Rise of AI and Machines: How to build a career in the emerging post Covid Digital world?

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Director

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About Myself

- Ganesh Sankaralingam
  - 20 years experience in Decision science, AI, ML and Business Analytics.
  - Opportunity to work in US, India, Japan and Europe.
  - Sharing my experience learnt working with large Technology, Media & Entertainment, Travel, Electronics Manufacturing clients over the past 20 years.
  - Visiting Faculty in IIMC in 2017 and offered Business analytics course for PGDBA students.

Disclaimer: Opinions expressed are solely my own and do not reflect the views or opinions of my present or past employers or clients.

I would like to thank the NPTEL team for giving me the opportunity to share my views. Hope everyone finds my suggestions useful to build their careers in the digital world.

Agenda

1

What is AI and should humans be worried about it?

2

How do smart people make decision in the Digital World?

Case Study: How to predict a movie revenue?

3

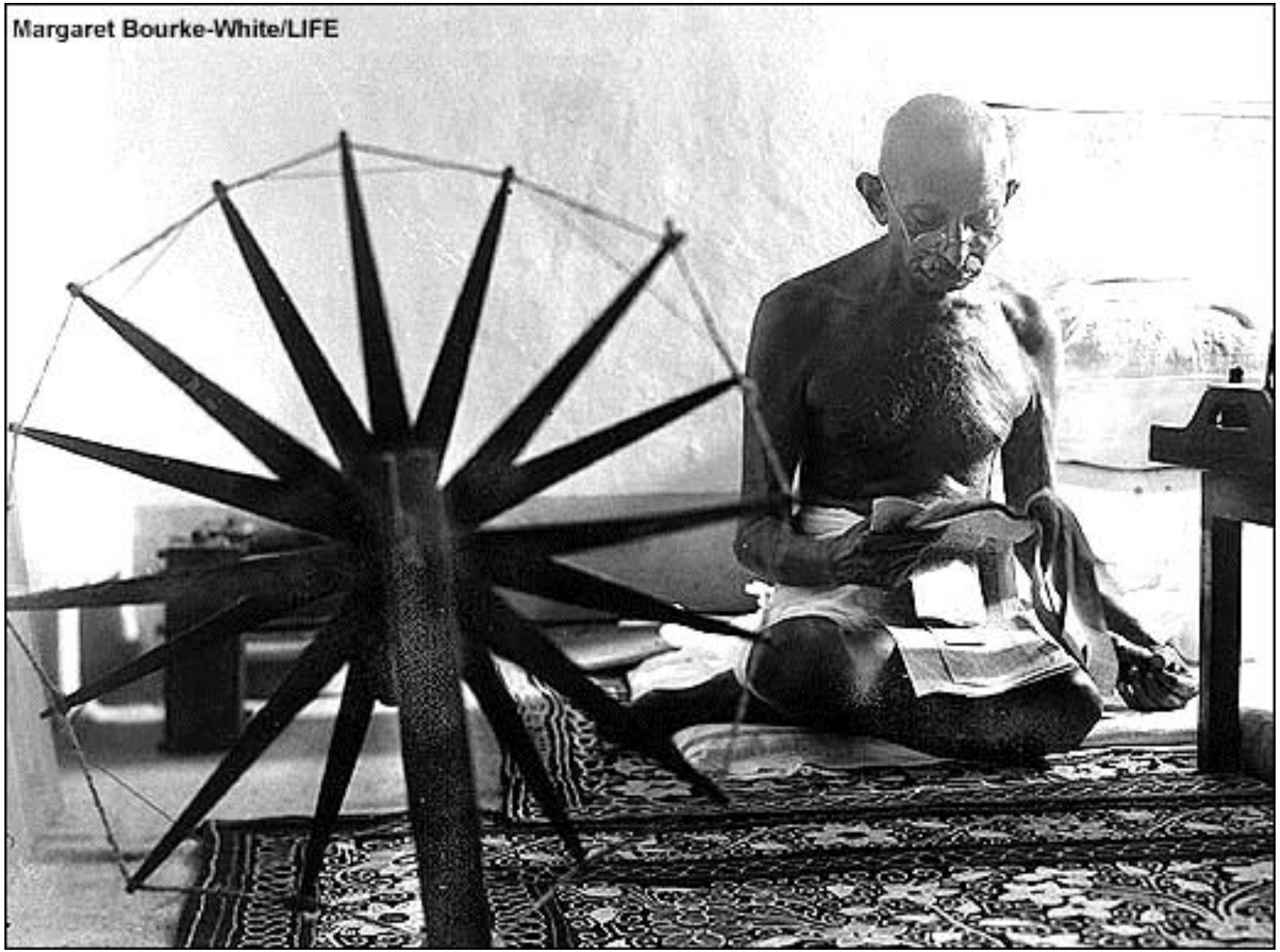
Skills required for a career in the Digital World

Concerns around machines and industrialization

> *I know that man cannot live without industry. Therefore, I cannot be opposed to industrialization.*
>
> *But I have a great concern about introducing machine industry. The machine produces much too fast, and brings with it a sort of economic system which I cannot grasp.*
>
> *I do not want to accept something when I see its evil effects which outweigh whatever good it brings with it.*

Source: https://www.oil-refinery.com/mahatma-gandhi-on-industrialization/

Mahatma Gandhi was concerned with unemployment due to machines



Concerns around machines and ~~industrialization~~ Digitization

I know that man cannot live without ~~industry~~. Therefore, I cannot be opposed to ~~industrialization~~.

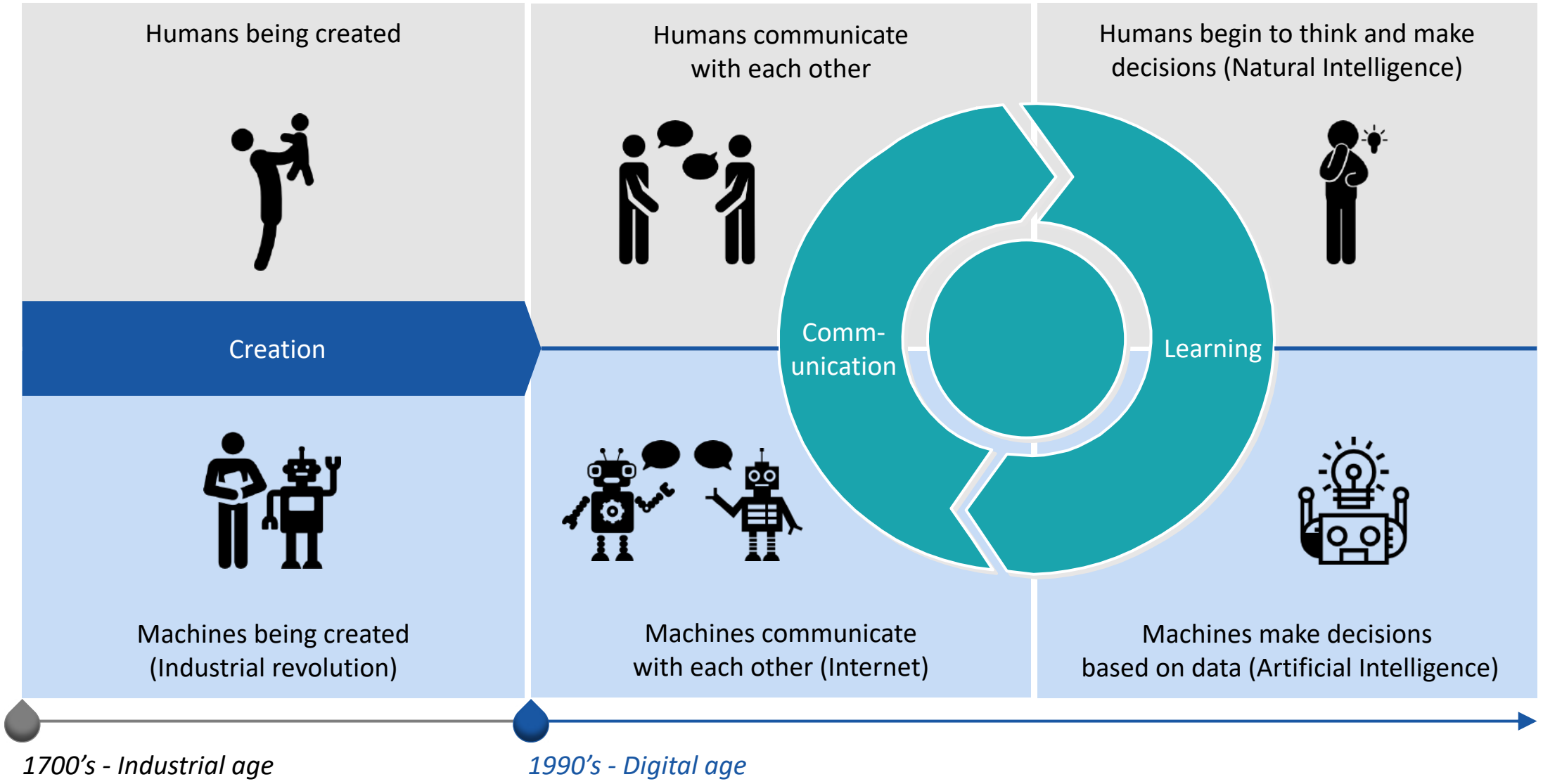
Computers

Digitization

But I have a great concern about introducing machine industry. The machine produces much too fast, and brings with it a sort of economic system which I cannot grasp.

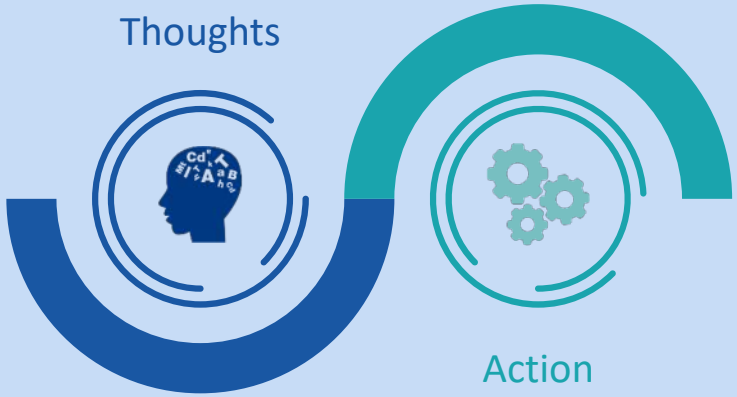
I do not want to accept something when I see its evil effects which outweigh whatever good it brings with it.

Evolution of Machines similar to Evolution of Humans



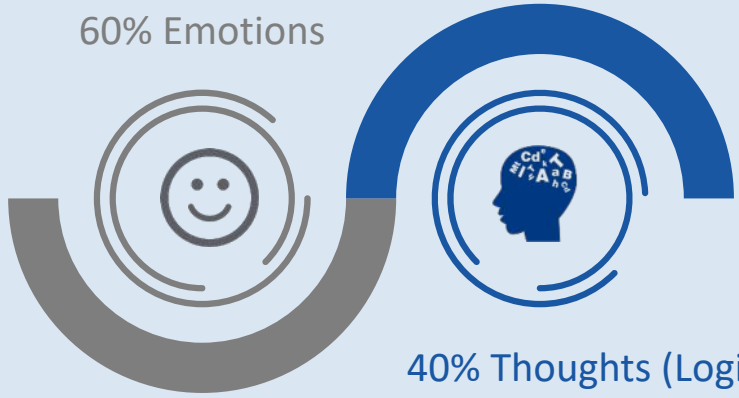
Argument 1: Emotions significant in decision making, Machines cannot make major decisions

Human evolution in 3 dimensions



Machines evolution in 2 dimensions

In Reality - Decisions are 60% Emotions + 40% Thoughts (Logically using Data available)



Decision making - Art of persuasion

Aristotle – 380 BC

1. **PATHOS** — Values | Emotions
2. **ETHOS** — Credibility | Trust

Emotions

3. **LOGOS** — Logic | Reason | Proof

Logic

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Argument 2: Human can multi task complex AI tasks while machines are specialized in one activity

AI that can drive a driver less cars
Cannot classify email spam
Cannot recommend music

AI is very specific to a business use case

While the same Human can driver cars
classify email Spam and change music

Humans are able to continuous identify and develop solutions to new problems

Humans are generalized AI vs Machines are specialized AI –
Machines will only be used in specialized areas

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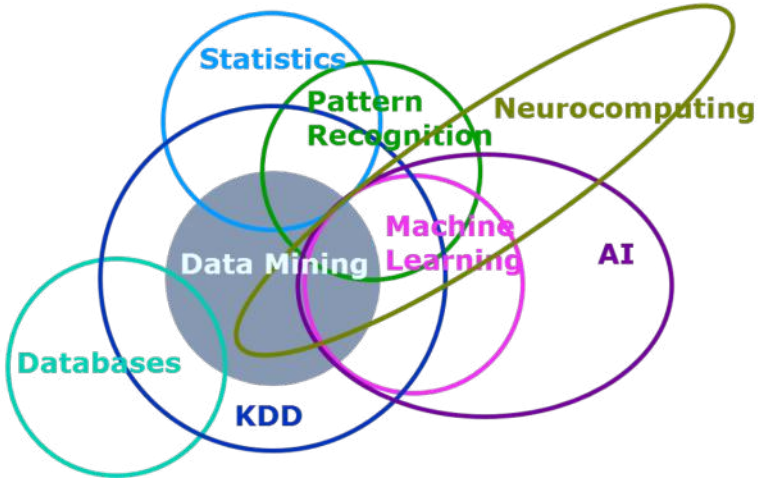
Difference between Artificial Intelligence and Machine Learning

Artificial Intelligence is creating machines that can process input, make decisions & take actions like humans

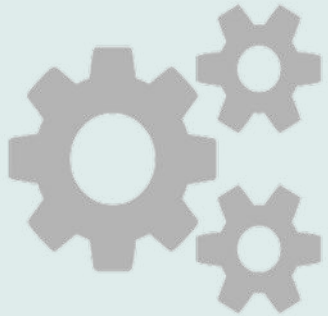
Front end

Artificial Intelligence

Machines mimicking human like vision (Camera Instead of Security Guard), Action (Driving a car), listening & speech (Google Translate)



Back end



Machine learning

The ability of a machine to learn without being explicitly programmed from data

Extensive application of ML in industry to assist Decision making

Large Amount of Data Generated by Machines allowing AI to Learn

- Cheap Data Storage
- Cheap Data Processing
- Free Open Source Software

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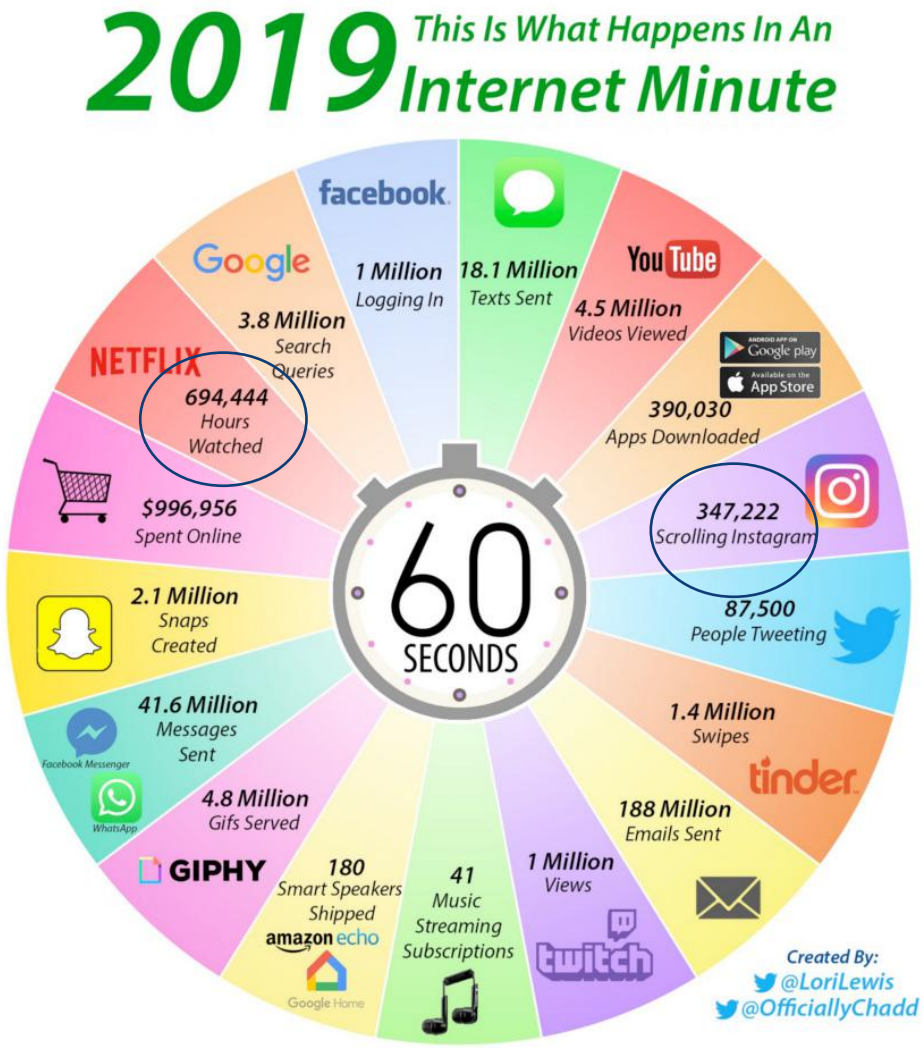
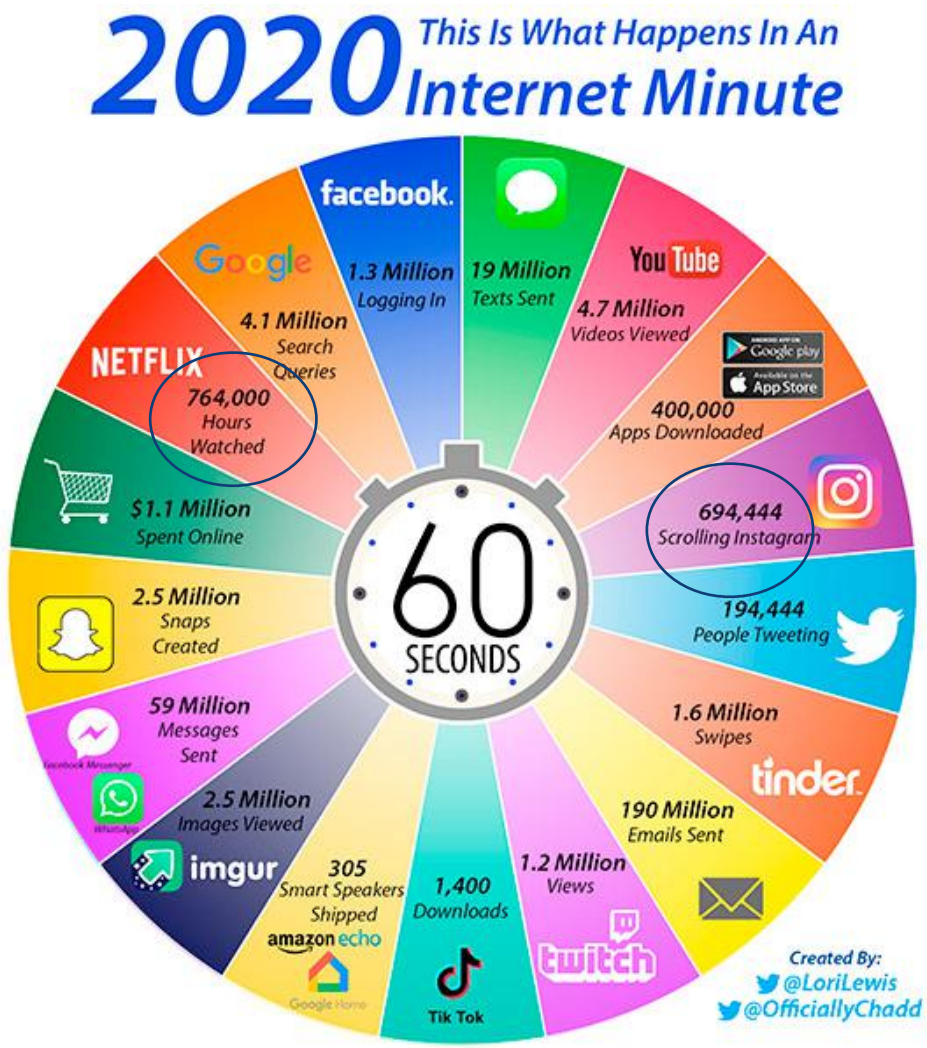
Data continues to grow in the Digital world





Data from the machines have been collected, now how do we make decision with this data?

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How do smart people make decisions in Digital world? Answer: Data

"The smartest people are constantly revising their understanding, reconsidering a problem they thought they'd already solved. They're open to new points of view, new information, new ideas, contradictions, and challenges to their own way of thinking."

Jeff Bezos, 2019

Should I spend more on marketing this movie to increase Revenue – Analyst would have to Combine Data, Analyze, Assist Decision makers with marketing spends

Major Social Media metrics displayed a trend pattern similar to that of Box Office Revenue

Box Office Vs IMDB

Total Box Office Revenue & # of User who rated are correlated at **96%**

Box Office Vs Wiki-edits

Total Box Office Revenue & Wiki edits are correlated at **87%**

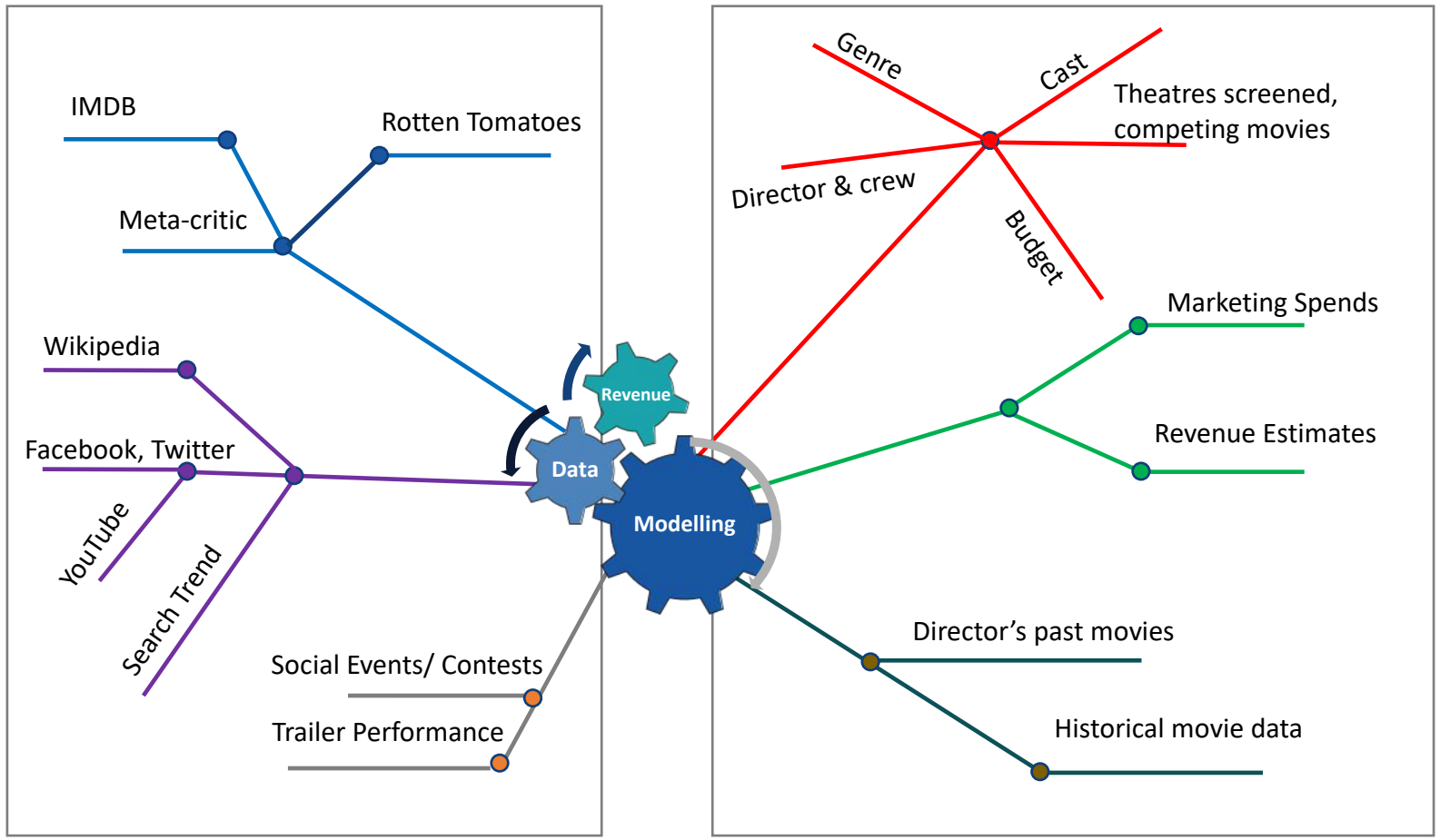
Box Office Vs YouTube views

Total Box Office Revenue & YouTube trailers likes co-relate at **78%**

Box Office Vs Tweets

Twitter and Box Office Revenue showed a similarity of **70%**

Prediction of Box office revenue using all the movie dimensions



Movie Revenue Prediction

Box office Revenue (Theatre)

Pre-release buzz created by trailer in Social Media, publicly available data and internal data can be used to predict movie revenue

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Home Entertainment Revenue (Netflix)

Pre-release Data along with Box office Revenue, pricing, post release reviews and social media buzz can be used to predict views in Netflix

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Different use cases in Media Domain

DL

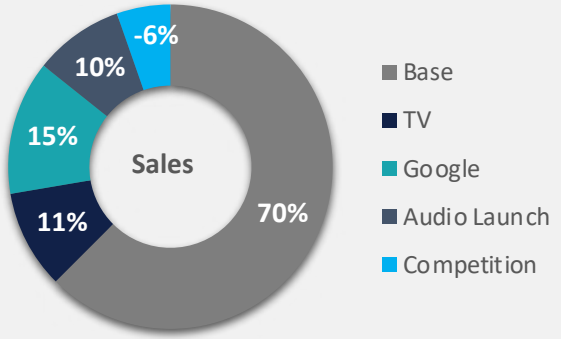
Classification of Movie Reviews in IMDB

Methodology: Deep Learning using Neural Network

How much to spend in Marketing a Movie?

ML

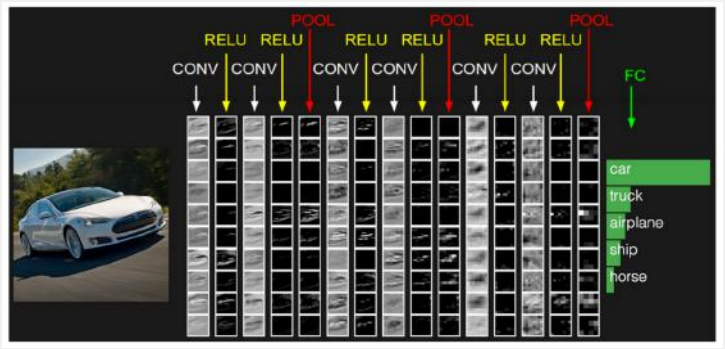
Methodology: Decomposition of Sales using Multiplicative Regression



DL

What objects are in the creative (poster)?

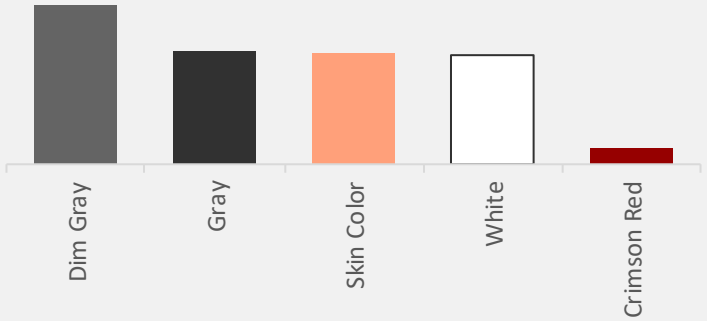
Methodology: Deep Learning using CNN



What colors highlighted in the creative (poster)?

ML

Methodology: Image Classification based on color



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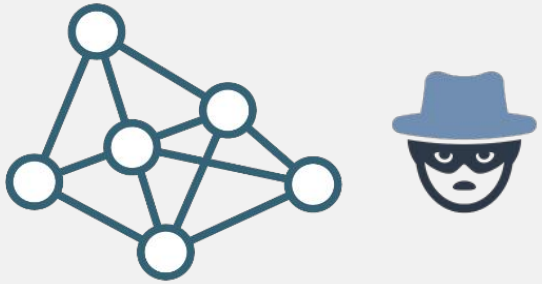
Different use cases in Retail Domain

Fraud Detection – Debit Card

Methodology: Algorithms like Random Forest (RF), Gradient Boosting Machine (GBM) are popular.



Recommendation system - Amazon

Methodology: Product Recommendation using Collaborative filtering

Forecast products sales - Pepsi

Methodology: Deep learning techniques like RCNN (Neural Networks) offer better accuracy when compared to traditional time-series forecasting models

Anomaly Customer Refunds - Flipkart

Methodology: Identify Refunds discrepancies

Business (Horizontal + Domain knowledge) + Data + Math

You would need to understand the

BUSINESS

- Domain Knowledge – Movie industry
- Horizontal Knowledge - Sales & Marketing, Research & Development, Finance & Accounting, HR, Manufacturing, Logistics, Operations etc

DATA

Digital data (YouTube view, Wiki edits, Twitter etc) and offline data (No of theatres)

MATH

Regression to forecast Movie revenue

Examples

Horizontal	Domain or Vertical		
	Consumer Goods - Pepsi	Retail – Walmart	Media – Studios
Finance & Accounting		Improve Gross Margin	
Supply Chain Logistics, Manufacturing & Operations	Improved machine utilization		
HR		Reduced staff attrition	
Sales & Marketing		Improved Customer experience	Should I spend more marketing budget to influence movie revenue?
R&D	Design a new product		

Students and professionals do not try to understand how the business works

Aerospace (aircraft manufacturing)	Agriculture	Chemical (manufacturing) - Pharmaceuticals (research)
Computers – Software, Peripherals, repair, retail	Education - Preschools and daycares, Primary, Secondary, & Tertiary (higher), Vocational	Energy (production, distribution) - Electrical Power, Petroleum (oil), Coal, Nuclear Renewable (sustainable, alternative)
Entertainment - Amusement Parks, Film, Game Manufacturing, Media, Music	Financial - Banks and Credit Unions, Insurance, Accountancy, Stock Brokerages, Investment Funds	Retail
Healthcare	Information Technology	Manufacturing - End Products, Raw Materials, Machining
Mass Media – Broadcasting, Film, Internet, Music, News, Publishing	Telecommunications	Transport

Importance of Business Domain knowledge and Horizontal knowledge.

Students and professional do not try to understand how the business works

Professional need to start from business problem and then use data and finally go to Math.

I see professional starting from math or data and not understanding the business problem

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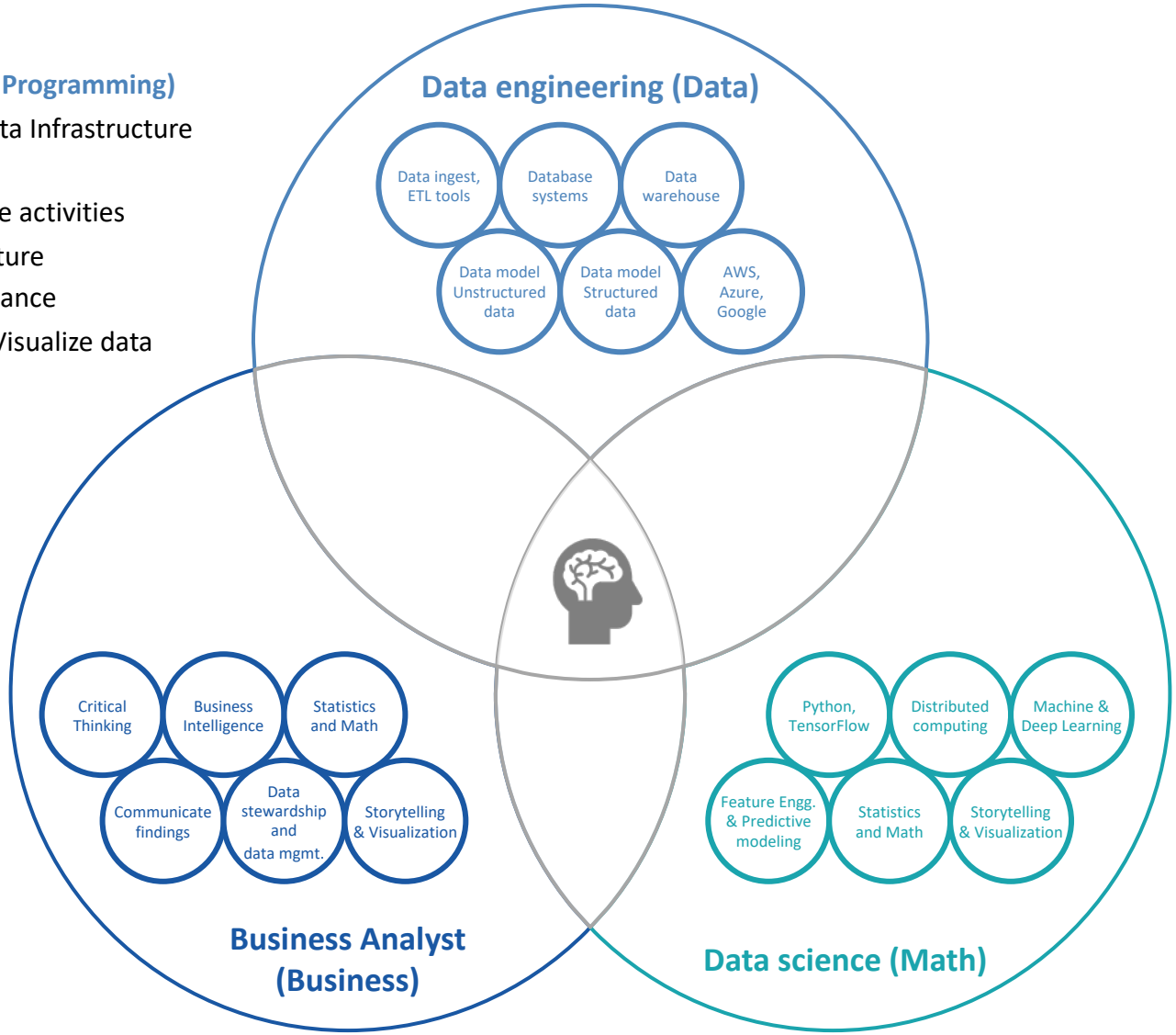
Skills required for a career in the Digital World

Difference - Data Engineer, Data science and Business Analysis

Focus area = Data (90% Programming)

- Build and Support Data Infrastructure
- Build Data Pipeline
- Support Infrastructure activities
- Deploy Data architecture
- Manage Data Governance
- Collect, analyze and Visualize data



Focus area = Business (40% Programming with focus on Story telling and Visualization)

- Analysis and Interpretation of data using Excel or PPT. e.g Marketing Analyst, Finance Analyst, Supply Chain Analyst, HR Analyst.
- Use Math to identify patterns and try to predict future patterns

Focus area = Math (70% Programming with focus on Math)

- Analysis and Interpretation of data - 40%
- Programming – 40%
- Use Math to identify patterns and try to predict future patterns

Ideal Career Ladder from BA to AI – Business + Data + Math

Industry + Post graduate Academic Experience	Business Analysis	Data Science	Data Engineer	Consulting	Sales
12 to 25 years	• Ability to operate & influence C level decisions.	Fellow – AI/ML	Fellow – AI/ML	Director	Director
8 to 16 years	• Ability to operate at VP level and influence Strategic business decisions. Expertise in 2 Vertical and 2 Horizontals	IC - Sr Principal Data Scientist **AI/ML**	IC - Sr Principal Data Engineer **AI/ML**	Senior Account Manager	Senior Sales Manager
6 to 12 years	• Strong influencer of Key business decisions. **Ability to manage a 20-member team**. Domain expert - Expertise in 1 vertical and 1 horizontal	IC -Principal Data Scientist **AI/ML**	IC - Principal Data Engineer **AI/ML**	Account Manager	Sales Manager
4 to 8 years	• **Ability to manage a 5-member team** • Develop expert data skills using in SQL, Python, Java scripts, Cloud computing. • Develop expert Math skills using Python, R, ML. Expert story telling skills using PowerPoint • Develop intermediate Math skills using Python – 2 to 5 years.	IC - Data Scientist **AI/ML**	IC - Data Engineer **AI/ML**		
2 to 3 years	• Develop intermediate data skills using SQL, Python, Java scripts, Cloud computing. • Develop intermediate Math skills using Python, R, ML. Independent story telling skills using PowerPoint or Tableau (other dashboarding skills) • Develop intermediate Math skills using Python				
1st year	• Business understanding and working with Basic Data skills using Excel, SQL, Beginner Story telling using PowerPoint				

Thoughts dimensions - Learn to Communicate with both People and Machines

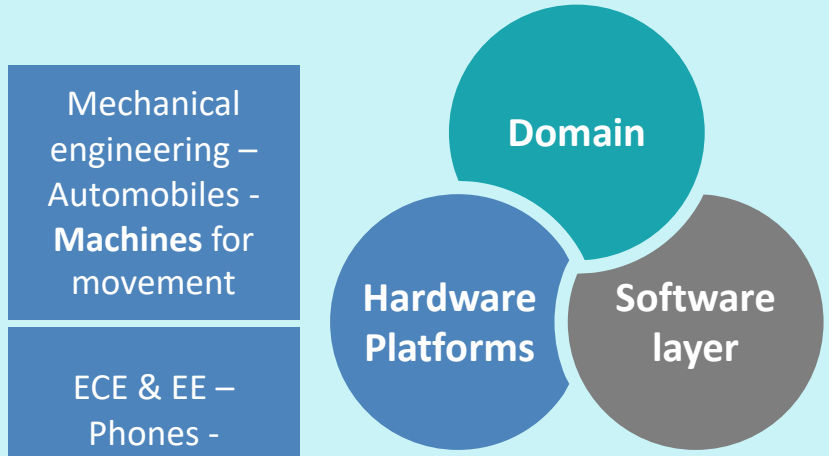
Languages

People	Machines
English	Java
Tamil	SQL (Structured data)
Hindi	Python (Unstructured data & ML)
Malayalam	Java Script / CSS (Visualization)
Japanese	MSW Logo (Elementary school)

Learn to Communicate with Machines by learning to program

Complete projects that cover various disciplines (Cross disciplines)

- Marketing
- Healthcare
- Manufacturing
- Automobiles



- Mechanical engineering – Automobiles - **Machines** for movement
- ECE & EE – Phones - **Machines** for communication
- Computer science, IT
- Math, Stats, Operations Research

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Emotion Dimension – Personality development (Music, Arts, Painting, Drama, Sports, Religion, Spirituality) – Ethos and Pathos mentioned by Aristotle

Self

Self Awareness

- Emotional Self Awareness
- Accurate Self Assessment
- Self Confidence

Self Management

- Self Control
- Trustworthiness
- Initiative
- Goal Orientation
- Adaptability
- Conscientiousness

Ability to read and understand your emotions and recognize their impact on Work performance, relationships and the like.

Accurate Self Assessment: A realistic evaluation of your strengths and limitations

Social

Social Awareness

- Empathy
- Service Orientation
- Organization awareness

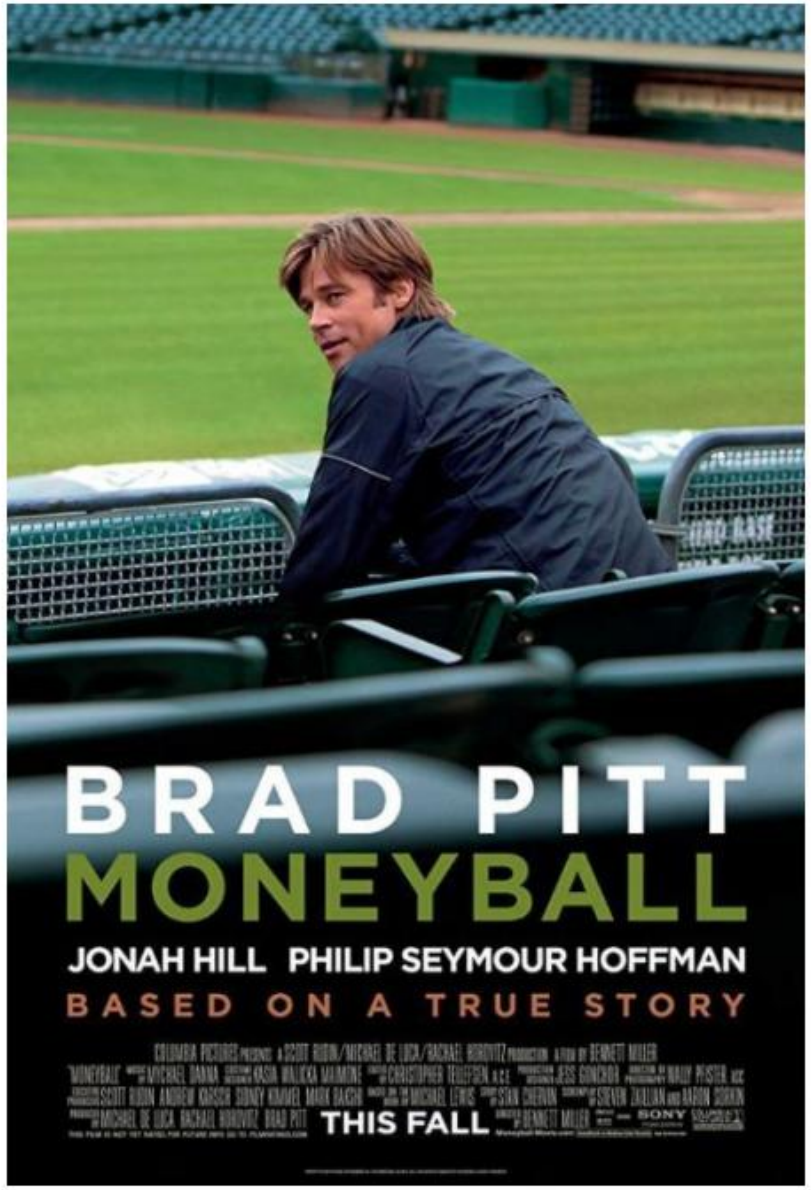
Social Skill

- Leadership
- Influence
- Developing others
- Communication
- Conflict management
- Building bonds
- Team work
- Collaboration

Emotional Quotient will improve by interacting and spending time with Humans
Emotional Quotient will not improve by spending time with Machines such as watching tv or using computers by yourself or playing video games

Watch Movies – Real life application of Decision science in various Domains

Moneyball (2011)

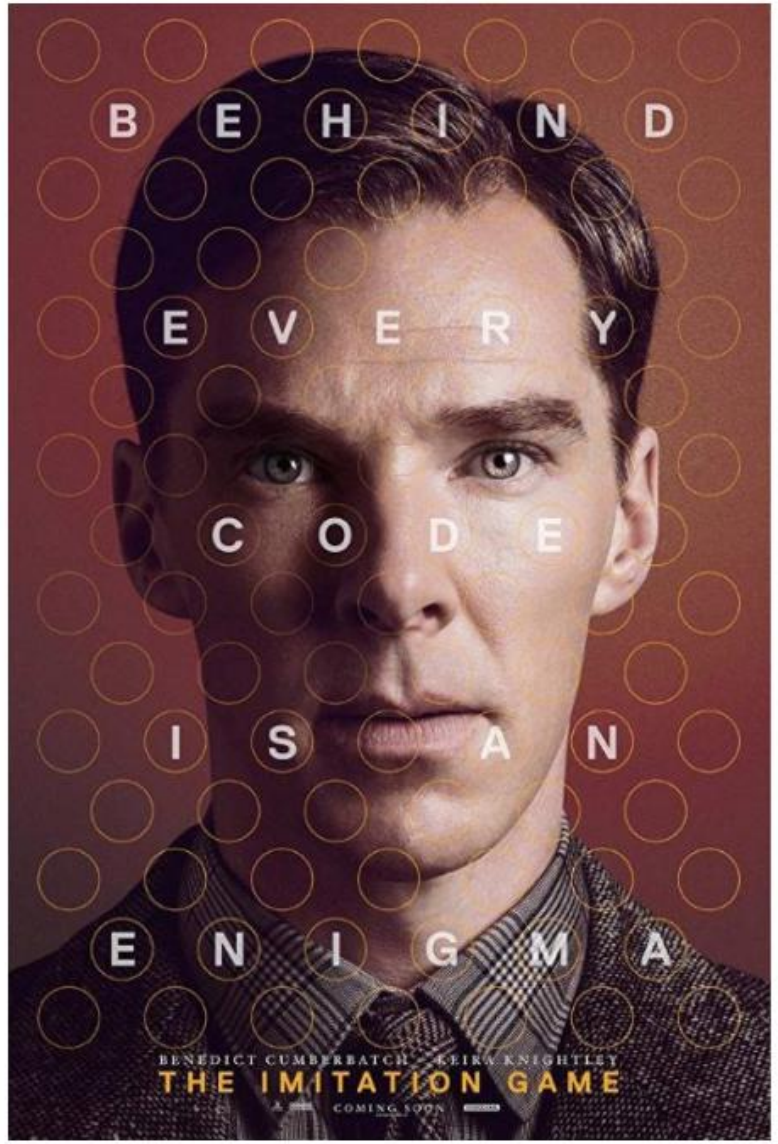


Moneyball is real life story of Baseball team General Manager and how data influenced his team selection within limited budget
Domain: Sports

Imitation Game is real life story of Alan Turing and how Machines influenced World War 2
Domain: Defense and Cyber Security

Hint: Observe the emotional stress these individuals faced while trying to change their organization into a data driven organization.

The Imitation Game (2014)



SUMMARY

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BDM Skills required for a career in the Digital World

RECAP: Must-haves for a successful analyst in the Digital World

A successful analyst will have these skills to succeed in Post-Covid digital world

- **Logic (Business (Horizontal + Vertical) + Data + Math)**
- **Pathos – Art of persuasion using stories**
- **Ethos – Integrity, Ethics, Communication, Team work**

After Covid, please expect digitization to accelerate

People are working more and more online and minimize human interactions in the post Covid world

Increased Zoom meetings

Increase in Netflix viewership

NETFLIX

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Post Covid world – Which economic sectors (S&P 500) will do well?

Strong performers (>1 year for recovery)

1. Information Technology - Companies that develop or distribute technological items or services, and includes internet companies. Technology products include computers, microprocessors, and operating systems. Microsoft Corporation, Oracle Corp., and Mastercard Inc.

2. Health Care - Medical supply companies, pharmaceutical companies, and scientific-based operations or services that aim to improve the human body or mind. Johnson & Johnson

3. Consumer Staples - Consumer staples companies provide all the necessities of life. This includes food and beverage companies, household product providers, and personal product providers., Procter & Gamble, Kroger, which is the largest supermarket chain in the U.S.

4. Communication Services - Companies that keep people connected, internet providers and phone plan providers includes media, entertainment, and interactive media & services companies. Netflix Inc. and Walt Disney Co. AT&T, CBS Corp., and Facebook.

Average performers (> 1.5 years to 2 years for recovery)

5. Financials - finance, investing, and the movement or storage of money. It includes banks, credit card issuers, credit unions, insurance companies, and mortgage real estate investment trusts (REITs). Bank of America Corp, JPMorgan Chase & Co., and Goldman Sachs.

6. Industrials - from airlines and railroad companies to military weapons manufacturers. The sector has 14 different industries. Two of the largest industries are Aerospace & Defense and Construction & Engineering. Delta Air Lines and Southwest Airlines, FedEx Corporation, and Boeing Company.

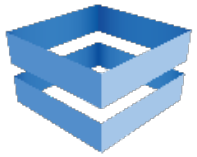
7. Consumer Discretionary - Discretionary consumer products are luxury items or services that are not necessary for survival. The demand for these items depends on economic conditions and the wealth of individuals. Products include cars, jewelry, sporting goods, and electronic devices. Starbucks, Best Buy

8. Energy - oil, gas, and consumable fuels business. This includes companies that find, drill, and extract the commodity. It also includes the companies that refine the material and companies that provide or manufacturer the equipment used in the refinement process. Exxon Mobil and Chevron

9. Utilities -Utility companies provide or generate electricity, water, and gas to buildings and households. For example, Duke Energy generates and distributes electricity, and Southern Company provides gas and electricity.

10. Real Estate - As the name suggests, the newest addition to the S&P sectors includes Real Estate Investment Trusts (REITs) and makes up 2.9% of the S&P 500. Companies in the sector include American Tower Corp., Boston Properties, and Equinix.

11. Materials - materials sector provide the raw material needed for other sectors to function. This includes the mining companies that provide gold, zinc, and copper, and forestry companies



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Q&A

Next Steps

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Questions from the Audience via Google form

- *Sir as a lifescience background, from where to start learning?? I am very much interested but when I start any course on Machine learning or AI, it looks like very tough to learn. Can you plz tale me, What are small and easy steps required to build strong concepts in this field. Thanks*
  - *Debabrata Samanta, Kolkata*

  - Answer: Thanks for your question. I would suggest online courses in NPTEL. Yes, learning a new language takes a couple of years. You should aspire for a BA role which typically have less 50% programming.
  - Try to choose a online course that offers Lifecycle domain projects such as image classification of cells or Tumor detection using Machine Learning. This would give you the chance to learn how a Life science problem is solved using data and math.
- *Hello Sir! Being from a commerce background what would be the right path for honing my skills and establishing a career in Data science? At the moment we've very less post graduation degrees in data science. Either of we can opt for an MBA in Business Analytics or we can do a PGDs. As per the industry demands what is more preferable? Thanks and regards.*
  - *Varun Deshpande, Pune, Maharashtra*

  - Answer: Thanks for your question. Try to focus on ‘E-commerce’ around how business is conducted online by setting up an online store. Choose a course that offers business projects such as Forecasting product demand using Machine Learning and estimating how much cash flow will be locked in Fixed assets and Inventory.
  - I recommend MBA after 2 years of Full time Industry experience or 4 years of Part time Industry experience.

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Show 10 entries Search: data science

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NOC:Data Mining	Computer Science and Engineering	Prof. Pabitra Mitra	IIT Kharagpur	Video
NOC:Data Base Management System	Computer Science and Engineering	Prof. Partha Pratim Das	IIT Kharagpur	Video
NOC:Algorithms for Big Data	Computer Science and Engineering	Prof. John Augustine	IIT Madras	Video
NOC:Programming, Data Structures and Algorithms using Python	Computer Science and Engineering	Prof. Madhavan Mukund	IIT Madras	Video

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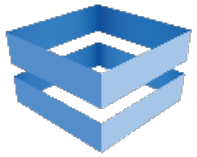
- Krishnan Venkata (Chief Client Officer, LatentView Analytics)
- Palaniappan Ponniah (Storytelling, LatentView Analytics)
- Jayant Pandit (Former Marketing leader, LatentView Analytics)
- Tarunya Suresh (Marketing leader, LatentView Analytics)
- Kiruthika Lakshmi (Marketing team member, LatentView Analytics)

I would like to share 20 years of my learnings in AI, ML, Optimization and Business Analytics learnt from Global Technology companies, so the next generation would benefit. This presentation was designed for college students and young professionals. I would like to wish everyone a successful career in the post Covid digital world.



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Thank you

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