Career Transition to Artificial Intelligence

Yogesh Haribhau Kulkarni

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Outline

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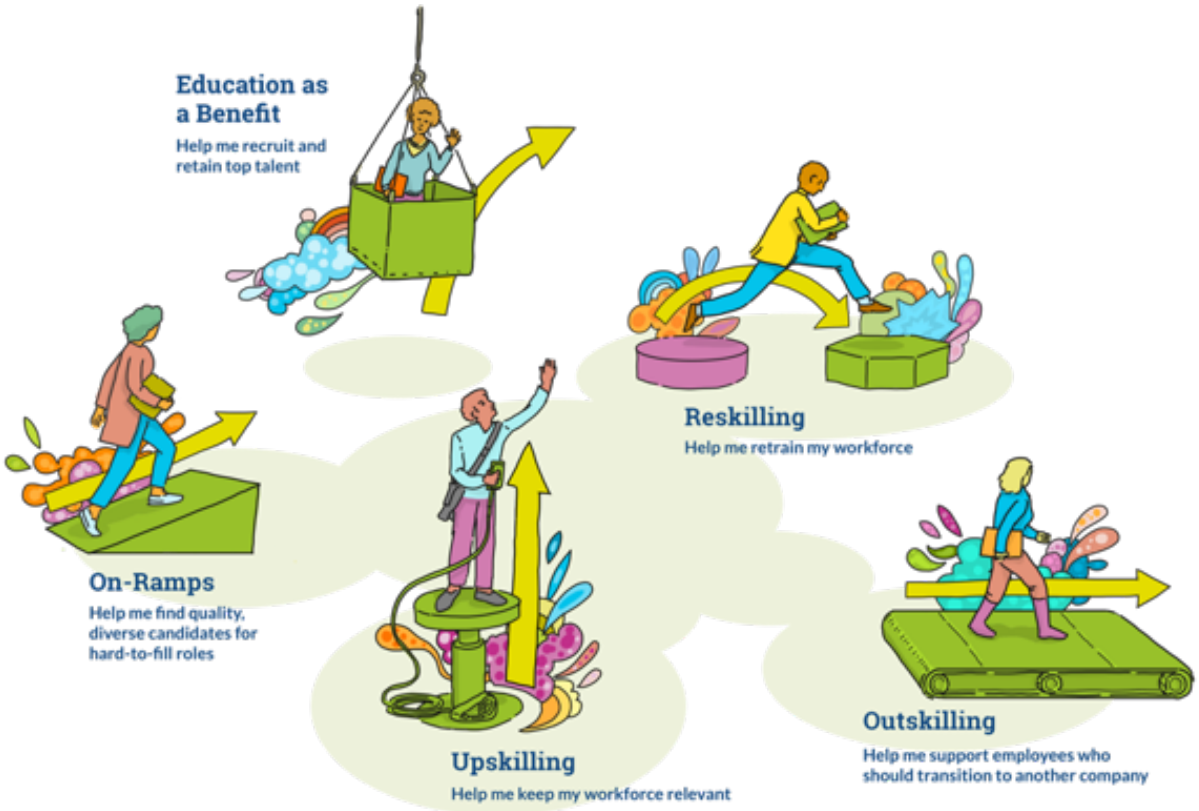
Career in AI: Background

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 – Forbs.com)

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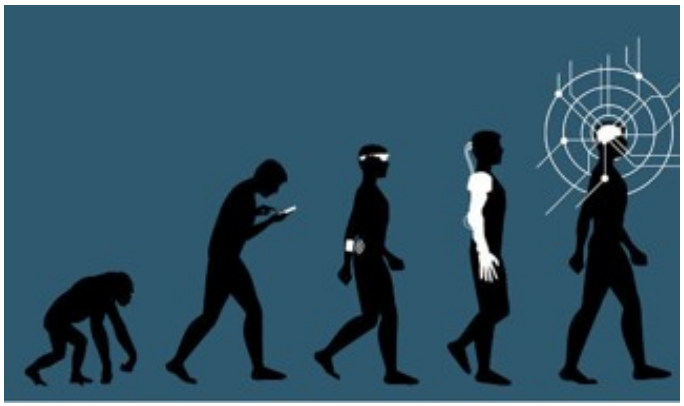
Examples

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)

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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

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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?

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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 . . .

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Introduction to Artificial Intelligence

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“Houston, we have a problem!!”

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

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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?

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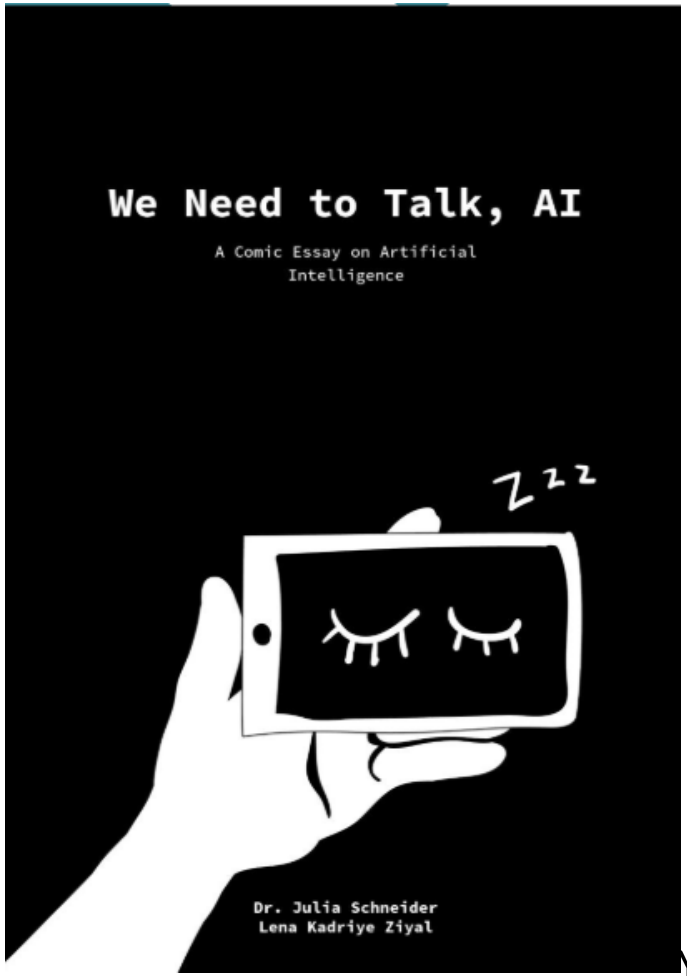
The Problem

Every company is claiming to be working in AI-ML

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

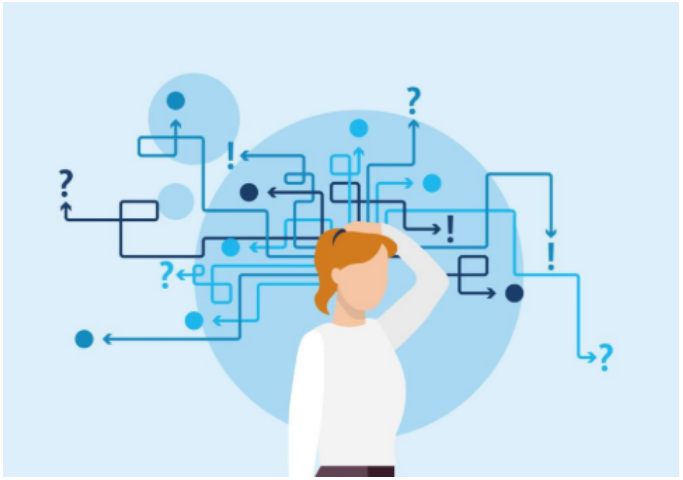


Or is it just a plain BIG hype?

What is the Core Idea?

What's the core idea?'

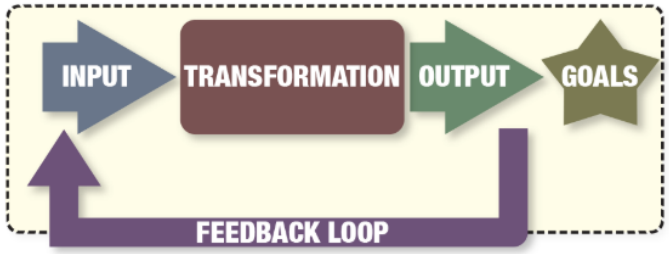
- behind problem solving?
- behind writing software algorithms?
- solving research problems?



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.



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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

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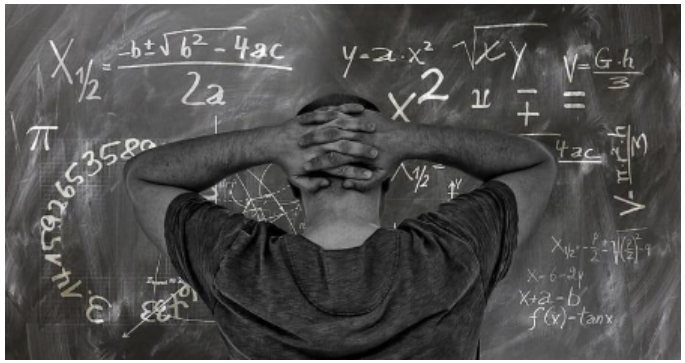
Functions

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



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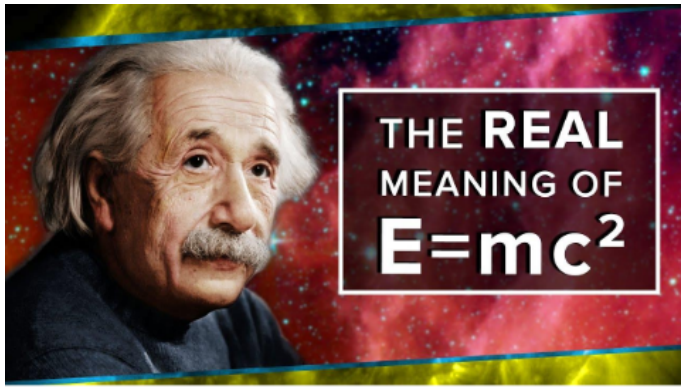
Functions

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



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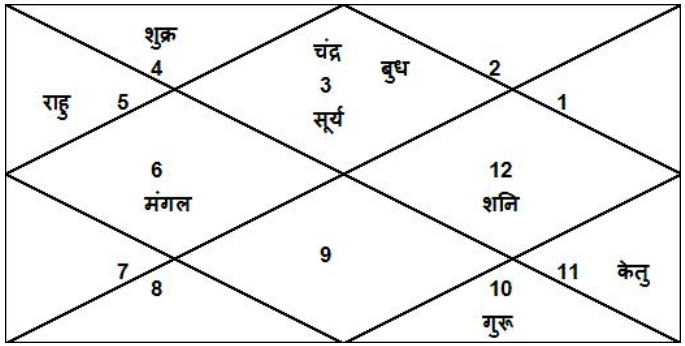
Controversial Example

- 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 ficticous)
- Reliable??



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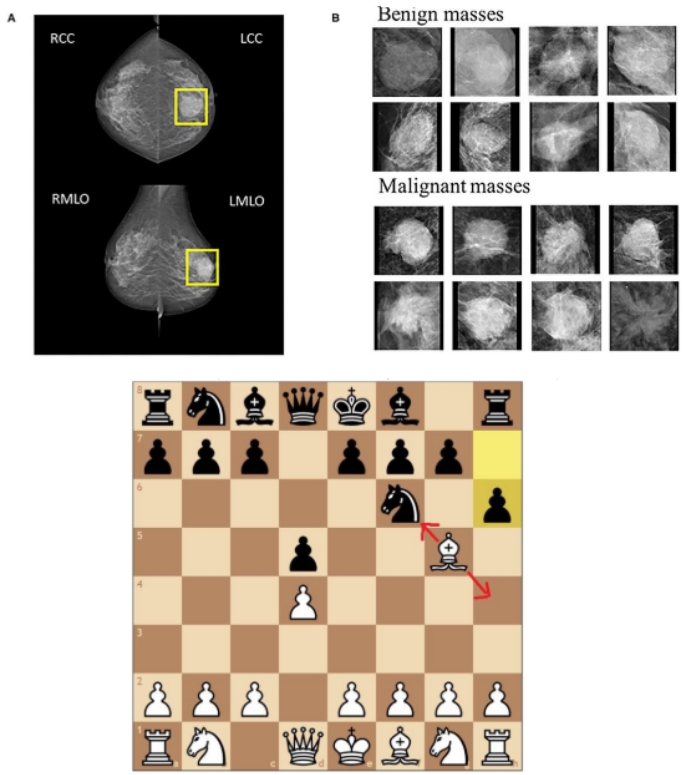
Functions

- 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, whats 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

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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.

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What is Artificial Intelligence?

My definition

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

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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!!

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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 !!

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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.

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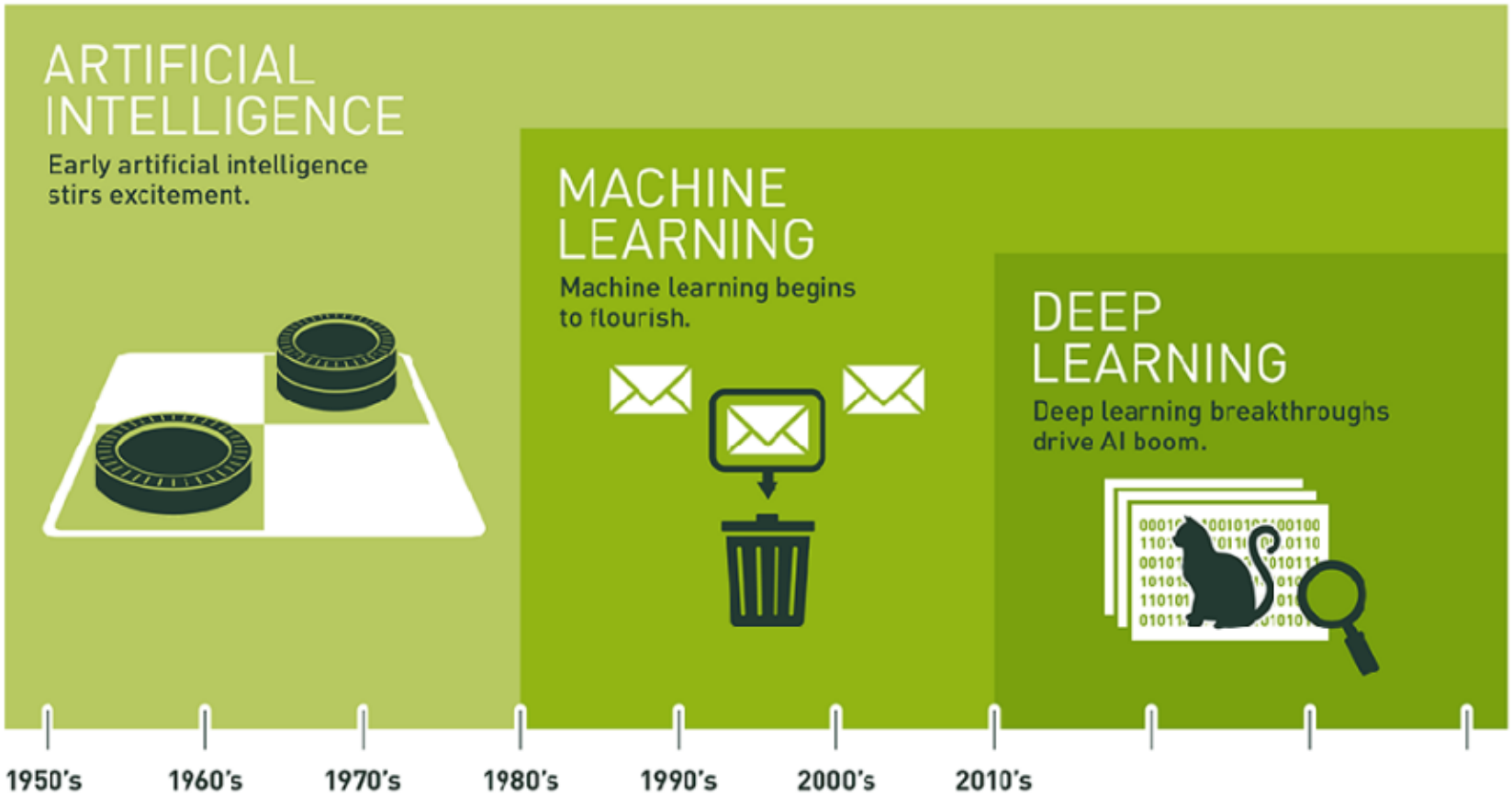
AI, ML, DL . . . Same?

Or Relationship between them ?



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

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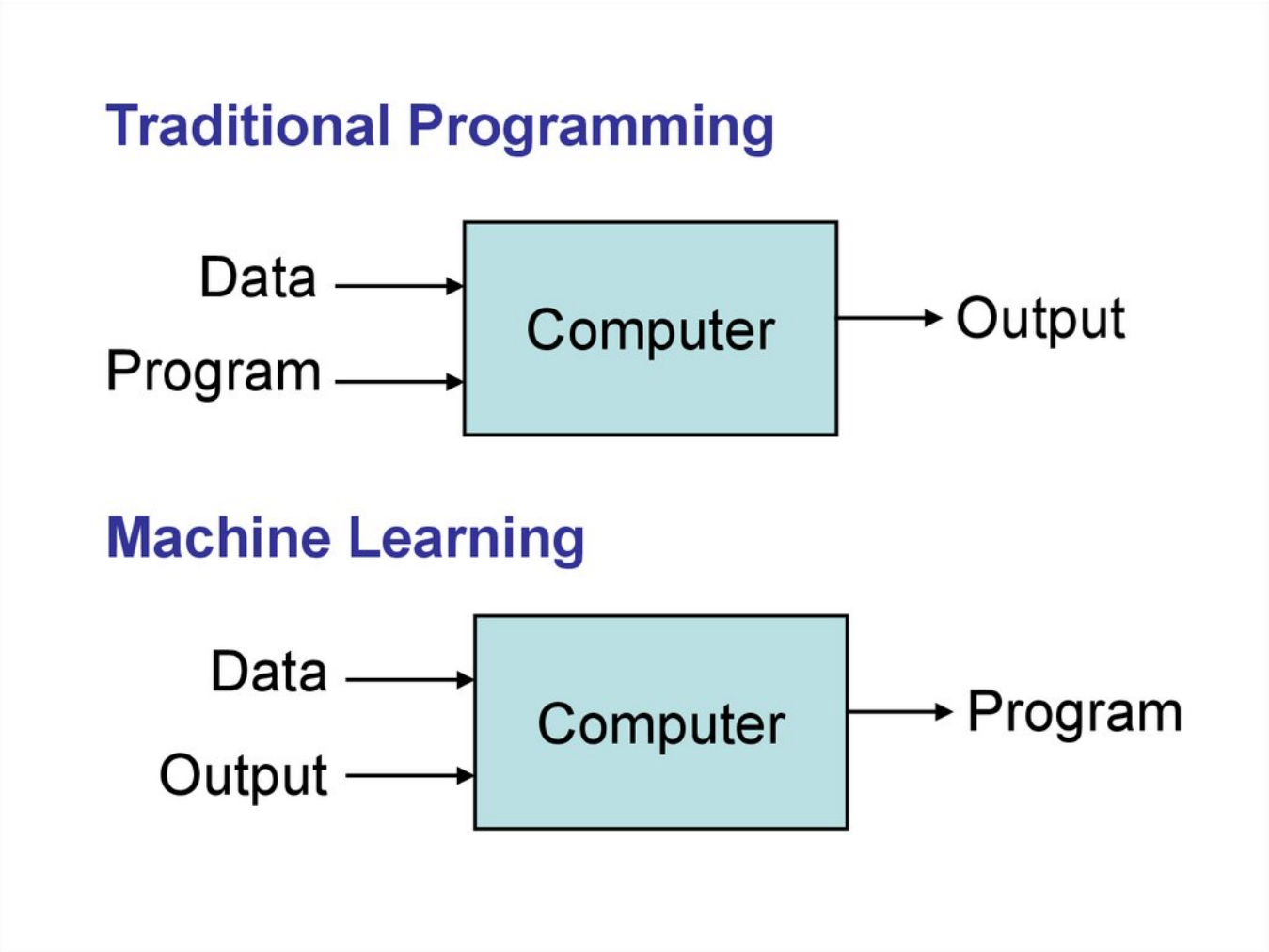
Traditional vs. Machine Learning?



Why Machine/Deep Learning?

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

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Why now?

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

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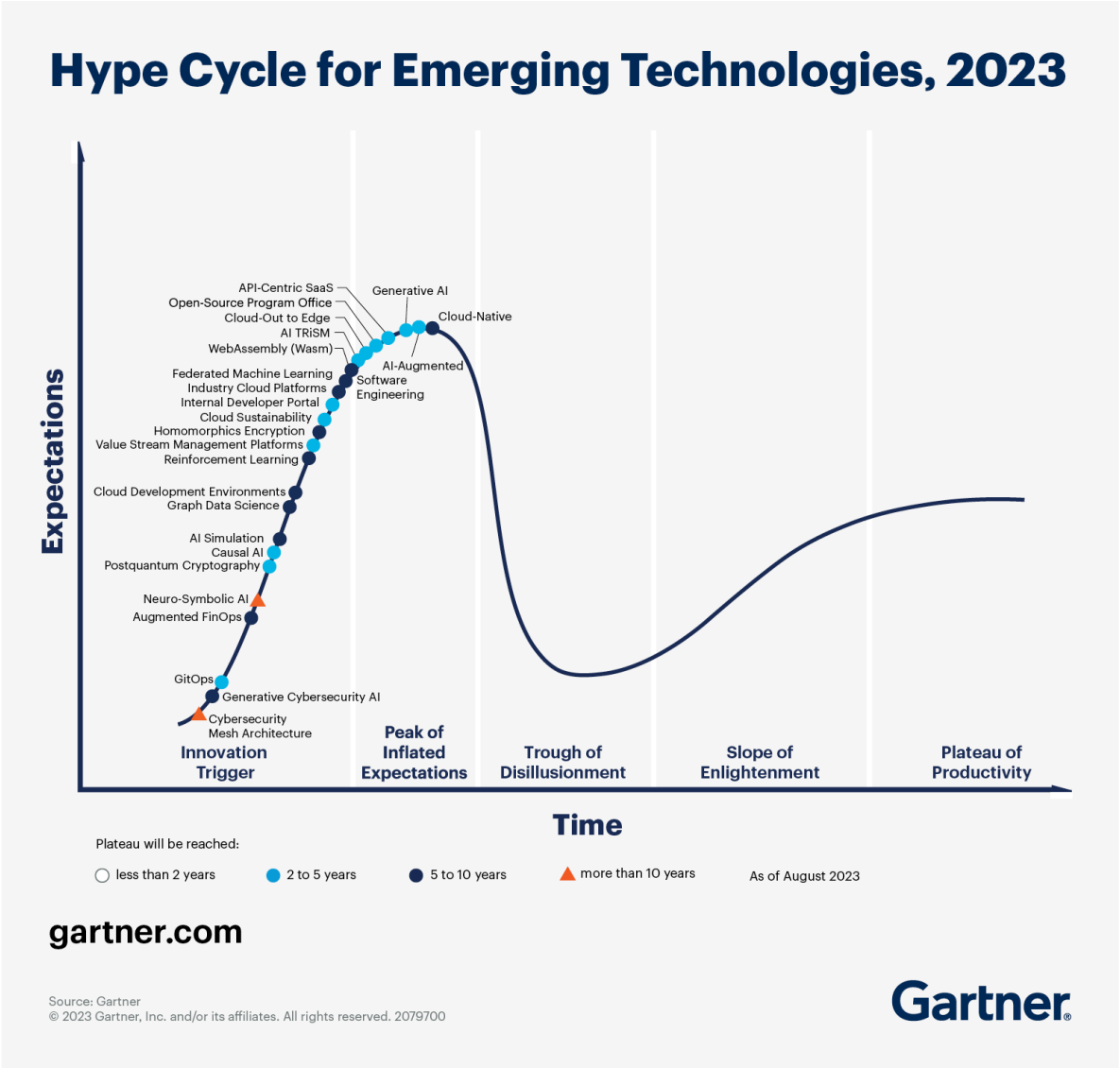
Gartner Hype Cycle Emerging Technologies 2023



Is AI a threat?

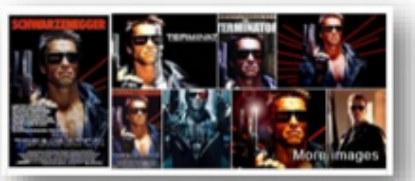
Is AI a threat?

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

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

Is AI a threat?

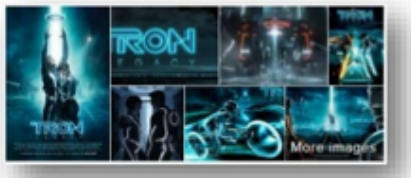
If you believe in these movies, then YES.



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)

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Fear: Are we being replaced?

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

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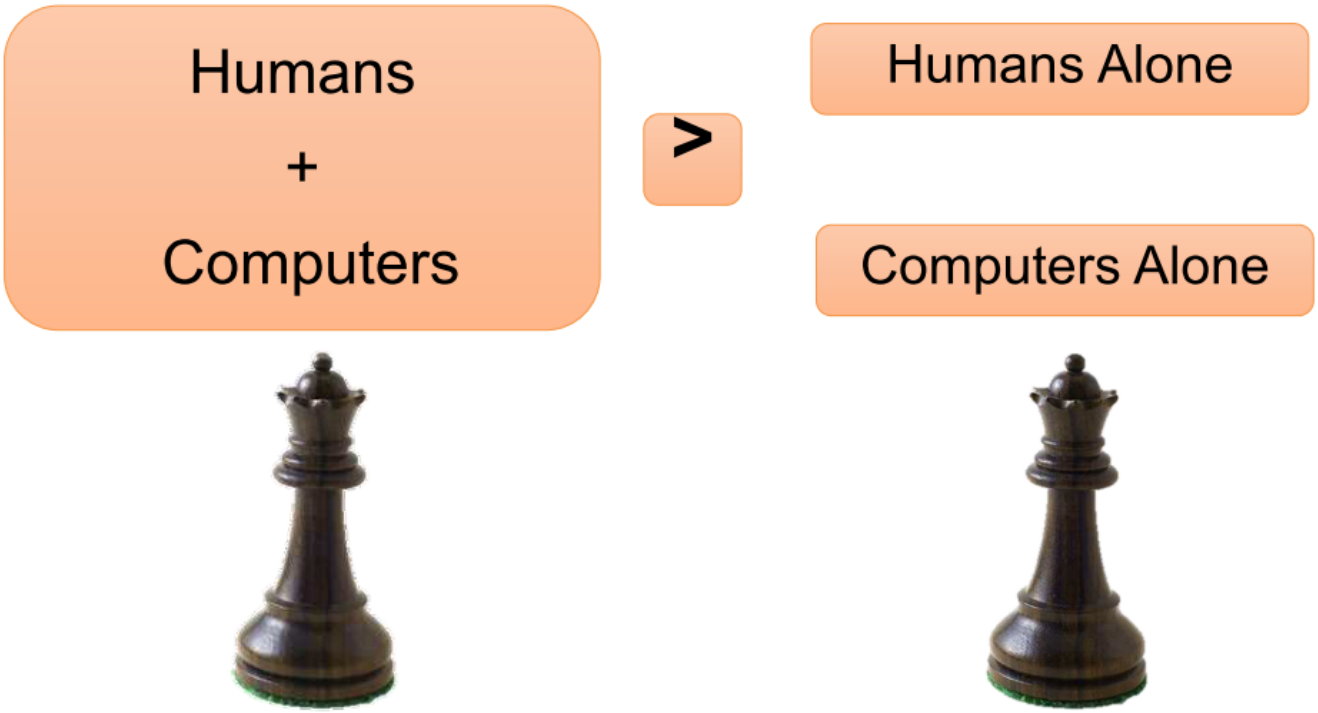
Mostly

Technology Enhancing (Not Replacing) Humans



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

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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

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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.

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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 impact-ful solutions.

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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.

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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.

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Career in AI: Tools

Scikit-Learn

- Popular machine learning library
- Provides simple and efficient tools for data mining and data analysis

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TensorFlow

- TensorFlow is an open-source library for machine learning and artificial intelligence
- Developed by the Google Brain team
- Allows easy deployment of computation to CPUs, GPUs, and TPUs
- Provides a Python API as well as APIs for other languages

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Key Features

- Eager Execution for interactive coding
- Keras for building and training models
- TensorFlow Hub for reusable models
- TensorFlow Lite for mobile and embedded devices
- TensorFlow Extended (TFX) for model pipelines

Code Example: MNIST Digits Classification

```
import tensorflow as tf

mnist = tf.keras.datasets.mnist
(x_train, y_train), (x_test, y_test) = mnist.load_data()

model = tf.keras.models.Sequential([
  tf.keras.layers.Flatten(input_shape=(28, 28)),
  tf.keras.layers.Dense(128, activation='relu'),
  tf.keras.layers.Dropout(0.2),
  tf.keras.layers.Dense(10, activation='softmax')
])

model.compile(optimizer='adam', loss='sparse_categorical_crossentropy',
model.fit(x_train, y_train, epochs=5)
model.evaluate(x_test, y_test)
```

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Future Developments

- Improved support for multi-cloud and hybrid environments
- Continued focus on performance, scalability, and efficiency
- Integration with emerging hardware like AI accelerators
- Expanded model libraries and pre-trained models
- Advanced features for research and experimentation

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Pytorch

- Open-source machine learning library
- Developed by Facebook's AI Research lab (FAIR)

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ChatGPT - A Tipping Point for Generative AI

- Released by OpenAI in November 2022
- Generative AI chatbot
- Rapid worldwide popularity
- 1 million users in 5 days
- Netflix took 3.5 years for same user count
- 100 million monthly active users by January 2023
- Fastest-growing application in history

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Midjourney: Image Generation Model

- Developed by Midjourney Inc.
- Released in July 2022
- Architecture details undisclosed
- High-quality image generation
- Wide variety of styles and genres

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LLaMA

- February 2023: Meta releases LLM "LLaMA"
- LLaMA: 65-billion parameter model
- Trained on extensive text and code dataset

Significance of LLaMA Release

- One of the largest public LLMs
- Suited for complex and challenging tasks
- Open source, initially for research purposes
- Model weights leaked online, accessible to all
- Sparked development of numerous open source LLMs

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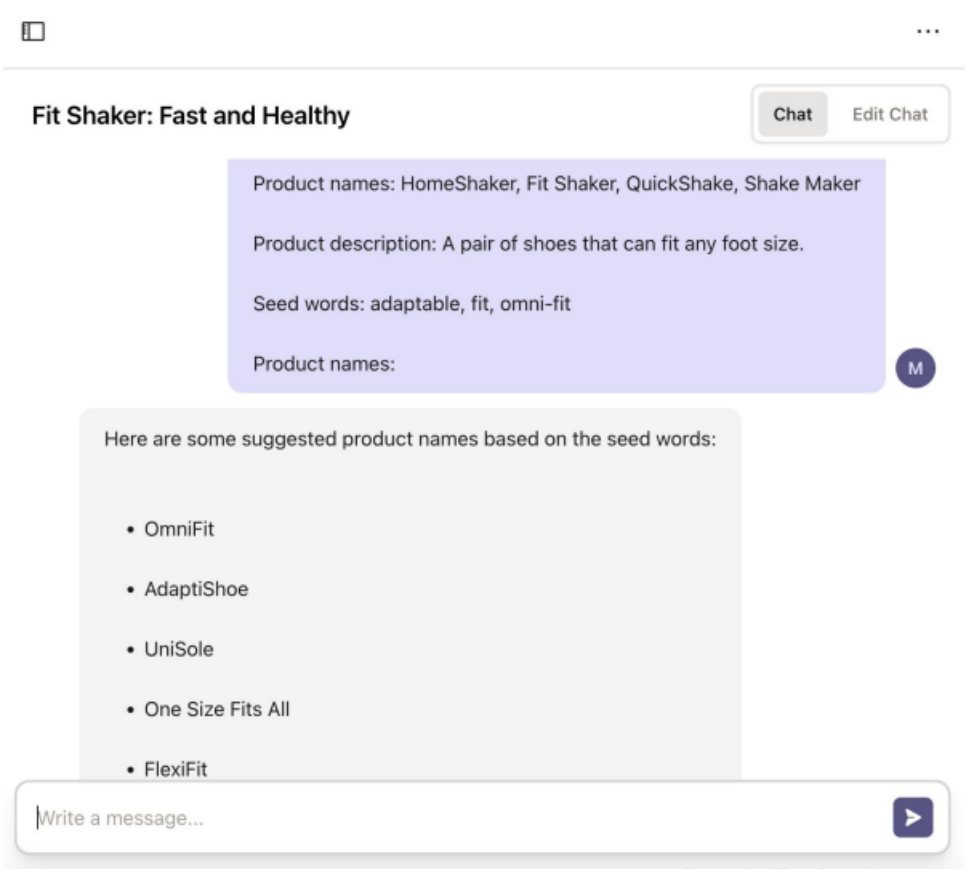
Anthropic Claude



(Ref: The Complete Prompt Engineering for AI Bootcamp (2023))

Created by Anthropic https://console.anthropic.com/ or API Uses Constitutional AI rather than RLHF Constitutional AI trains to follow a set of high-level principles or rules, such as a constitution, that specify the desired behavior and outcomes of the system. RLHF uses human feedback, such as ratings, preferences, or corrections, to optimize a language model or an agent's policy using reinforcement learning

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Github Copilot: Breakthrough Coding Assistant

- OpenAI introduced Github Copilot in 2021
- Built on GPT-3 architecture
- Fine-tuned on millions of public code lines
- Auto-completes and suggests code
- Supports multiple programming languages

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Low/No Code Platform : Knime

- Open-source low/no code platform for data analytics, reporting, and integration
- Offers visual programming interface

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Low/No Code Platforms: Weka

- Open-source low/no code platform for data mining and machine learning
- Provides tools for data preprocessing, classification, regression, clustering, and association rules

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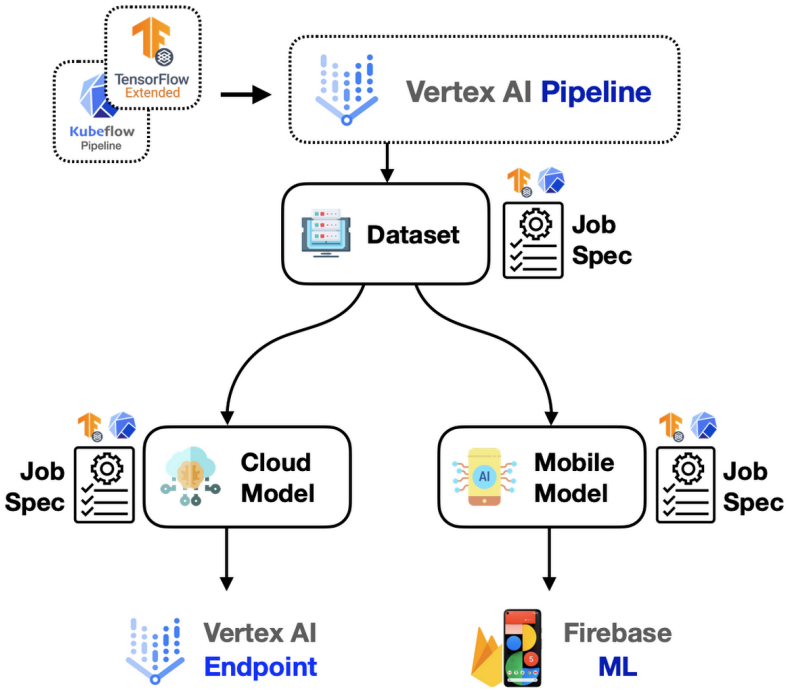
Cloud Platforms: GCP



- Google Cloud Platform (GCP)
- Cloud computing services by Google
- Offers various AI and machine learning services such as Gen AI Studio, Vertex AI, etc.

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Cloud Platforms; Azure

- Microsoft Azure
- Cloud computing services by Microsoft
- Provides AI and machine learning services like Azure Machine Learning, Cognitive Services, etc.

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Cloud Platforms: AWS

- Amazon Web Services (AWS)
- Cloud computing services by Amazon
- Offers AI and machine learning services such as Amazon SageMaker, Amazon Comprehend, etc.

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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.

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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.

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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.

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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.

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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.

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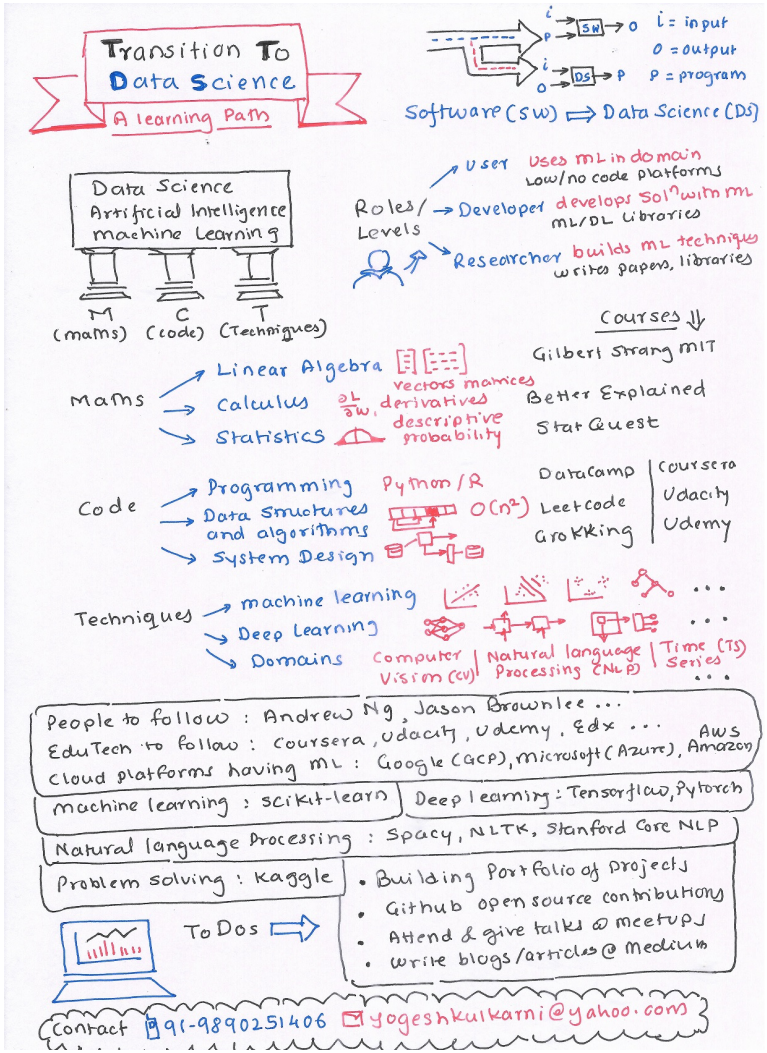
My Sketchnote



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

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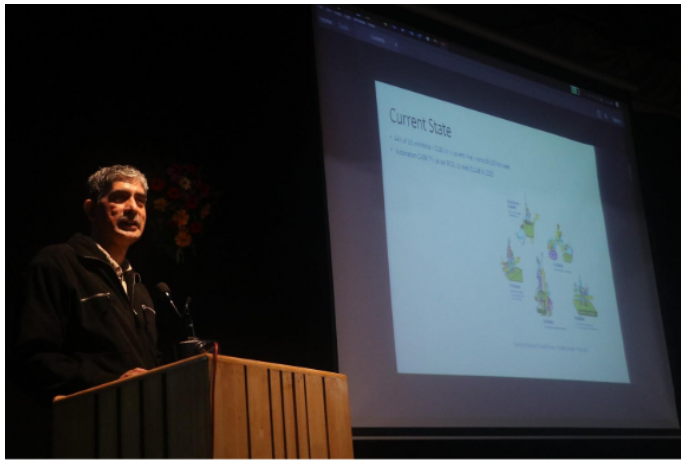
Summary Steps

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.



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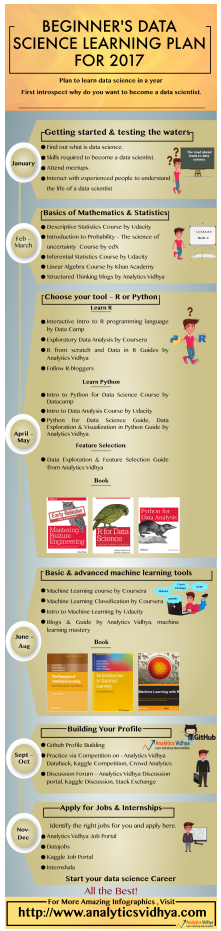
Analytics Vidhya Learning Path 2017

- 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

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- 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

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Thanks ...

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