

# CAREER TRANSITION TO ARTIFICIAL INTELLIGENCE

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# Outline

## ① BACKGROUND

## ② INTRODUCTION

## ③ ROLES

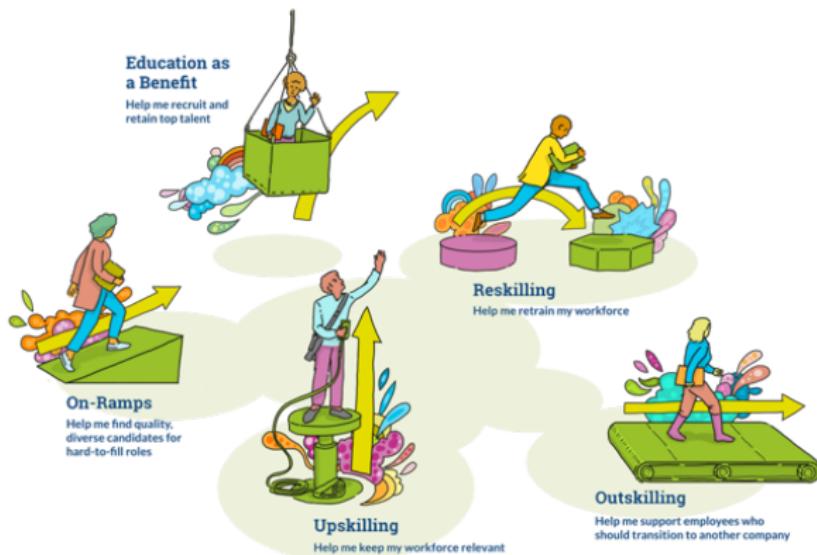
## ④ PREPARATION

## ⑤ REFERENCES

# Career in AI: Background

## Current State

- ▶ 44% of US workforce < \$18K/yr (< poverty line), works 80-100 hrs/week
- ▶ Automation CAGR 7% (as per BCG), to reach \$114B by 2025



(Ref: As Pressure To Upskill Grows, 5 Models Emerge – Forbes.com)

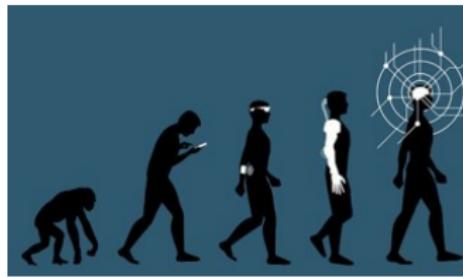
# Examples

Less mechanical, automatable

- ▶ Bill and account collectors
- ▶ Data entry operators
- ▶ Computer network support
- ▶ Administrative assistants
- ▶ Insurance sales agents

More Cognitive, Creative, Human

- ▶ Software developers
- ▶ Human resources managers
- ▶ Psychologists
- ▶ Sportsman
- ▶ Nurses, care



(Source: The Simplistic Debate Over Artificial Intelligence – Preston  
Estep )

# Changes

## Technological

- ▶ AI deluge
- ▶ Digitization → Data + APIs
- ▶ Remote \*

## Social

- ▶ Over interaction + isolation
- ▶ Obsolete roles, emergence of new
- ▶ Lifelong re-skilling



(Source: Rise of the Chatbots: How AI Changed Customer Service – Salesforce.com)

## Financial

- ▶ Widening gap
- ▶ Flatter world
- ▶ Gigs over jobs

# Data Science — Artificial Intelligence is critical in bringing intelligent automation

What are Data Sciences?  
What is Artificial Intelligence?  
What is Machine Learning?  
What is Deep Learning?

## What is Data Science?

- ▶ Science of Data (obviously)
- ▶ Use of Data for Applications
- ▶ Some parts of AI uses Data to find patterns and insights which are helpful in multiple applications
- ▶ Machine and Deep Learning that part of AI that leverages data.

So, more on AI-ML soon ...

# Introduction to Artificial Intelligence

The logo consists of the letters "YHK" enclosed in a thin black rectangular border.

“Houston, we have a problem!!”



50 Years Ago: “Houston, We’ve Had a Problem” – John Uri

YHK

## Whats the Problem?

- ▶ Along with some softer words like “disruption”, “passionate”, “excited” ...
- ▶ If you don't have word “innovation” in your talk/speech/conversation it's BIG problem.
- ▶ Irrespective of fields. You can be Corporate, Political, Social, etc.

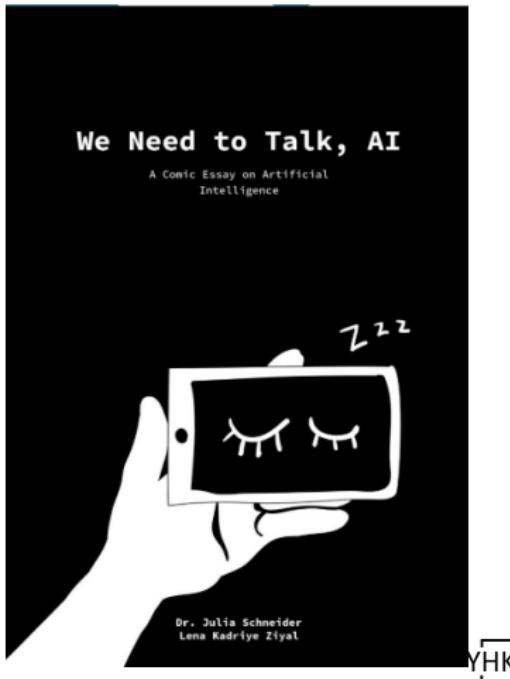
And there is an addition of one more word, which is a must in every talk...and that is?

# The Problem

Every company is claiming to be working in AI-ML

- ▶ Is it really so?
- ▶ What exactly is AI (ML)?
- ▶ What is not AI?

Or is it just a plain BIG hype?



# What is the Core Idea?

YHK

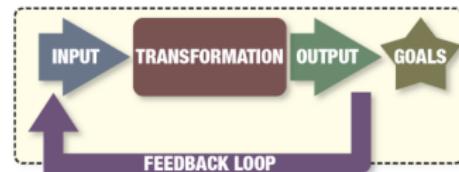
# What's the core idea?

- ▶ behind problem solving?
- ▶ behind writing software algorithms?
- ▶ solving research problems?



# Desire

- ▶ To find a “function”
- ▶ To find a relation
- ▶ To find a transformation
- ▶ To build a model
- ▶ From given inputs to desired outputs.  
That's it.



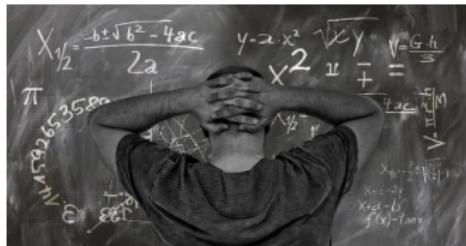
# Functions

- ▶ Some functions are straight forward
- ▶ *"In summer, ice-cream sale goes up"*
- ▶ Cause and effect
- ▶ Relation (function, Mathematical model) is found out
- ▶ Here, simple rule based programming suffices



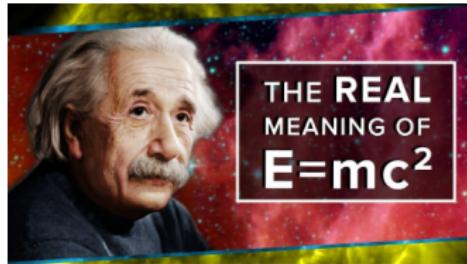
# Functions

- ▶ But some functions are complex
- ▶ *"More you put efforts, your business flourishes."*
- ▶ Cause and effect again, but the relation is far too complex
- ▶ Too many variables
- ▶ Here, simple rule based programming not humanly possible.
- ▶ Lots of research needed to come up with equations.



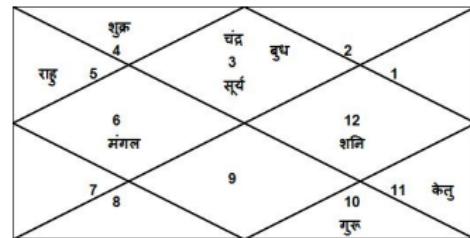
# Functions

- ▶  $E = mc^2$
- ▶ What's this? a function?
- ▶ Input variable(s)?
- ▶ Output variable(s)?
- ▶ Parameters?
- ▶ How's the relation? linear?



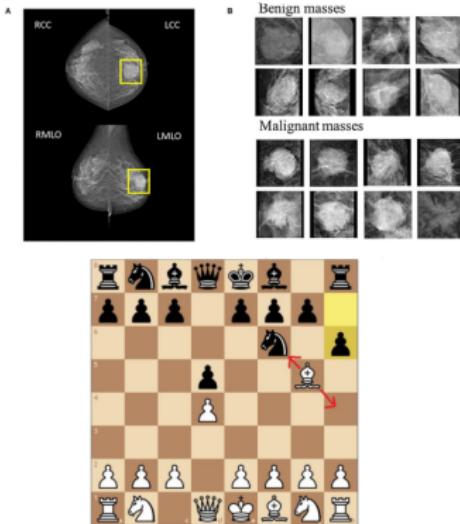
## Controversial Example

- ▶ Even astrology is a model, based on the past cases.
- ▶ Could claim empirical evidence.
- ▶ Given this planetary position, it predicts.
- ▶ Represented by "Horoscope"
- ▶ Got weights for each planets (real or fictitious)
- ▶ Reliable??



# Functions

- ▶ But most real-life functions are not deterministic
- ▶ Some are probabilistic, some non-linear.
- ▶ “*Detecting if the tumor is benign or malignant*”
- ▶ “*At any state in the game of chess, what's the next move?*”



## Chess: next move?

- ▶ Needs extreme expertise
- ▶ Needs “intelligence”
- ▶ How do you get that?
  - ▶ Built by lots of training.
  - ▶ By studying lots of past games.
- ▶ This is how Humans build intelligence



# Intelligence

- ▶ Can machine (software/program) also do the same?
- ▶ Can it play chess?
- ▶ Can it build intelligence?
- ▶ By looking at past experiences (data),
- ▶ Training Data: games played, moves used, etc.

Yes, it can!! That's Artificial Intelligence.



# What is Artificial Intelligence?



## My definition

“If machines (or computer programs) start doing some/all of these “intelligent” tasks, then that’s Artificial Intelligence”

## Intelligence: the differentiation

- ▶ Ability to think various domains
- ▶ Ability produce something new
- ▶ Ability to detect the unseen
- ▶ Ability to enhance knowledge (rules, patterns)



All these, AI has started doing. The AI era has arrived!!

## Everyday usage

Artificial intelligence seems to have become ubiquitous.

- ▶ Replying to our emails on Gmail
- ▶ Learning how to drive our cars,
- ▶ Sorting our holiday photos.
- ▶ etc.



Too good to be true, isn't it, sort of Magical !!

## But then ...

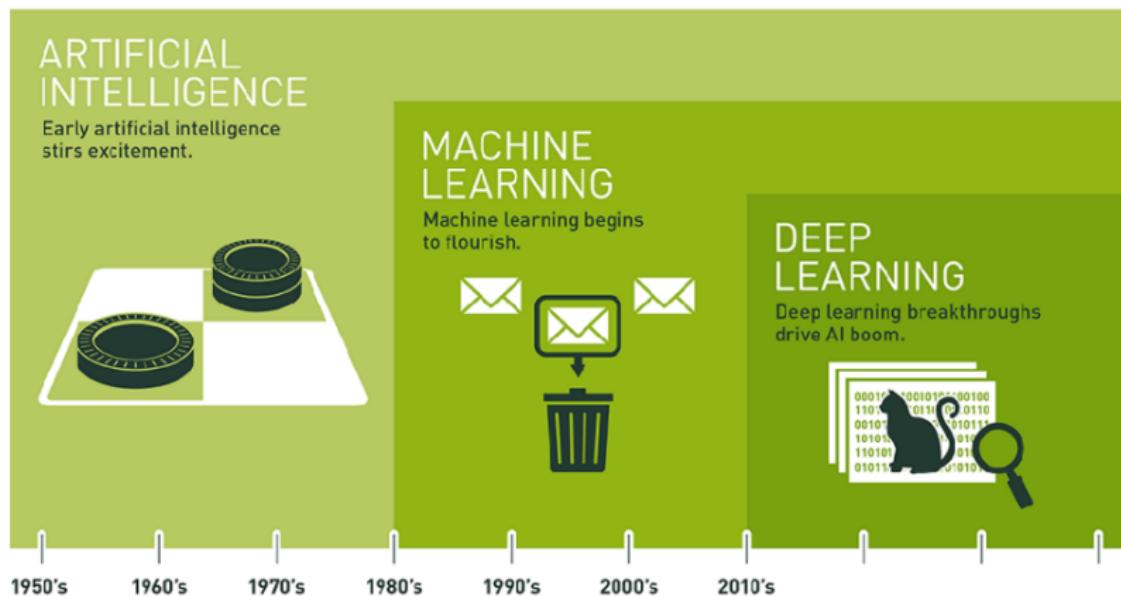
- ▶ When its too good, you start suspecting
- ▶ Is it for real!!
- ▶ How can such thing happen?
- ▶ How far will it go?



The next thing you know, people are worrying about exactly how and when AI is going to doom humanity.

# AI, ML, DL ... Same?

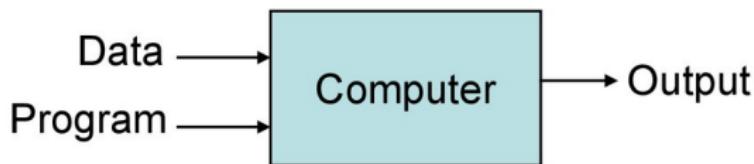
Or Relationship between them ?



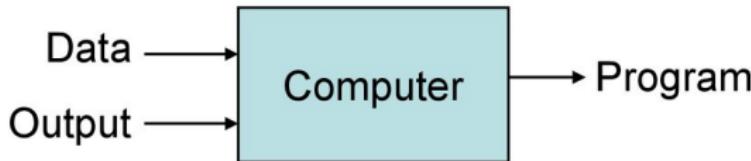
(Ref: <https://blogs.nvidia.com/blog/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai/>)

# Traditional vs. Machine Learning?

## Traditional Programming



## Machine Learning



# Why Machine/Deep Learning?

- ▶ Problems with High Dimensionality
- ▶ Hard/Expensive to program manually
- ▶ Techniques to model 'ANY' function given 'ENOUGH' data.
- ▶ Job \$\$\$

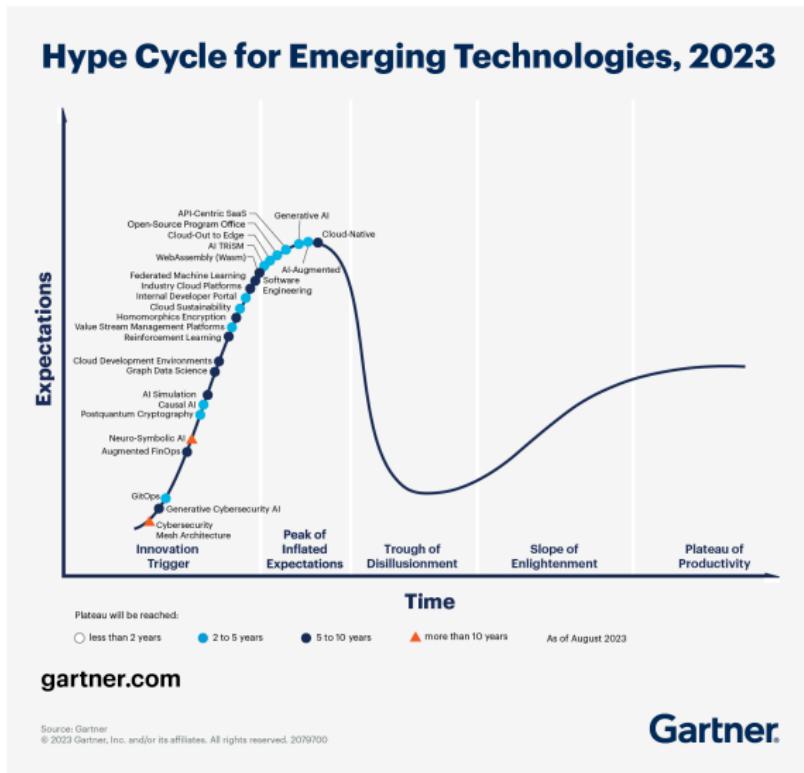


## Why now?

- ▶ Flood of data (Internet, IoT)
- ▶ Increasing computational power
- ▶ Easy/free availability of algorithms
- ▶ Increasing support from industries



# Gartner Hype Cycle Emerging Technologies 2023



# Is AI a threat?



## Is AI a threat?

If you believe in what Elon Musk says, then YES.



*Elon Musk recently commented on Twitter that artificial intelligence (AI) is more dangerous than North Korea*

(Ref: What is Artificial Intelligence — Artificial Intelligence Tutorial For Beginners — Edureka)

# Is AI a threat?

If you believe in these movies, then YES.



The Terminator



I, Robot



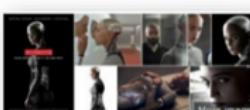
The Matrix



Tron: Legacy



War Games



Ex Machina

Well, AI based War robots are not impossible anymore.

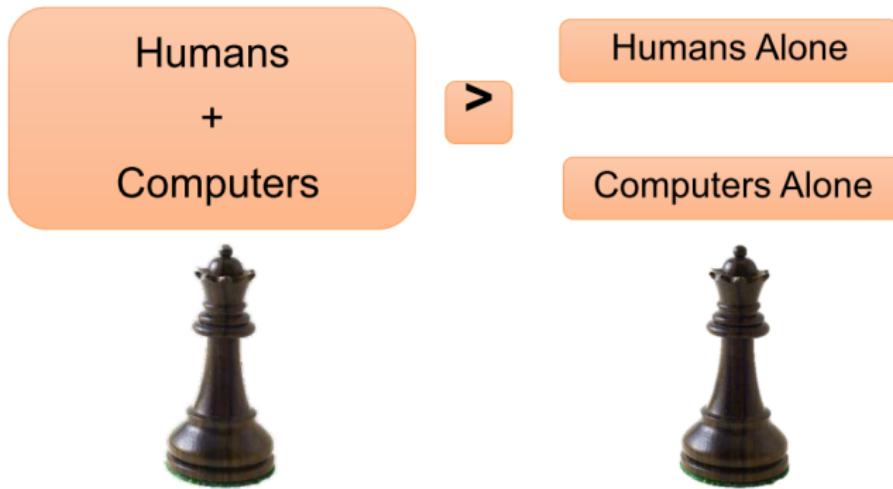
(Ref: What is Artificial Intelligence — Artificial Intelligence Tutorial For Beginners — Edureka)

## Fear: Are we being replaced?

- ▶ Yes. in tasks that are repetitive
- ▶ But not which require complex thinking and creativity

# Mostly

Technology Enhancing (Not Replacing) Humans



(Ref: "Artificial Intelligence Overview" - Harry Surden )

## Limits on Artificial Intelligence

- ▶ Many things still beyond the realm of AI
- ▶ No thinking computers
- ▶ No Abstract Reasoning
- ▶ Often AI systems Have Accuracy Limits
- ▶ Many things difficult to capture in data
- ▶ Sometimes Hard to interpret Systems

# Career in AI: Roles



# Data Science Roles

- ▶ Data Scientist
- ▶ Data Analyst
- ▶ Data Architect
- ▶ Data Engineer
- ▶ Statistician
- ▶ Database Administrator
- ▶ Business Analyst
- ▶ Data and Analytics Manager

(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

## Data Scientist Role

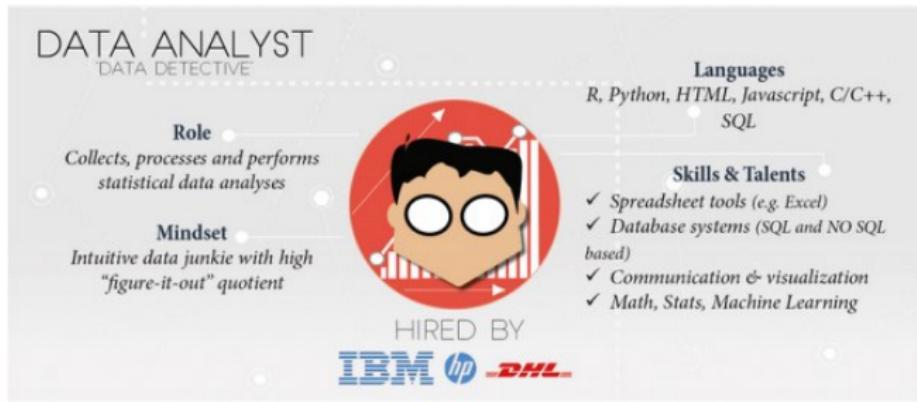
Able to handle the raw data, analyzing that data with the help of statistical techniques, to sharing his/her insights with his peers in a compelling way



(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

# Data Analyst Role

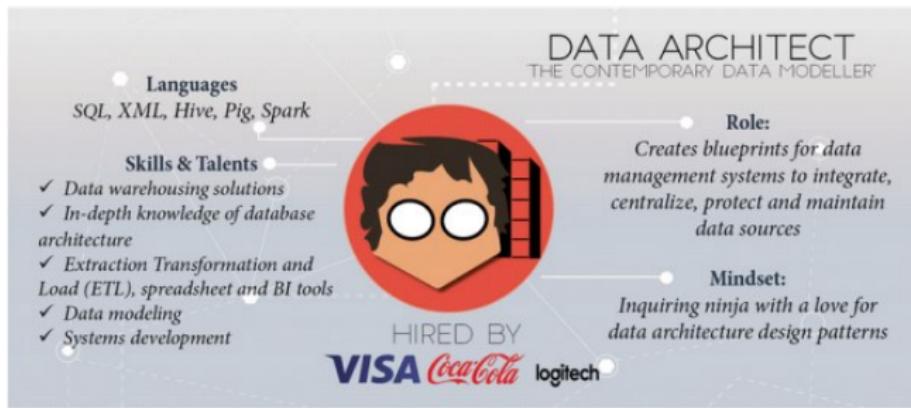
The data analyst is the Sherlock Holmes of the data science team.



(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

## Data Architect Role

Creates the blueprints for data management systems to integrate, centralize, protect and maintain the data sources.



(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

# Data Engineer Role

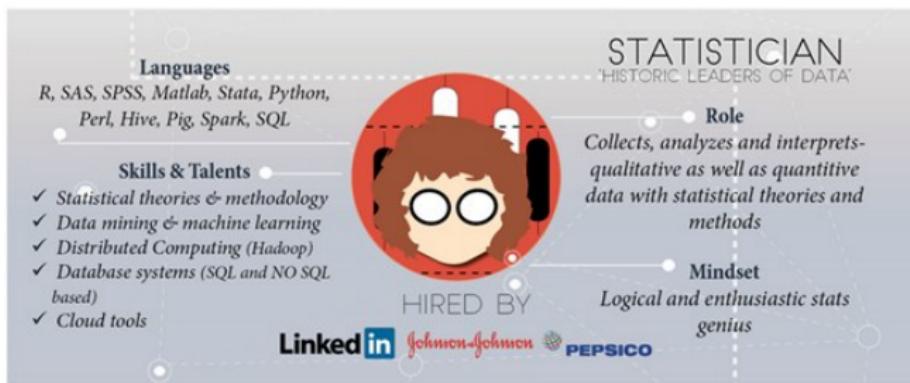
Has a background in software engineering and loves to play around with databases and large –scale processing systems.



(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

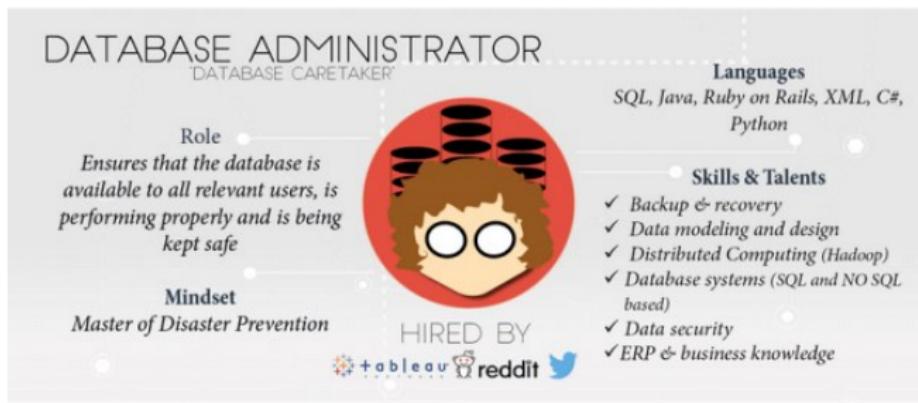
## Statistician Role

Harvests the data and turns it into information and knowledge.



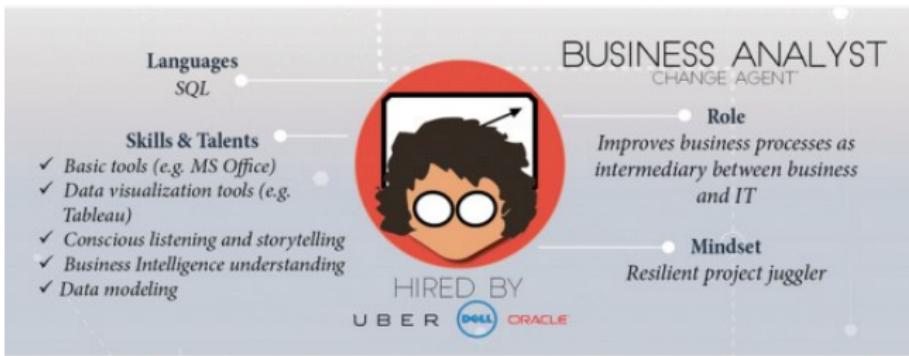
(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

# Database Administrator Role



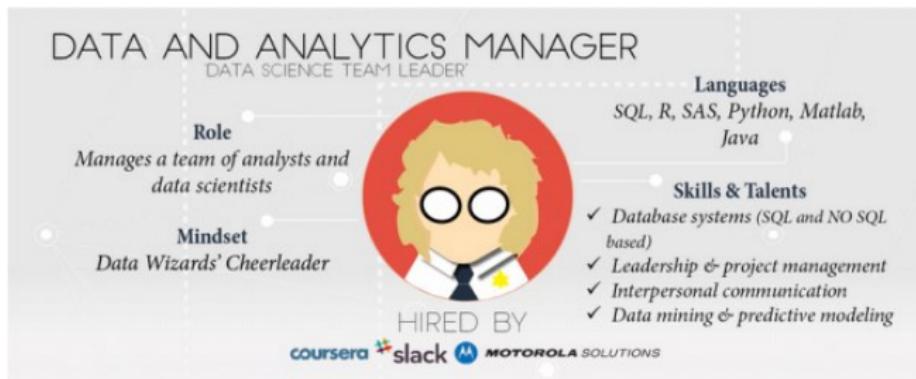
(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

# Business Analyst Role



(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

# Data and Analytics Manager Role



(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

## Salary (US - 2015, minimal inflation)



(Ref: The different data science roles in the industry - Martijn Theuwissen, DataCamp)

## What are Skills Needed?

- ▶ Problem Solving
- ▶ Statistics Mathematics
- ▶ Programming
- ▶ Data bases/storages
- ▶ Business

# Finding Your Persona . . .

## Choosing Your Persona for Transition to Data Science

## The USER Persona

- ▶ Leverage domain expertise.
- ▶ Utilize low/no code platforms like Weka or Knime.
- ▶ Build machine learning workflows easily.
- ▶ Ideal for managers, marketing professionals.
- ▶ Make data-driven decisions without extensive coding.



## The DEVELOPER Persona

- ▶ Technical enthusiast with a programming flair.
- ▶ Expertise in scikit-learn, TensorFlow, PyTorch.
- ▶ Develop robust data science applications.
- ▶ Dive deep into machine learning techniques.
- ▶ Transform ideas into impactful solutions.



## The RESEARCHER Persona

- ▶ Passionate about mathematics and innovation.
- ▶ Invent new techniques, contribute to research.
- ▶ Caters to deep R&D professionals, PhD holders.
- ▶ Shape the data science landscape with created libraries.
- ▶ Be at the forefront of groundbreaking discoveries.



## Choosing a Persona

- ▶ Select a persona based on skills and interests.
- ▶ Allow projects and interests to guide your journey.
- ▶ Explore new areas of expertise.
- ▶ Expand your skill set accordingly.
- ▶ The right persona empowers excellence and lasting impact.



# Learning Path, Roadmap

## Resources

- ▶ First : try Free Online resources, see how much you grasp
- ▶ No expensive (read, fees in lakhs) certification courses, to start with
- ▶ Test waters, gain some understanding of yourself then decide.

## Start Playing the Role

- ▶ Wish to be a Data Scientist? Start playing that role today.
- ▶ Take specific actions to embody the desired role.
- ▶ Tone of the suggestion: Begin playing the coveted role immediately.

## Build Foundation

- ▶ Take courses in necessary mathematics, programming, ML, and DL.
- ▶ Engage in assignments to solidify foundational knowledge.
- ▶ Lay the groundwork for a strong understanding of key concepts.

## Kaggle Competitions

- ▶ Participate in Kaggle competitions across various domains.
- ▶ Explore NLP, Image Processing, Time-Series, and more.
- ▶ Gain practical experience and exposure to diverse challenges.

## Specialize and Apply

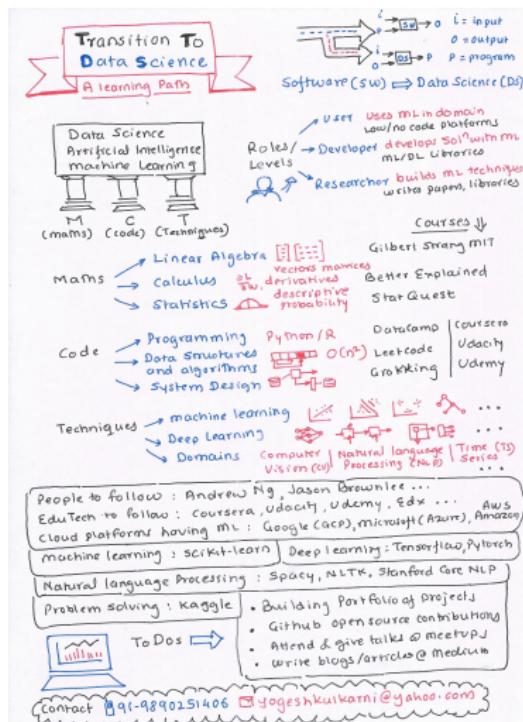
- ▶ Choose a specific area, e.g., NLP, and go deep into it.
- ▶ Apply your expertise to problems from different domains (legal, medical, etc.).
- ▶ Develop a comprehensive and specialized skill set.

## Build a GitHub Portfolio

- ▶ Showcase your work, courses, and projects on GitHub.
- ▶ Portfolio serves as a self-assessment tool and demonstrates your grasp.
- ▶ Discuss it during interviews, providing concrete evidence of your skills.
- ▶ Your GitHub repo is your real resume – proxies like education and gender matter less.



# My Sketchnote



(Ref: How to become a Data Scientist? - Yogesh Kulkarni)

# Summary Steps

Prep:

- ▶ Mathematics: Statistics, Calculus, Linear Algebra
- ▶ Programming: Python, Data Structure & Algorithms, Tools
- ▶ ML/DL: algorithms & frameworks
- ▶ Practice: Kaggle, Hackathons, projects on Github, blogs, Meetups-talks, etc.



Analytics Vidhya Learning Path 2017

- ▶ An year long schedule
  - ▶ Mostly free resources
  - ▶ Followed it myself
  - ▶ Separate paths for:
    - ▶ Beginner: Not much experience in programming but just college maths
    - ▶ Transitioner: Decent experience programming, but no ML and just college maths
    - ▶ Intermediate: Knows ML, comfortable with programming and maths.



<https://www.analyticsvidhya.com/blog/2017/01/the-most-comprehensive-data-science-learning-plan-for-2017/>

## Career in AI: References

## References

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- ▶ Finding Your Persona - Yogesh Kulkarni
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- ▶ What is Data Science? - SimpliLearn
- ▶ Roadmap: How to Learn Machine Learning in 6 Months - Zach Miller, Senior Data Scientist at Metis
- ▶ Tetiana Ivanova: How to become a Data Scientist in 6 months
- ▶ How to switch career to data science from non computer science background - Codebasics
- ▶ Step by step roadmap for machine learning engineer - Codebasics

# Thanks ...

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