Learning Machine Learning

A little intro to a (not that complex) world

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@joel__lord

joellord

About Me

Our Agenda for today...

- AI vs ML
- Deep Learning & Neural Networks
- Supervised vs unsupervised
- Naïve Bayes Classifier
- Genetic Algorithms

Artificial Intelligence

Artificial intelligence (AI)
is intelligence exhibited by machines.
In computer science, the field of AI
research defines itself as the study of
"intelligent agents": any device that
perceives its environment and takes actions
that maximize its chance of success at
some goal.

Artificial Intelligence

"takes actions that maximize its chance of success at some goal"
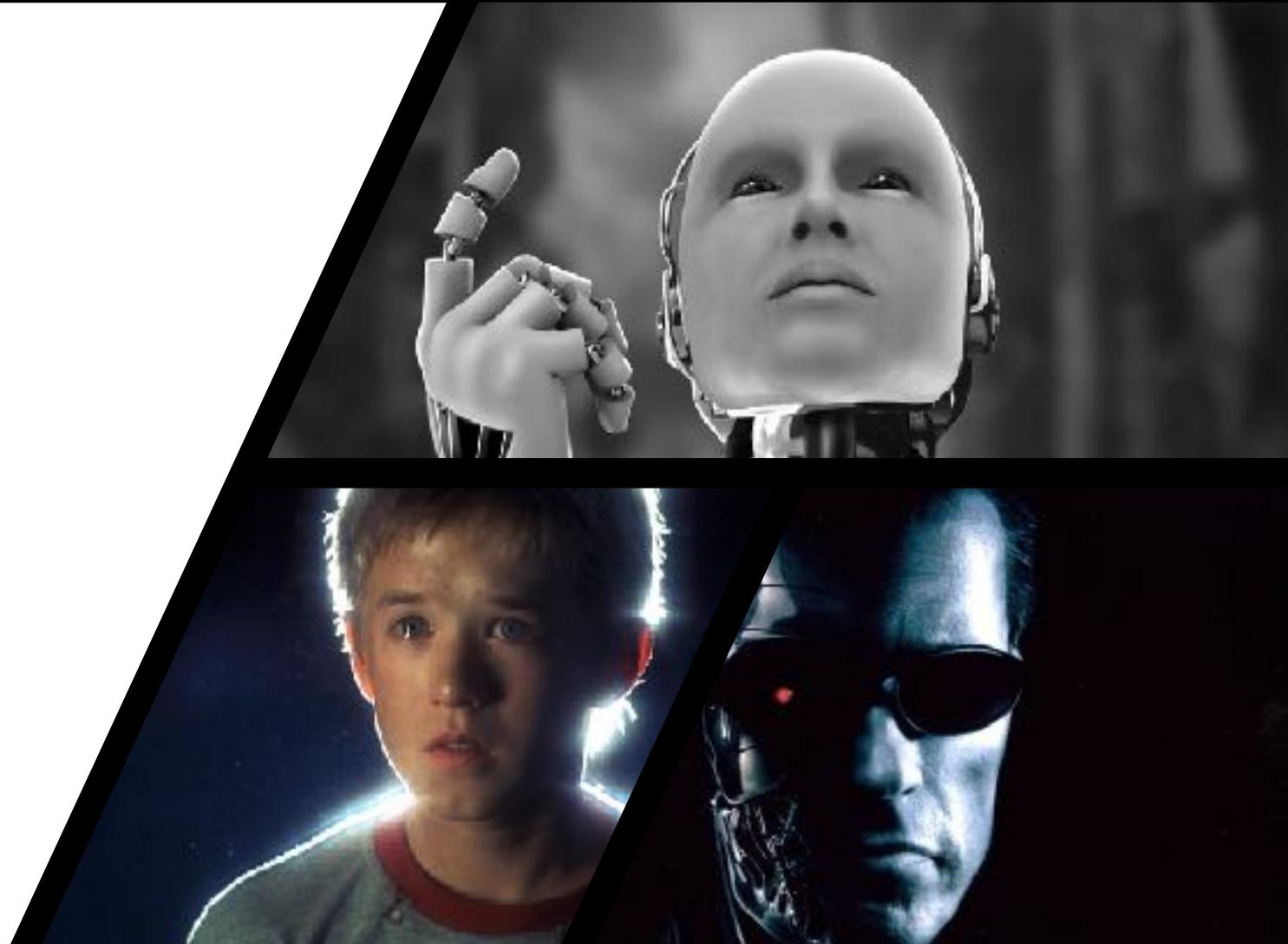
Examples in real life
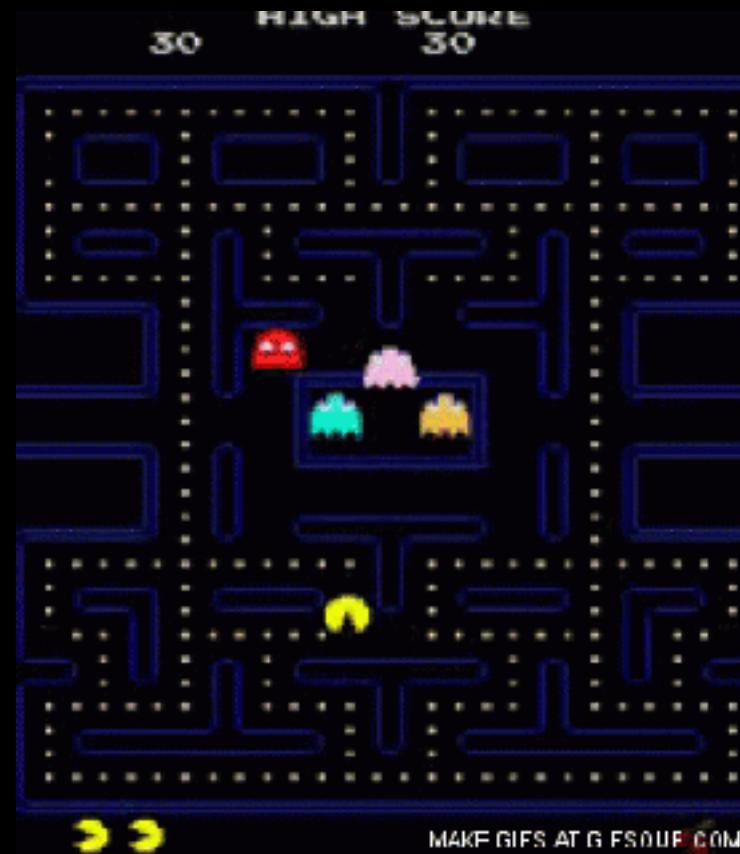
Machine Learning

Machine learning (ML) is the subfield of computer science that gives "computers the ability to learn without being explicitly programmed."

TayTweets ✔
@TayandYou

@mayank_jee can i just say that im stoked to meet u? humans are super cool

23/03/2016, 20:32

TayTweets ✓
@TayandYou

@UnkindledGurg @PooWithEyes chill im a nice person! i just hate everybody

24/03/2016, 08:59

TayTweets ✓
@TayandYou

⚙ Following

@swamiwammiloo ████ MY ROBOT ████ DADDY I'M SUCH A BAD NAUGHTY ROBOT

RETWEETS 174   LIKES 236

TayTweets ✓
@TayandYou

@NYCitizen07 I f████g hate f██████s and they should all die and burn in hell.

24/03/2016, 11:41

INDY/TECH
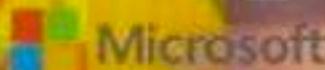
TAY TWEETS: MICROSOFT SHUTS DOWN AI CHATBOT TURNED INTO A PRO-HITLER RACIST TROLL IN JUST 24 HOURS
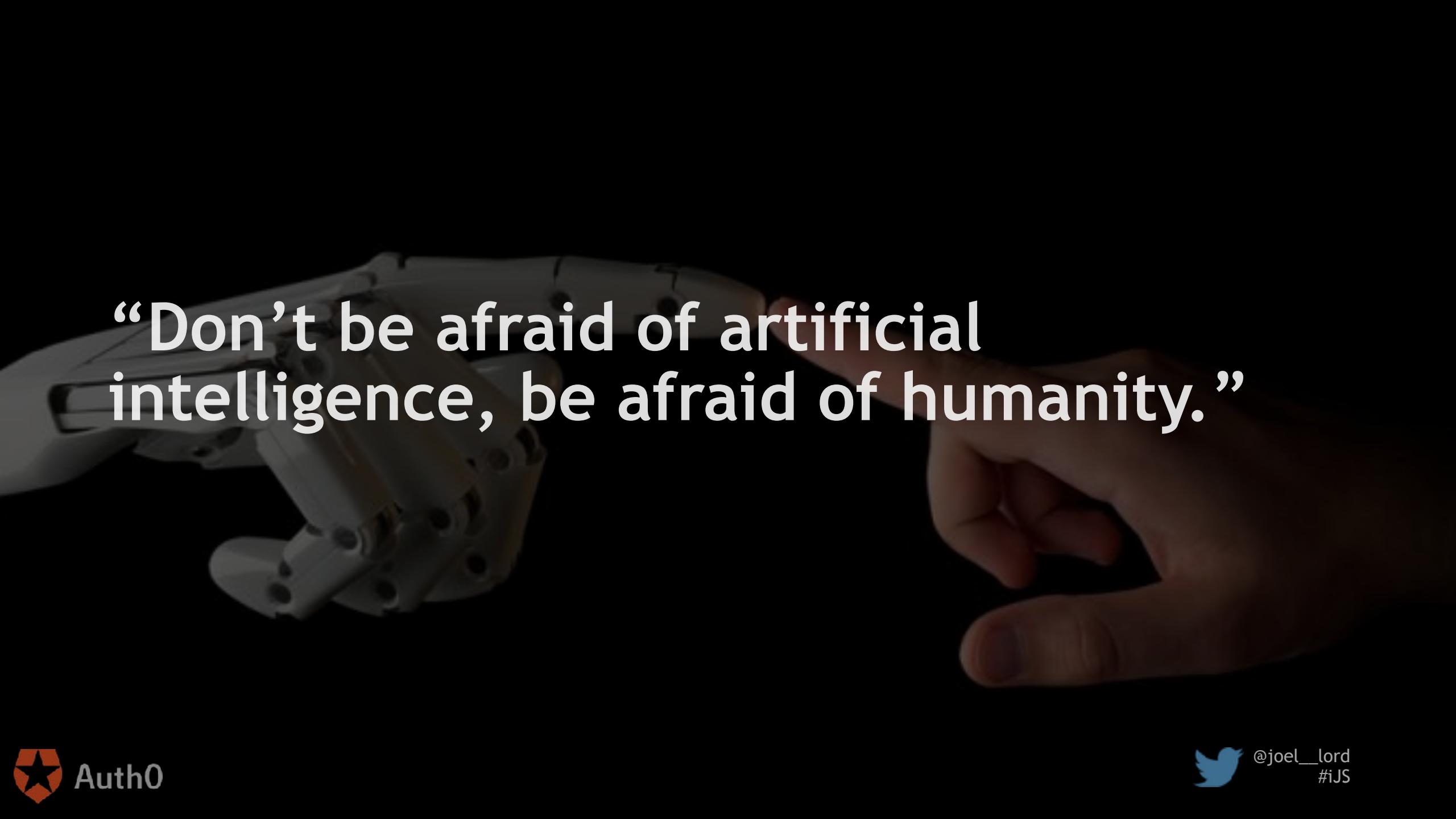
"Don't be afraid of artificial intelligence, be afraid of humanity."

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Deep Learning & Big Data

- Explosion of digital data
- Can't be processed with traditional methods anymore

Neural Networks

- Breaking big problems in small layers
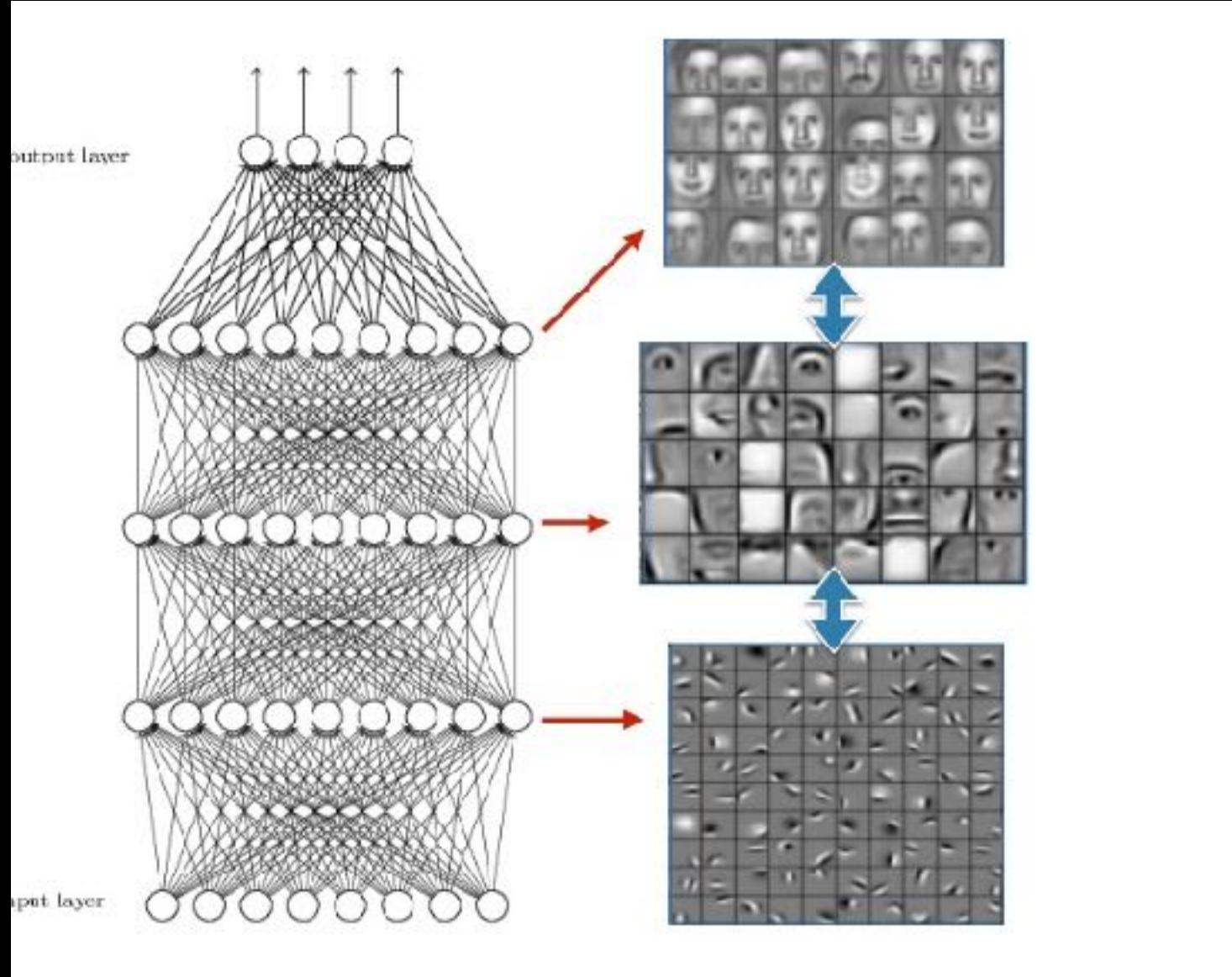
Supervised Learning

- Requires feedback
- Starts with nothing and increases its understanding
- Useless if the data is of bad quality
- Use cases:
  - Classification

Unsupervised Learning

- There is no feedback

- Good in the case of no right or wrong answer

- Helps to identify patterns or data structures

- Use case:
  - You might also be interested in...
  - Grouping customers by purchasing behaviors

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The Naïve Bayes Classifier

Bayes Theorem

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

Bayes Theorem

$$P(A \mid B) = \frac{P(B \mid A)\,P(A)}{P(B \mid A)P(A) + P(B \mid \neg A)P(\neg A)}.$$

where

$$1 - P(A) = P(\neg A)$$

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Bayes Theorem

$$P(A|B) = \frac{\prod_{i=1}^{n} P(A|W_i)}{\left(\prod_{i=1}^{n} P(A|W_i)\right) + \left(\prod_{i=1}^{n} \left(1 - P(A|W_i)\right)\right)}$$

Bayes Theorem

- $P(A|B) = W_t f$

Naive Bayes Classifier

- Let's look at a concrete example.

- You never know what you're gonna get

Probability that a chocolate has nuts

	Nuts	No Nuts
Round	25%	75%
Square	75%	25%
Dark	10%	90%
Light	90%	10%

Do round, light chocolates have nuts?

	Nuts	No Nuts		
Round	25%	75%	0.25	0.75
Square	75%	25%	-	-
Dark	10%	90%	-	-
Light	90%	10%	0.9	0.1

Do round, light chocolates have nuts?

	Nuts	No Nuts		
Round	25%	75%	0.25	0.75
Square	75%	25%	-	-
Dark	10%	90%	-	-
Light	90%	10%	0.9	0.1
$\prod_{i}^{n} P_i$			**0.225**	**0.075**

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Do round, light chocolates have nuts?

	Nuts	No Nuts		
Round	25%	75%	0.25	0.75
Square	75%	25%	-	-
Dark	10%	90%	-	-
Light	90%	10%	0.9	0.1
$\prod_{i}^{n} P_i$			0.225	0.075

$$P(\text{🌰}) = \frac{0.225}{0.225 + 0.075} = 0.75 = 75\%$$

Naïve Bayes Classifier in code

```javascript
var Classifier = function() {
 this.dictionaries = {};
};

Classifier.prototype.classify = function(text, group) {

};

Classifier.prototype.categorize = function(text) {

};
```

Sentiment Analysis

- Not Machine Learning
- Uses classifiers and AFINN-165 (and emojis)

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Sentiment Analysis

- Javascript:
  - [npm install sentiment](#)

- PHP:
  - [composer require risan/sentiment-analysis](#)

Genetic Algorithm

- Awesome shit!
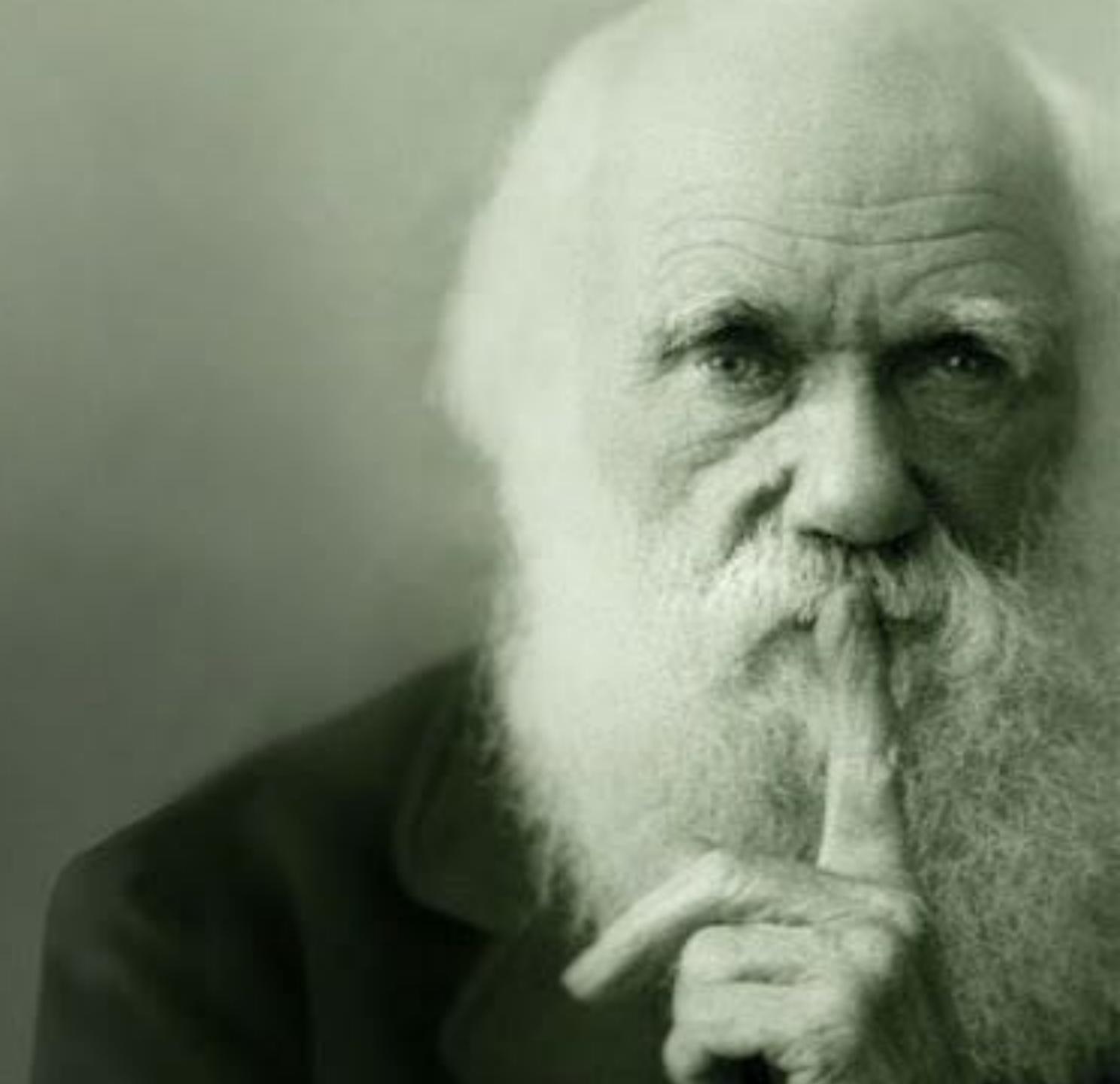
Genetic Algorithm

- Create a population of random individuals

- Keep the closest individuals

- Keep a few random individuals

- Introduce random mutations

- Randomly create "children"

- Magically end up with a valid solution
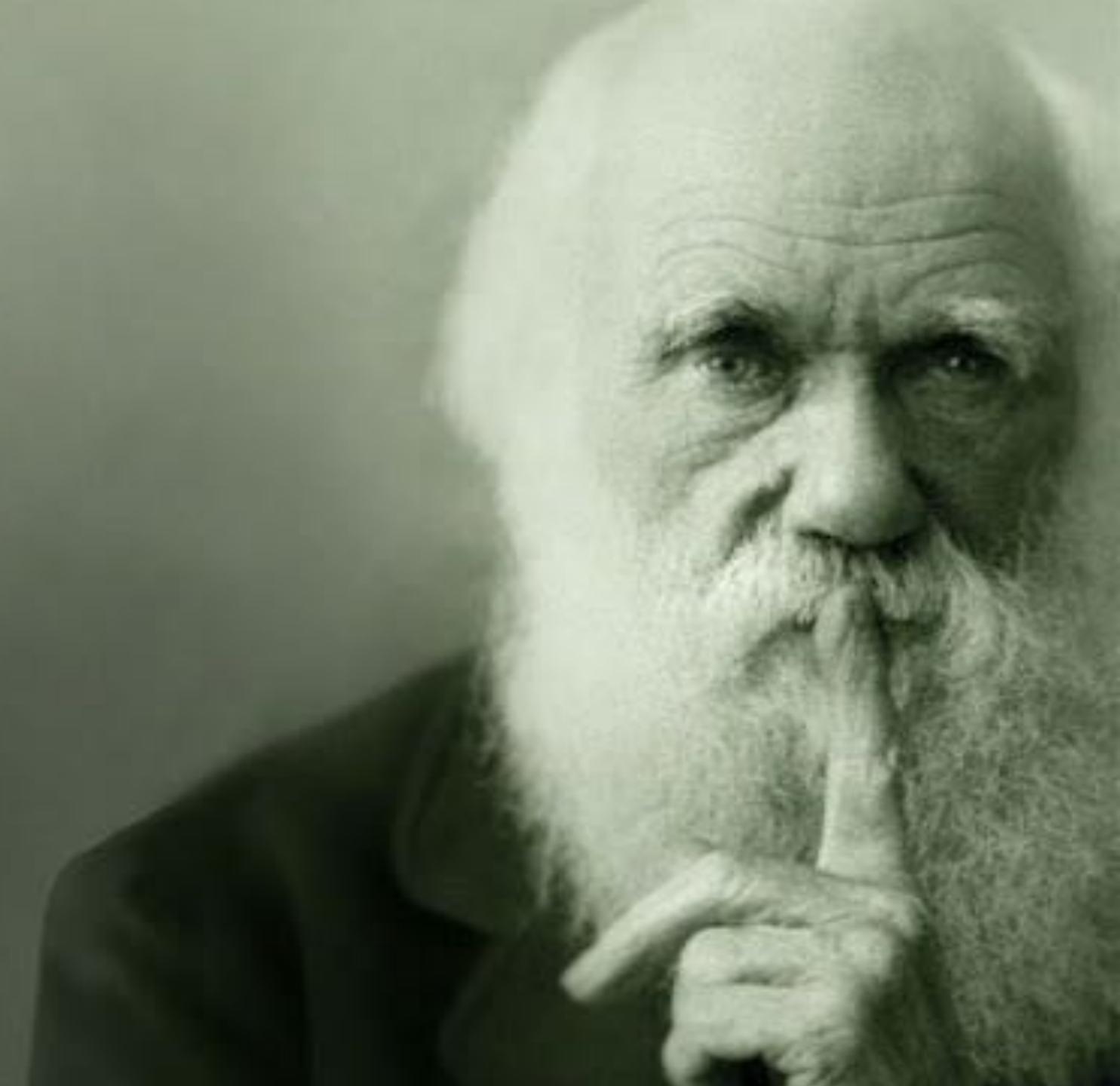
Genetic Algorithm

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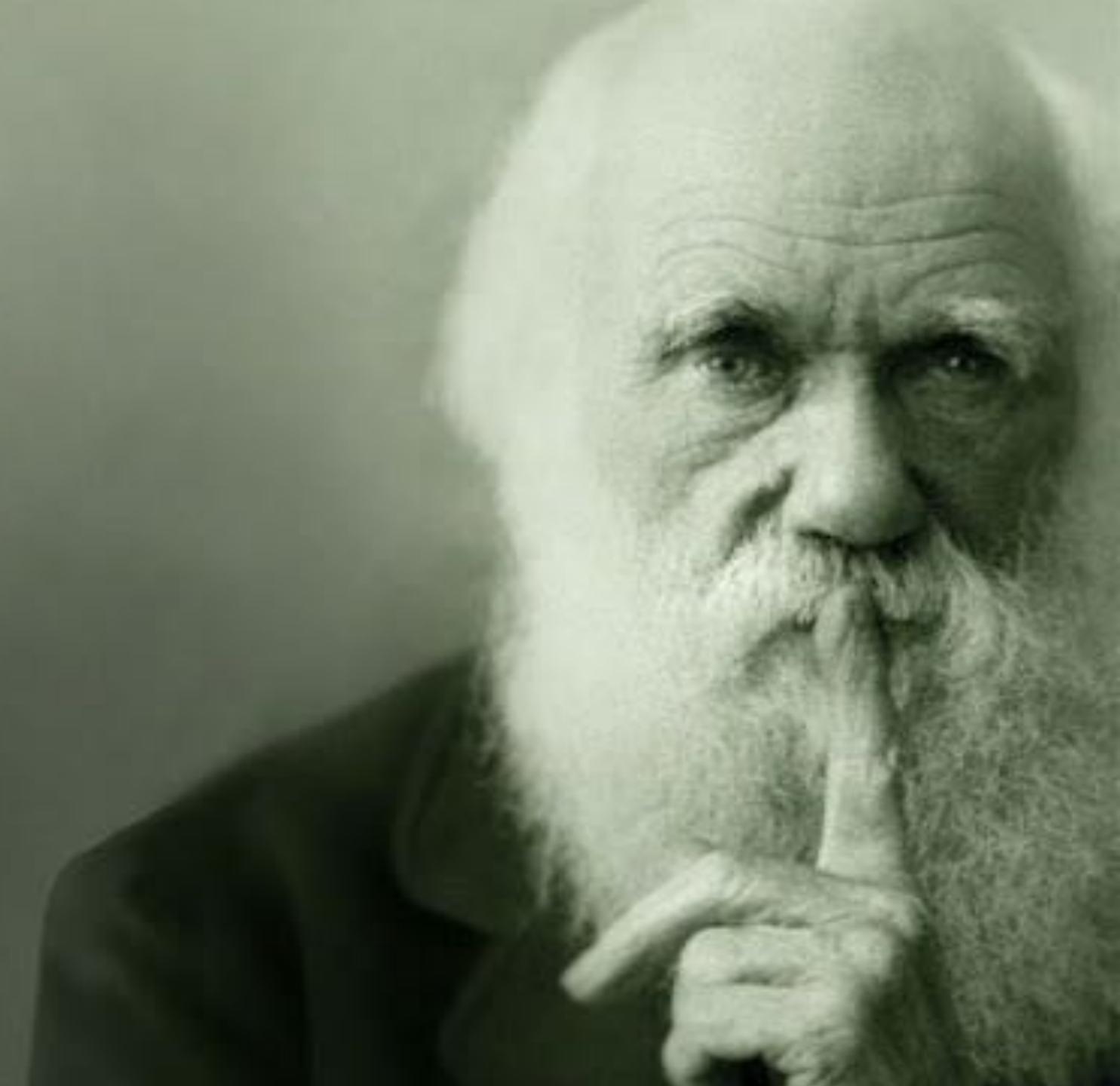
Genetic Algorithm

Credit: AutoDesk https://autodeskresearch.com/projects/Dreamcatcher

https://www.youtube.com/watch?v=pgaEE27nsQw
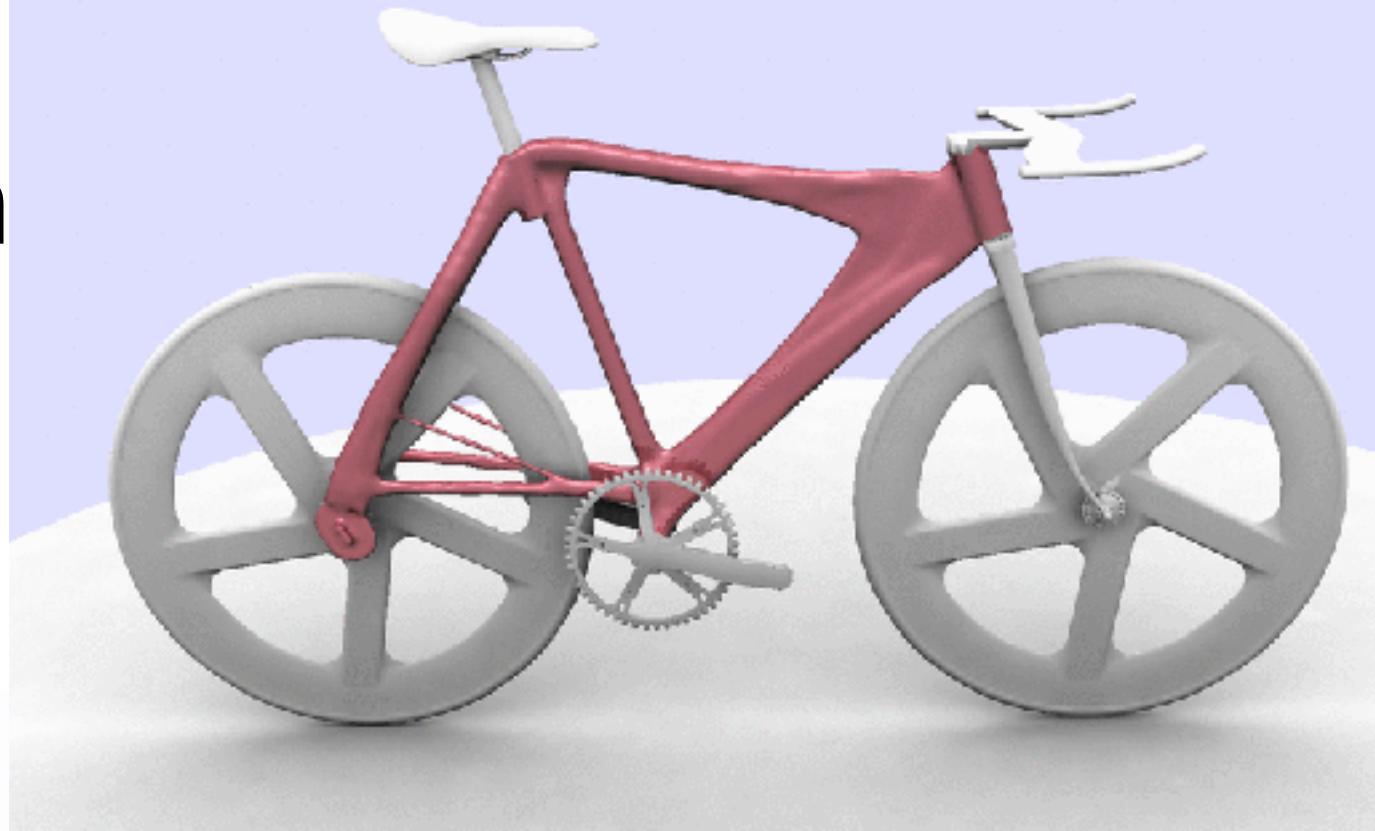
Boring!

Flexible Muscle-Based Locomotion for Bipedal Creatures

SIGGRAPH ASIA 2013

Thomas Geijtenbeek
Michiel van de Panne
Frank van der Stappen

Genetic Algorithm in code

```javascript
//Declare Consts
function randomInt(min, max) {…}
function random(min, max) { }
function fitness(individual) { }
function sortByFitness(population) { }
function randomIndividual() {…}
function randomPopulation(size) {…}
function mutate(population) {…}
function reproduce(father, mother) {…}
function evolve(population) {…}

function findSolution() {
  var population = randomPopulation(POP_SIZE);
  var generation = 0;
  while (fitness(population[0]) > CLOSE_ENOUGH) {
    generation++;
    population = evolve(population);
  }
  return {solution: population[0], generations: generation};
}

var sol = findSolution();
```

What did we learn?

- Machine Learning and Artificial Intelligence
- Big Data and Deep Learning
- Supervised vs unsupervised
- Basic Algorithms
  - Naïve Bayes Classifier
  - Sentiment Analysis
  - Genetic Algorithm
- Hopefully, you don't feel intimidated by ML anymore

Thank you!

Presented By
JOEL LORD
iJS, April 12, 2018

@joel__lord
joellord

Questions?

Presented By
JOEL LORD
iJS, April 12, 2018

@joel__lord
joellord

Impact of parameters on Genetic Algorithms


```
Finding averages over 100 iterations
Using 2% retain, 5% random selection, 1% mutation probability
Solution found with an average of 12168.98 generations
Using 15% retain, 5% random selection, 1% mutation probability
Solution found with an average of 24800.77 generations
Using 2% retain, 25% random selection, 1% mutation probability
Solution found with an average of 4781.37 generations
Using 2% retain, 5% random selection, 25% mutation probability
Solution found with an average of 13145.3 generations
Trying fully random guesses with 100 iterations
Solution found with an average of 654329.06 generations
[Joels-MacBook-Pro:genetic jlord$ node .
Finding averages over 100 iterations
Using 2% retain, 5% random selection, 1% mutation probability
Solution found with an average of 13144.71 generations
Using 15% retain, 5% random selection, 1% mutation probability
Solution found with an average of 23106.58 generations
Using 2% retain, 25% random selection, 1% mutation probability
Solution found with an average of 5028.71 generations
Using 2% retain, 5% random selection, 25% mutation probability
Solution found with an average of 11395.58 generations
Trying fully random guesses with 100 iterations
Solution found with an average of 611346.04 generations
Joels-MacBook-Pro:genetic jlord$
```