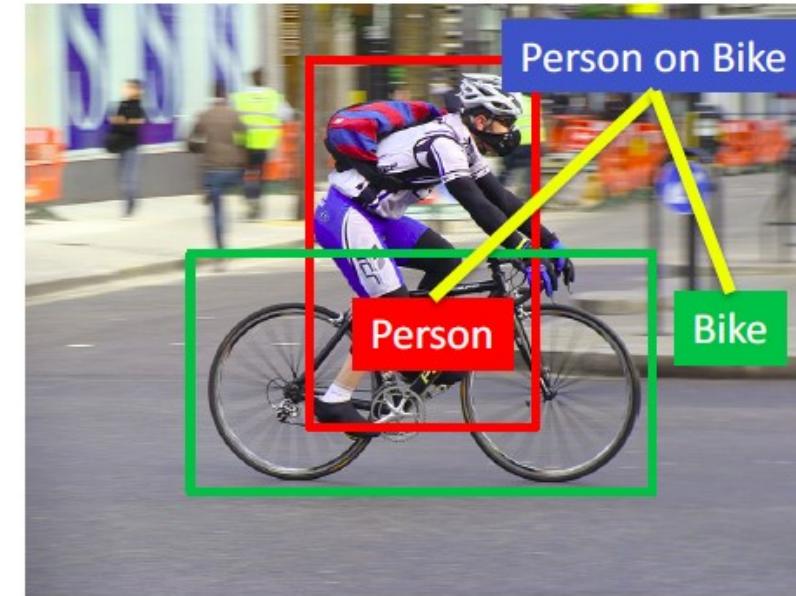


[This image](#) is licensed under CC BY-NC-SA 2.0; changes made



Person

Hammer



Person on Bike

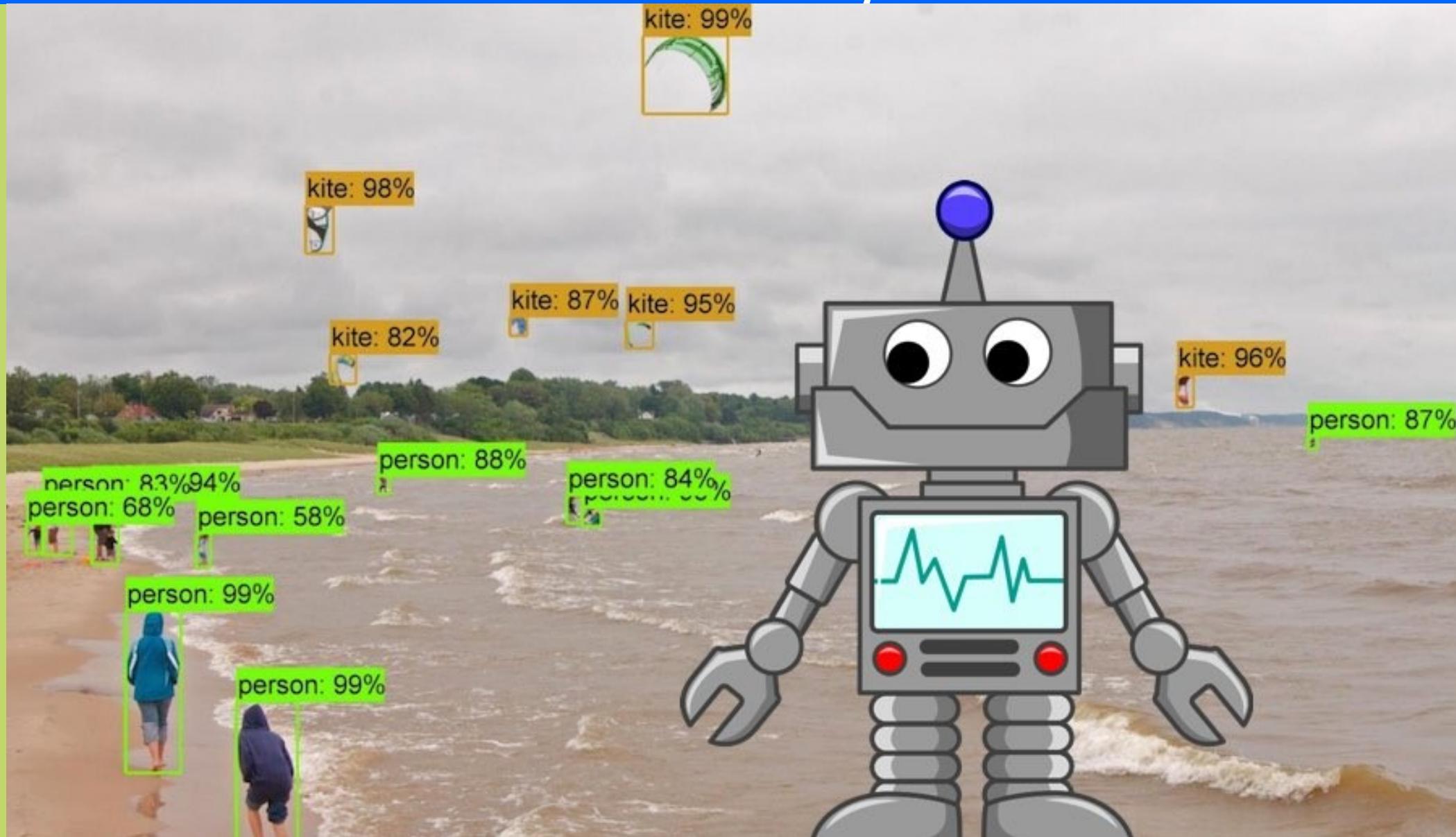
Person

Bike

[This image](#) is licensed under CC BY-SA 2.0; changes made

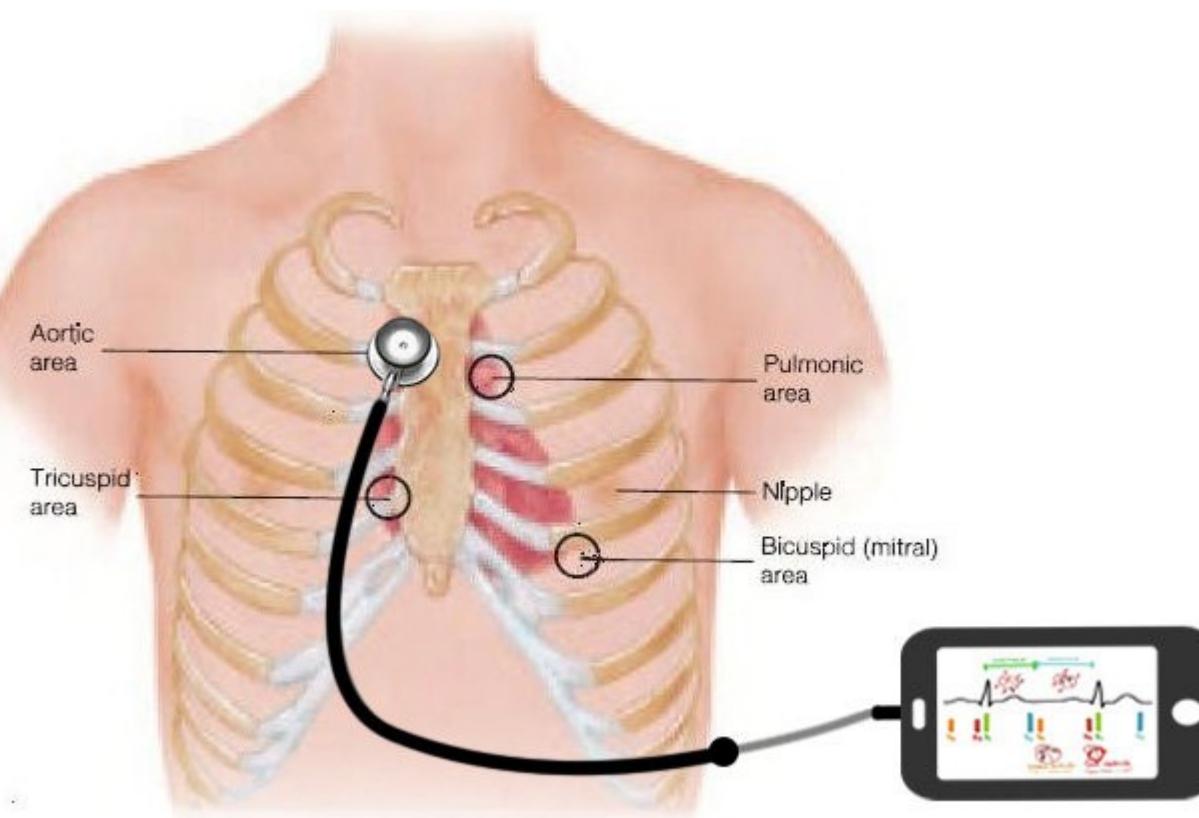
[This image](#) is licensed under CC BY-SA 3.0; changes made

# 1. Deep Learning visual recognition



# 1. Deep Learning sound pattern recognition

Monitor your heart 24/7 and preventive health alerts



5 microphones listen to heart values



# Deep Learning in One Slide

- **What is it:**  
Extract useful patterns from data.
  - **How:**  
Neural network + optimization
  - **How (Practical):**  
Python + TensorFlow & friends
  - **Hard Part:**  
Good Questions + Good Data
  - **Why now:**  
Data, hardware, community, tools, investment
  - **Where do we stand?**  
Most big questions of intelligence have not been answered nor properly formulated
- Exciting progress:**
- Face recognition
  - Image classification
  - Speech recognition
  - Text-to-speech generation
  - Handwriting transcription
  - Machine translation
  - Medical diagnosis
  - Cars: drivable area, lane keeping
  - Digital assistants
  - Ads, search, social recommendations
  - Game playing with deep RL

Credits:



For the full list of references visit:  
<https://hcai.mit.edu/references>

<https://deeplearning.mit.edu> 2019

Everyone

# The future of AI

## 1. Deep Learning



“Biggest leap since invention of computers”



Output of AI: Scalar values (numbers)

Output =

## 2. Generative Deep Learning



GAN “the most interesting idea in the last 10 years in ML.”



Output of AI: Vectors , Images

Output =



## 3. AI that creates another AI



Progressive, AutoML



Output of AI: Neural networks

Output =



## 2. Generative Deep Learning

### Generate a image

- Output: image



François Chollet · @fchollet · Feb 10

I made 4 pics in the past 6 months, and they all follow the same thread

## 2. Generative Deep Learning

### Convert Text to image

- Generative Deep Learning
  - VAE
  - GAN

#### Examples of generated images

[Reed +, ICML 2016]

A tiny bird, with a tiny beak, tarsus and feet, a blue crown, blue coverts, and black cheek patch

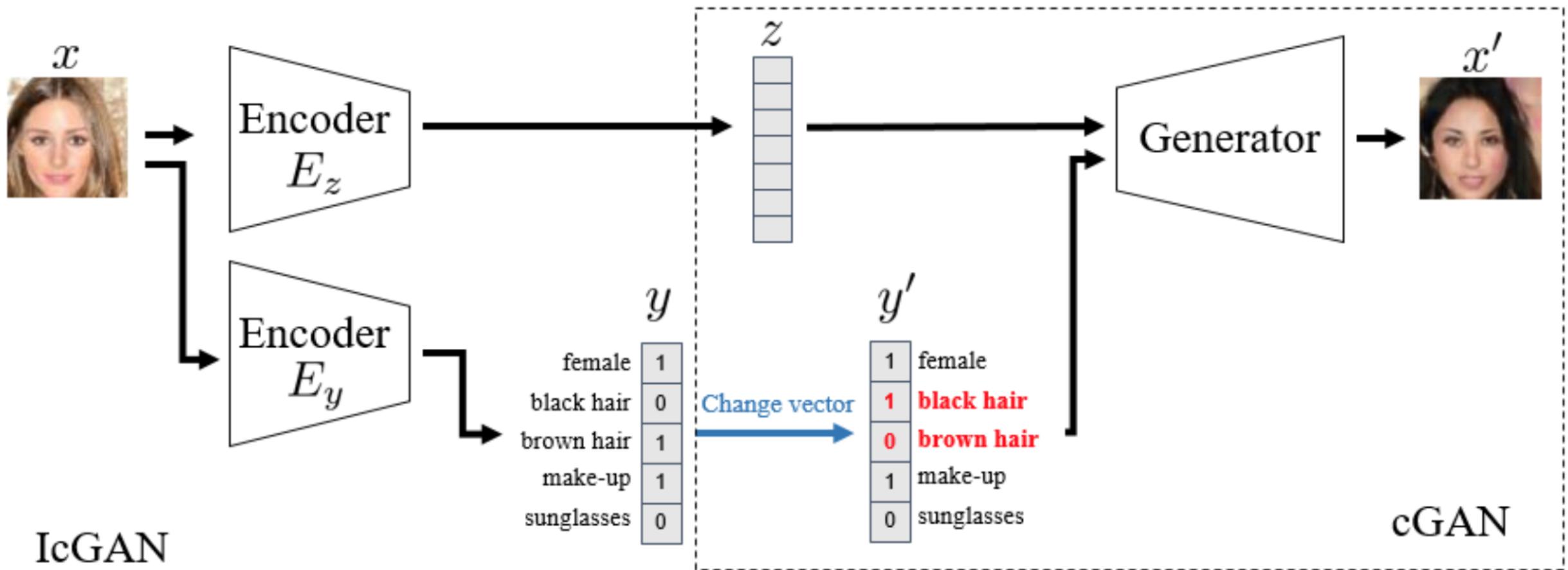


Bright droopy yellow petals with burgundy streaks, and a yellow stigma



## 2. Generative Deep Learning

### Create a artificial face



# The future of AI

## 1. Deep Learning



“Biggest leap since invention of computers”



Output of AI: Scalar values (numbers)

Output =

## 2. Generative Deep Learning



GAN “the most interesting idea in the last 10 years in ML.”



Output of AI: Vectors , Images

Output =



## 3. AI that creates another AI



Progressive, AutoML



Output of AI: Neural networks

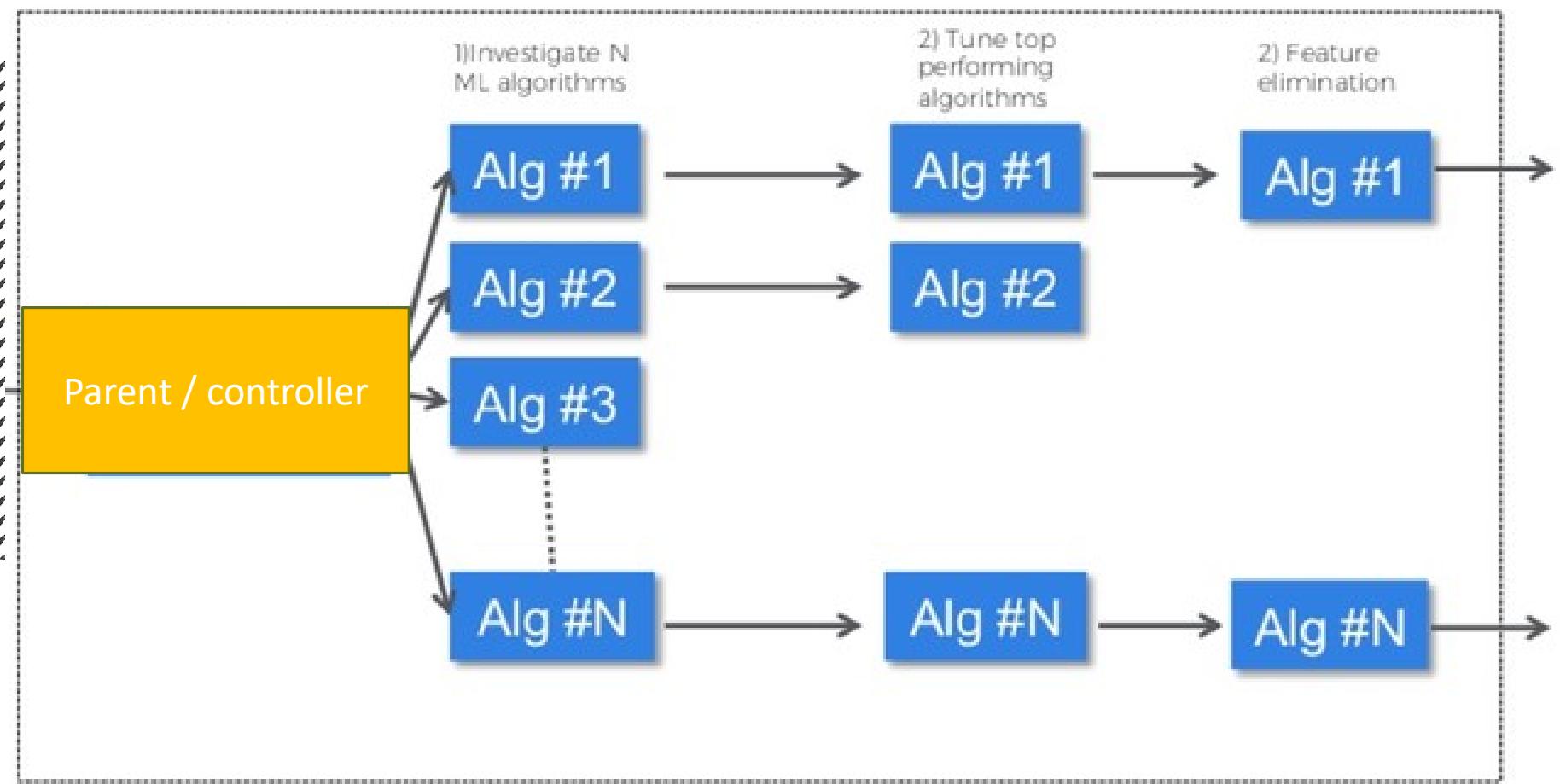
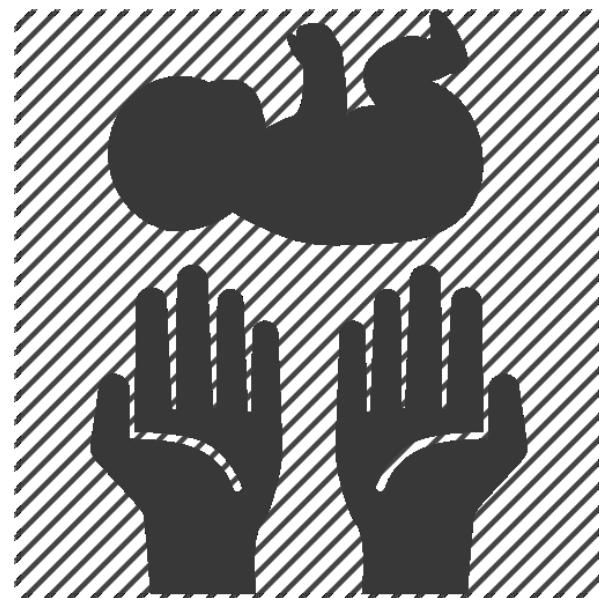
Output =



### 3. Artificial General Intelligence

A neural network creates another one

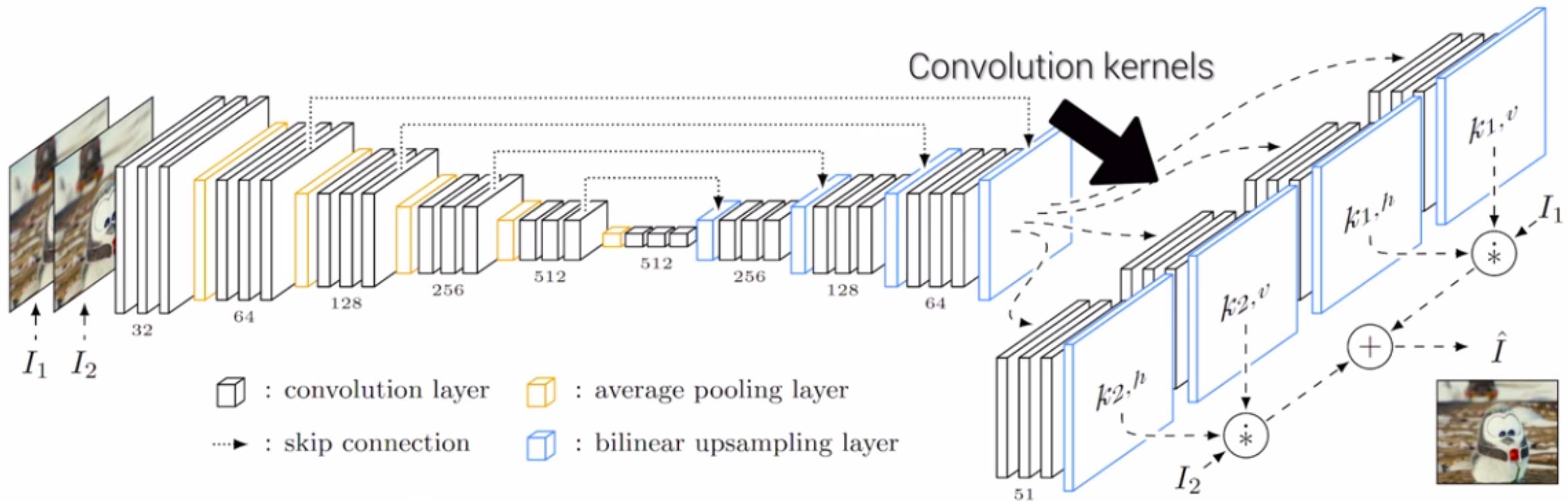
## AutoML



### 3. Artificial General Intelligence

# A neural network creates another one!

- Output: neural network



# Goal

- What is the future of AI?
- How can you apply AI?
- How can you invent AI?

You will be a leader in Deep Learning

# Is this a right time ?

- **Is this a right time to unlock the potential of AI ?**

Unlock the potential of modern travel

Commercial jet flights – Pay per trip

Jet Engine

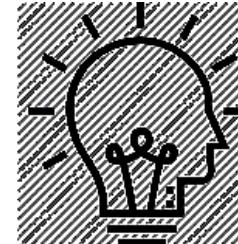
Oil

Unlock the potential of AI

Cloud/ Serverless - Pay per Seconds

Deep Learning algorithms

Data



# How you can lead?

How you lead the transition?

Create your custom AI model using your data

Access to cloud scale compute

Distributed training using 100's of GPUs/TPUs to train your neural network in minutes

Serve your model & scale for million of predictions/sec.

Pay per second in Cloud/Serverless with Cloud ML



Leverage easy to use libraries such as Keras to quickly prototype your deep learning network architectures



Develop easily using Deep Learning frameworks

Use algorithms coming out of research community using Tensorflow Canned estimators



Repurpose existing models such as inception for your market needs

Create solutions using AI Services

Affordable access to AI API



# Next

Jump start your 1<sup>st</sup> experiment

You will be a leader!

For more like this, <https://sites.google.com/view/AIforEveryone>