

# Problems:

- Reasoning, problem solving
- Knowledge representation
- Planning
- Learning
- Natural language processing
- Perception
- Motion and manipulation
- Social intelligence
- General intelligence

# Machine Learning

Part 1

# Sherlock Holmes

A fictional private detective

What made him so good ?

- Good observation skills
- Intelligence
- Memory

... but there was one more thing...

# Pattern Recognition

- He recognised patterns of criminals from his experience
  - Previous behaviour of people
  - Previous behaviour of criminals
  - Clothing, tyre marks, bite marks , poison effects, etc.  
,etc.
  - Patterns of crime scenes
  - Patterns of people – scars, gait, voice, clothing
- We see this pattern in all fictional crime movies and series

# Pattern Recognition

Real police use patterns when looking for criminals.

Real detective remember patterns from previous cases

Patterns of people

- Fingerprints
- Face
- Gait
- Social media profile and internet history
- Browser profile (we may cover that in another lesson)
- Tattoos
- Location/area
- Clothing
- Circle of friends/Known associates
- Speech pattern

# Information Online

- All the above patterns we wilfully enter into different online systems
- If Sherlock Holmes tried to remember patterns from 100,000 crimes it would take him about **30 years** (to read names, places , see pictures etc, if he did 10 per day)
- Billions of people upload their patterns to online systems every second

# Some statistics

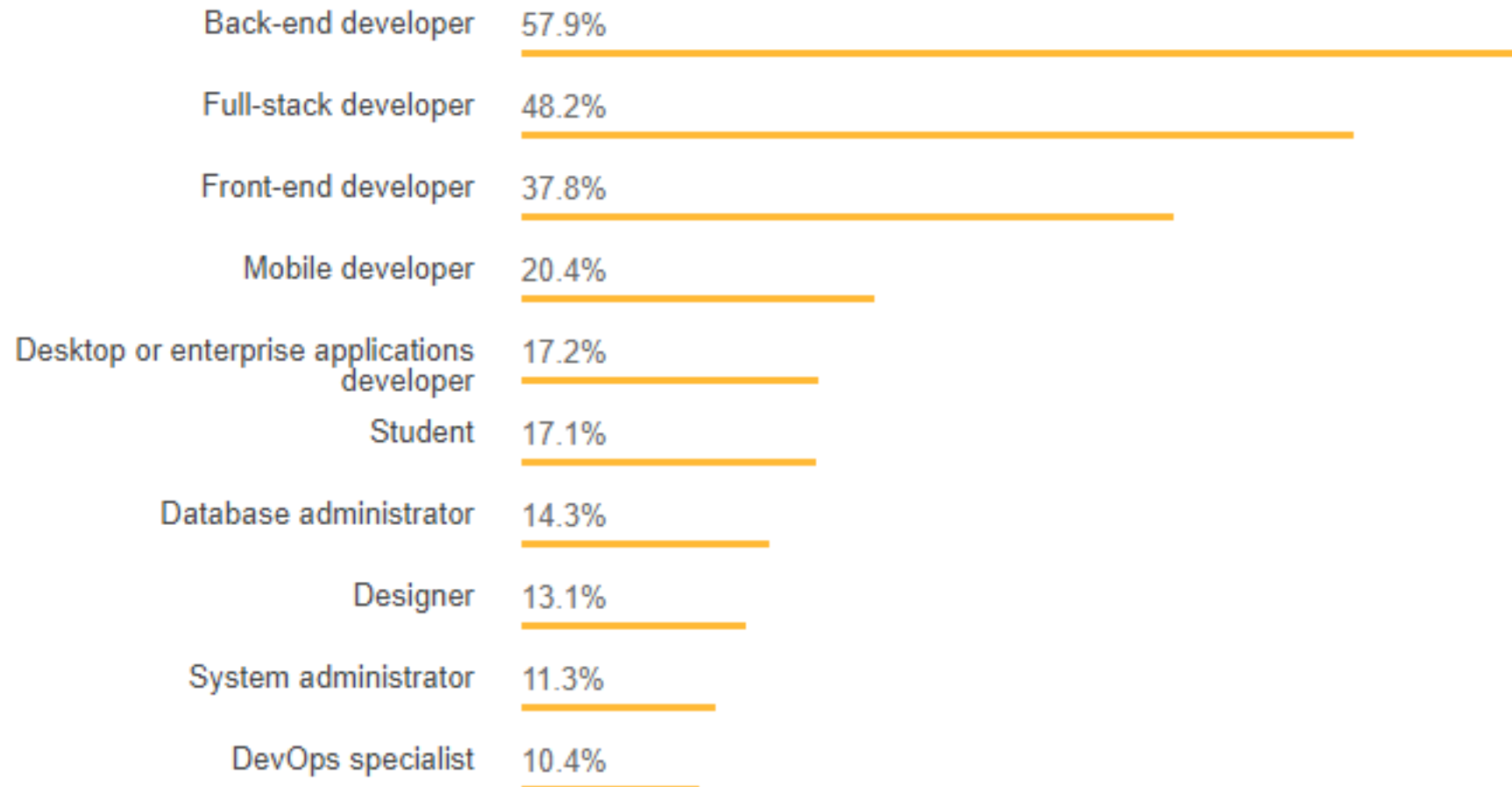
- Facebook – 2.7 billion monthly users
- YouTube – 1.8 billion monthly users (400 hours video uploaded/min)
- Instagram – 1.1 billion monthly users
- Twitter – 330 million monthly users (> 500 million tweets/day)
- Snapchat – 300 million monthly users

So, what does this have to do with  
Machine Learning ?

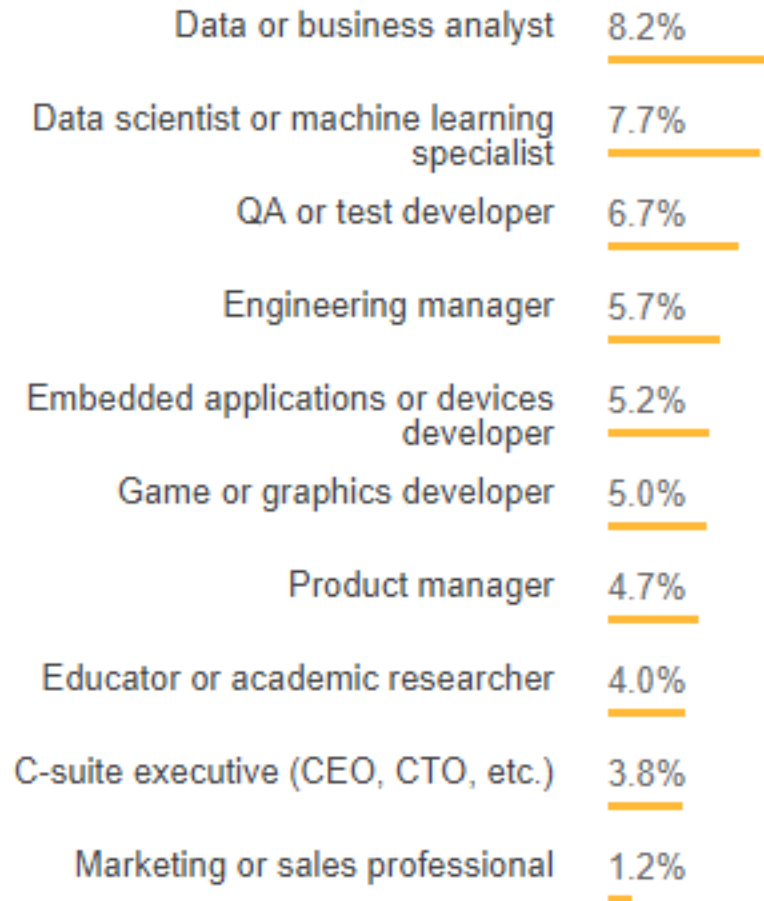


# More statistics – StackOverflow.com

## Developer Type



# More statistics – StackOverflow.com



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*92,098 responses; select all that apply*

# More statistics – StackOverflow.com

Survey Respondents

Monthly Stack Overflow Visits

Professional Developers



# More statistics – StackOverflow.com

## Gender

All Respondents

Professional Developers

Students

Male	93.1%
Female	6.7%
Non-binary, genderqueer, or gender non-conforming	0.9%

60,389 responses; select all that apply

## GENDER SHADES

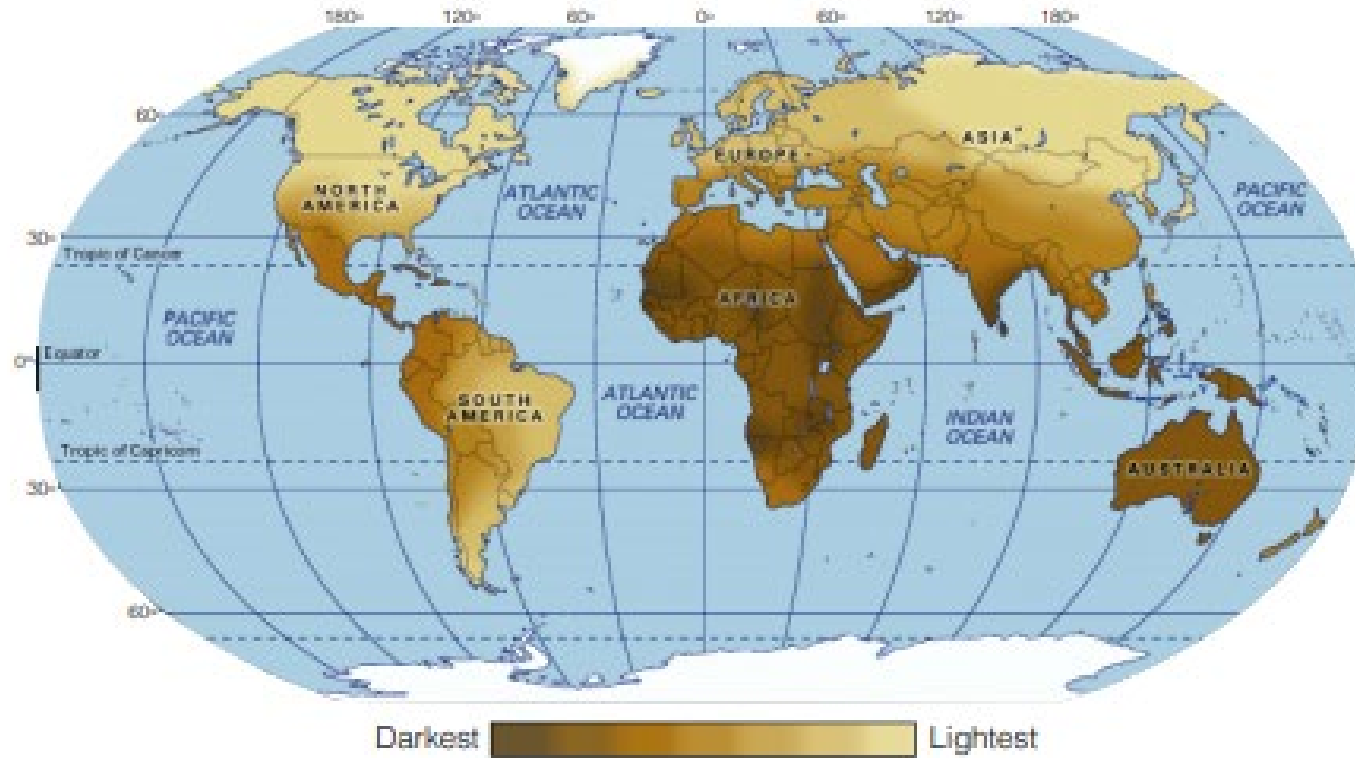


Figure 2: The global distribution of skin color. Most Africans have darker skin while those from Nordic countries are lighter-skinned. Image from ([Encyclopedia Britannica](#)) ©Copyright 2012 Encyclopedia Britannica.

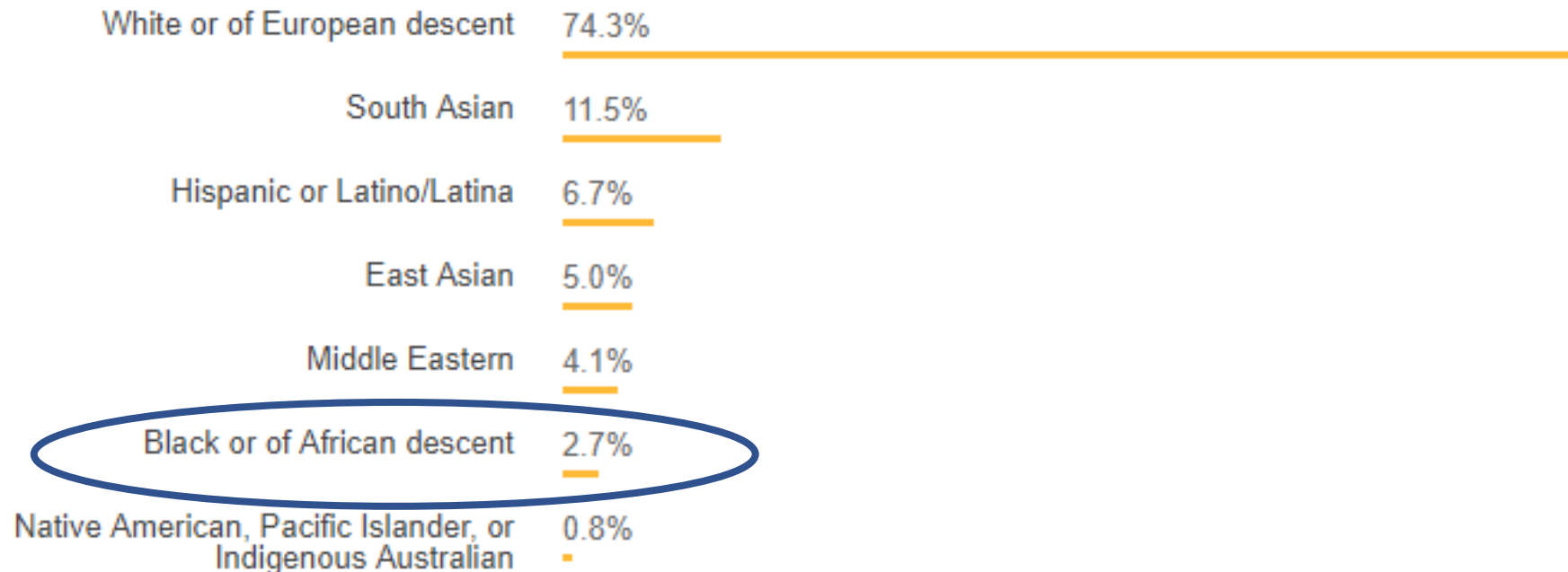
# More statistics – StackOverflow.com

## Race and Ethnicity

All Respondents

Professional Developers

Students



53,982 responses; select all that apply

# Problems with Patterns...

- Police UK
  - Average rate of recognition – 5%
  - Eg. Notting Hill Carnival – 2% \* **Big Brother Watch report May 2017**
- Police US
  - 28 current members of Congress were matched in 25000 mugshots
  - Software made by Amazon and Microsoft \***ACLU report July 2018**
  - “The false matches were disproportionately of people of color, including six members of the Congressional Black Caucus, among them civil rights legend Rep. John Lewis (D-Ga.)”

# Racial Bias in Amazon Face Recognition





# Next week

- Why white male majority software is bad for all software but very bad for machine learning and what you can do to change it.
- Effects on Machine Learning and it's uses in our everyday life. (police, marketing, medicine, and more)
- Jobs that Machine Learning **will eliminate**
- Machine Learning tools