

ARTIFICIAL INTELLIGENCE - SUMMER OF CODE NAVTTC – FULL Stack- [Course]

It is not about Theory, it is 20% Theory and 80% Practical –Technical/Development/Programming [Mostly Python based]

By the end of this course, the trainees should gain the following competencies:

- Understanding of core concepts of artificial intelligence and machine learning
- State of the art machine learning techniques
- Hands-on exposure to exploratory data analysis Practical exposure to model design, evaluation
- Familiarity with tools and libraries such as numpy, pandas, scikit learn, tensorflow, and keras

About Instructor:

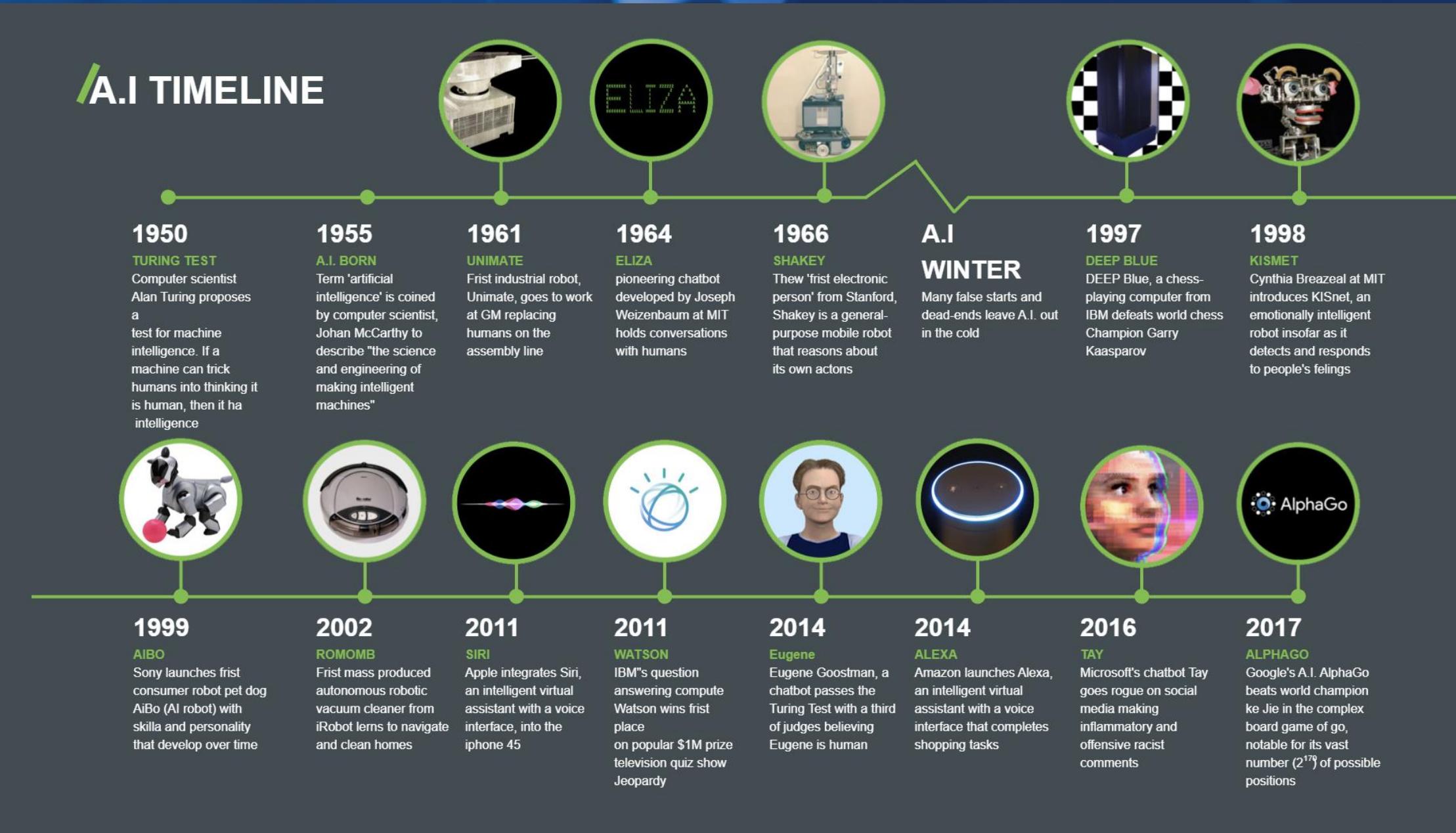
Shahzad - Software Fractional Strategy Consultant - 25+ Years of Experience in Software Industry - with clients in across North America and Europe, with focus on:

- Cloud/SaaS- Software as Service
- Artificial Intelligence & Generative AI & LLM
- Machine Learning & Deep learning & Neural Networks
- Data Analytics, Business Intelligence and Data Science
- CRM-ERP-CMS – Development, Implementation and Consulting
- Ecommerce Development - Platform and Services

About Institute: NexSkill is Pakistan's leading IT training institute, providing the best IT training in Pakistan. NexSkill offers a variety of professional learning platforms to its students.

<https://www.nexskill.com/>

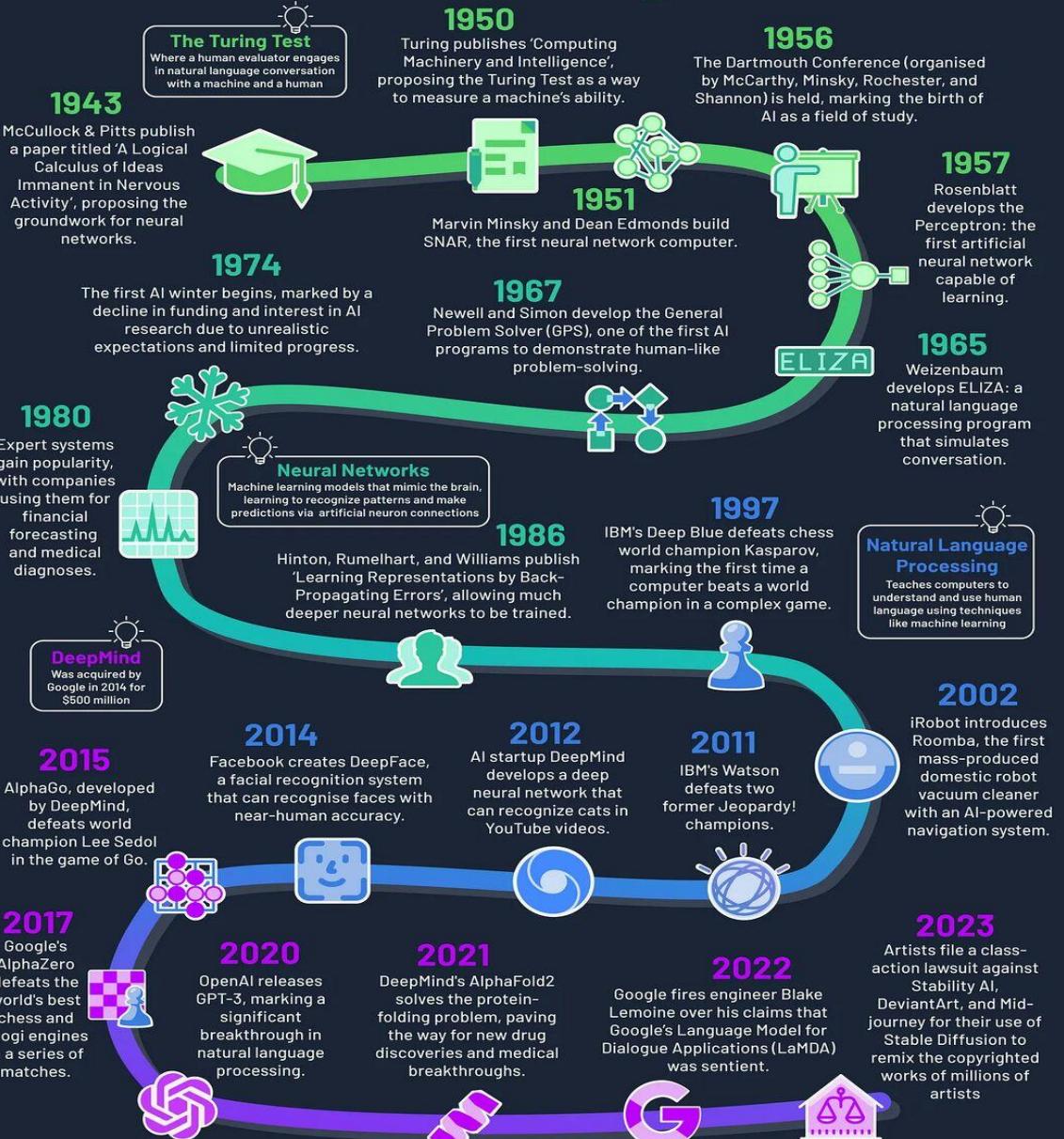
Artificial Intelligence (Machine Learning & Deep Learning) -Timelines



Artificial Intelligence (Machine Learning & Deep Learning) – Timelines – 2nd View

A brief history of... **Artificial Intelligence.**

CREATED BY
 genuine impact



Why AI is so important Today-What is happening

Market Growth: The global AI software market is expected to continue its rapid growth. According to various market research reports, the AI software market was valued at approximately \$136.55 billion in 2023 and is expected to grow at a compound annual growth rate (CAGR) of around 37-40% from 2024 to 2030. This would bring the **market size** to over \$1 trillion by 2030.



[Source: Statista - <https://www.statista.com>]

Development Team formation : Old style Formation vs New style Formation

2 front end developer + 2 backend developer + 1 QA engineer + Team Lead

[Old style Formation]

2 front end developer + 2 backend developer + 2 AI/ML Engineer + 1 QA + Team Lead

[New style Formation]

AI Everywhere –

Every CMS/CRM/ERP/E-commerce - solution , Every product or Every Mobile App
or Every web app - AI Everywhere

Applied AI in Industry:

Exercise: Create a account for HubSpot – explore breeze / co-pilot features

<https://www.hubspot.com/products/artificial-intelligence>



- ✓ Premium versions of all free tools, plus ...
- ✓ Intent orchestration
- ✓ Search intent criteria
- ✓ Buyer intent
- ✓ Data enrichment
- ✓ Form shortening
- ✓ Automated actions



Breeze Copilot
Your Virtual Assistant



Breeze Agents
Streamline Growth



Breeze Intelligence
Get the Complete Customer Picture



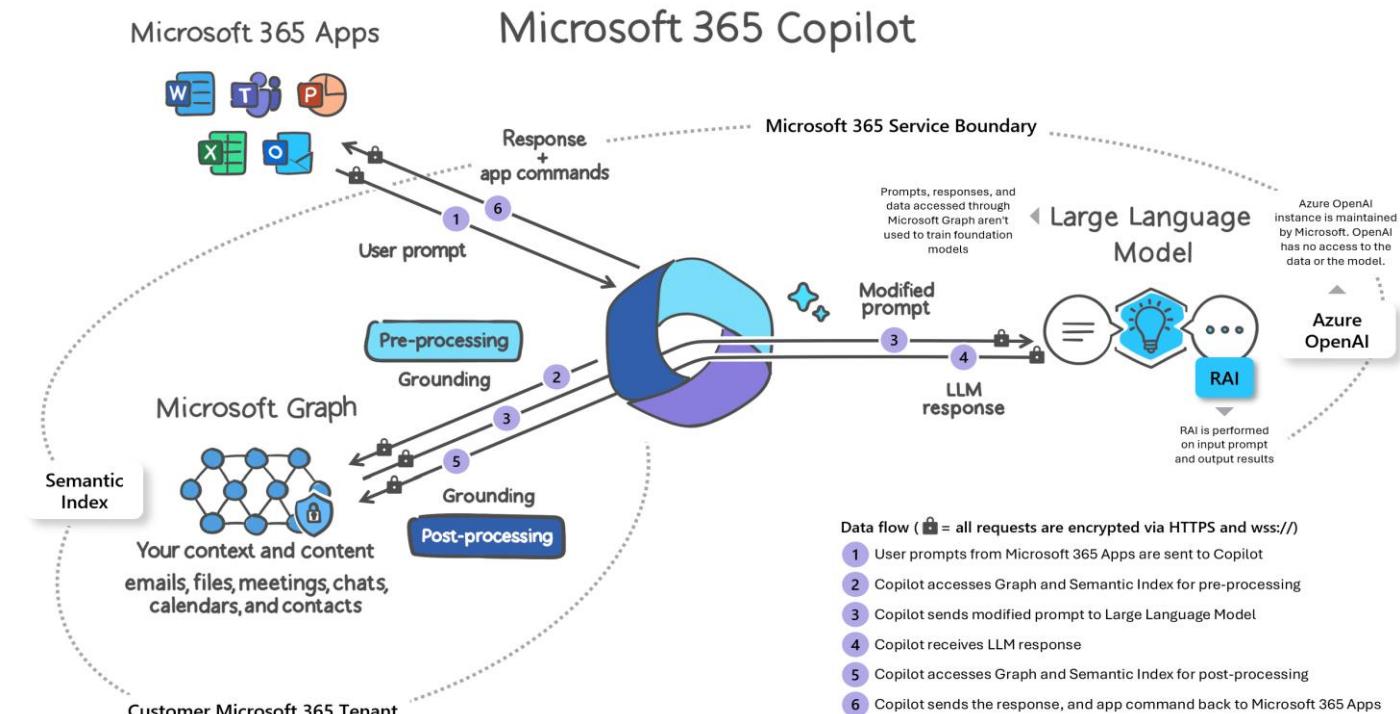
Breeze Features
80+ Updates Platform-wide

✓ Target markets

✓ Automated actions

Exercise: Create a account for Microsoft 365 – explore co-pilot features

<https://www.microsoft.com/en-us/microsoft-365/copilot>



AI Career Professional and Industry Trends

Accenture - Reference: <https://www.accenture.com/cz-en/insights/consulting/gen-ai-reinventing-enterprise-models>
<https://www.accenture.com/cz-en/insights/artificial-intelligence-summary-index>



The future of AI

According to Accenture's report, [AI: Built to Scale](#), 84 percent of business executives believe they need to use AI to achieve their growth objectives. However, 76 percent acknowledge struggling with how to scale AI across their business. Until now, there hasn't been a blueprint to getting past proof of concept into production and scale, a transition many struggle to make. At this inflection point, it's imperative businesses take the necessary steps to scale successfully.

84%

of business executives believe they need to use AI to achieve their growth objectives.

76%

acknowledge struggling with how to scale AI across their business.

Having AI Skills Can Increase Salaries by 40%

According to a study by researchers at the Oxford Internet Institute and the Copenhagen Center for Social Data Science, employees with AI skills are 'particularly valuable' and command [salaries that are 21% higher than average](#) but can potentially go up to 40%. This is due to their strong complementarities and their rising demand in recent years.

Among the most valuable AI skills are data science and programming languages. Of the frequently in-demand AI skills, the top 5 in terms of [economic value to the worker](#) were found to be:

- Machine Learning (+40%)
- Tensor Flow [1] (+38%)
- Deep Learning (+27%)
- Natural Language Processing (+19%)
- Data Science (+17%)

Which skills are in demand

<https://www.berlin-international.de/en/magazine/blog/why-having-ai-skills-is-important-in-todays-business-world/>
<https://www.forbes.com/sites/rachelwells/2024/06/10/3-in-demand-high-income-ai-skills-you-need-in-2024/>
<https://www.coursera.org/in/articles/ai-skills>



Forbes

LUMS
A Not-for-Profit University
Learning without Borders

INTERNATIONAL ECONOMIC DEVELOPMENT COUNCIL

Dynamics of AI Power economy and ecosystems - Reference:

<https://onlinedegrees.sandiego.edu/ai-impact-on-job-market/>
<https://www.forbes.com/councils/forbestechcouncil/2025/01/10/how-artificial-intelligence-is-transforming-the-job-market-a-guide-to-adaptation-and-career-transformation/>
<https://mhrc.lums.edu.pk/how-susceptible-pakistans-job-market-ai>
https://www.iedconline.org/clientuploads/EDRP%20Logos/AI_Impact_on_Labor_Markets.pdf

Modern SaaS AI Development Services

SaaS AI Development Platform : MicroSoft vs Google vs Amazon vs Oracle vs IBM

- Microsoft – Azure AI Services:

<https://azure.microsoft.com/en-us/solutions/ai/>

- Google AI services:

<https://cloud.google.com/products/ai/>

- Amazon AI Services

<https://aws.amazon.com/ai/services/>

- Oracle AI Services:

<https://www.oracle.com/artificial-intelligence/ai-services/>

- IBM AI Services:

<https://www.ibm.com/artificial-intelligence>

Azure AI services – are included with training tasks.

On-site	IaaS	PaaS	SaaS
Applications	Applications	Applications	Applications
Data	Data	Data	Data
Runtime	Runtime	Runtime	Runtime
Middleware	Middleware	Middleware	Middleware
O/S	O/S	O/S	O/S
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking

Legend:

- You manage
- Service provider manages

References:

<https://www.redhat.com/en/topics/cloud-computing/iaas-vs-paas-vs-saas>

<https://www.bmc.com/blogs/saas-vs-paas-vs-iaas-whats-the-difference-and-how-to-choose/>

AI Standard alone Development Services, Platform, Framework



CLOUDERA

.d dotData



Caffe

H₂O.ai

mlflow



PYTORCH

Playment

iMerit



Tamr

Spark

Kubeflow

References:

<https://dagshub.com/blog/top-ai-frameworks-and-libraries/>

https://www.splunk.com/en_us/blog/learn/ai-frameworks.html

<https://www.geeksforgeeks.org/top-artificial-intelligence-frameworks/>

<https://5ly.co/blog/best-ai-frameworks/>

<https://clockwise.software/blog/artificial-intelligence-framework/>

AI/ML/DL-Framework/Services [Covered in this Course]

Scikit-learn

- Simple and efficient tools for predictive data analysis
- Accessible to everybody, and reusable in various contexts

<https://scikit-learn.org>

TensorFlow

- An end-to-end platform for machine learning
- TensorFlow makes it easy to create ML models that can run in any environment.

<https://www.tensorflow.org/>

Keras

- Keras is a deep learning API designed for human beings, not machines. Keras focuses on debugging speed, code elegance & conciseness, maintainability, and deployability

<https://keras.io/>

Basics - What is AI-Artificial Intelligence

Artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience

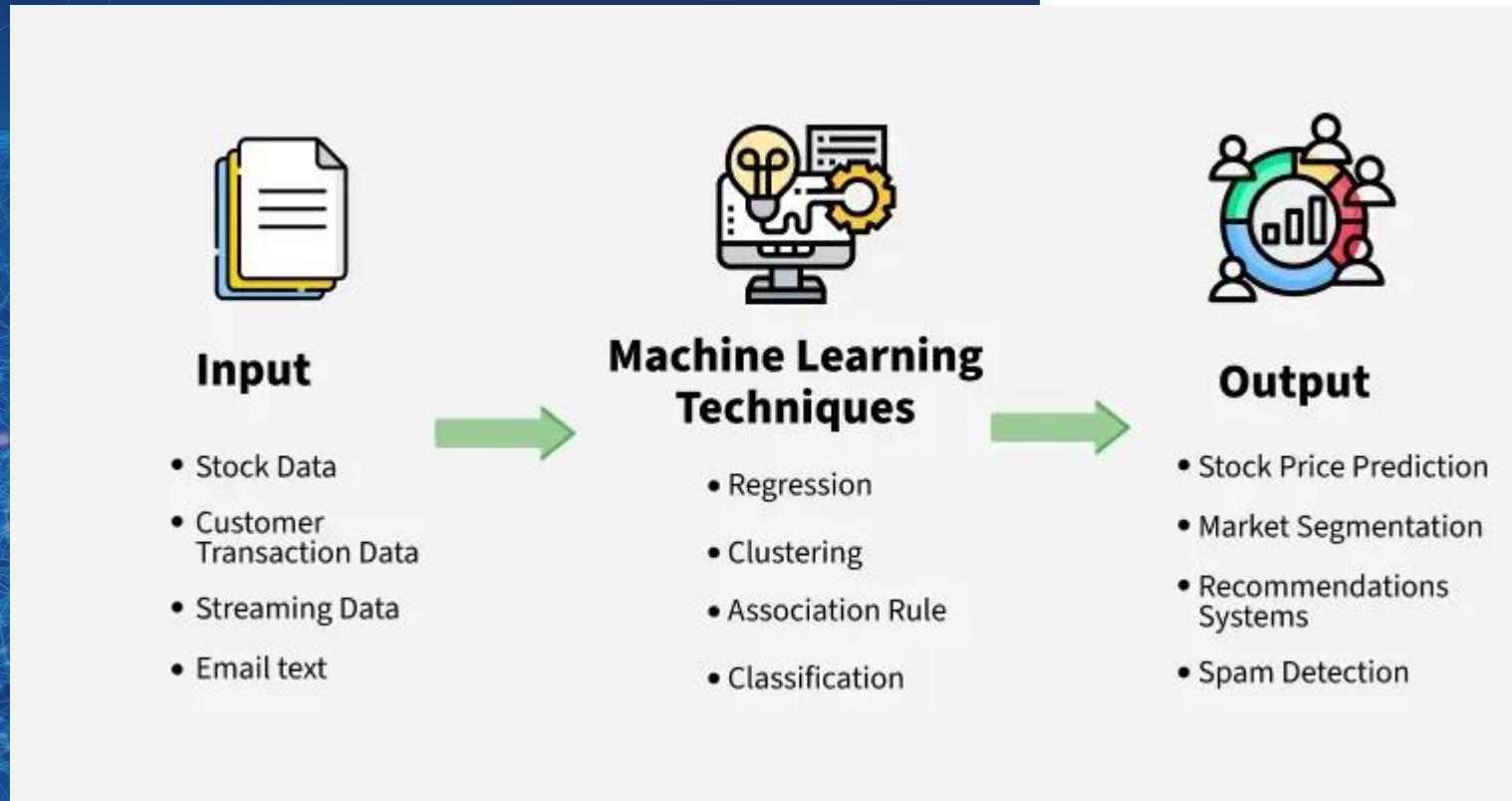


References:

- <https://cloud.google.com/learn/what-is-artificial-intelligence?hl=en>
- <https://www.coursera.org/articles/what-is-artificial-intelligence>
- <https://www.ibm.com/think/topics/artificial-intelligence>

Basics - What is ML-Machine Learning

Machine Learning (ML) is a subset of Artificial Intelligence (AI) that enables computers to learn and improve from data without explicit programming, using algorithms to analyze data, identify patterns, and make predictions or decisions



References:

<https://www.ibm.com/think/topics/machine-learning>

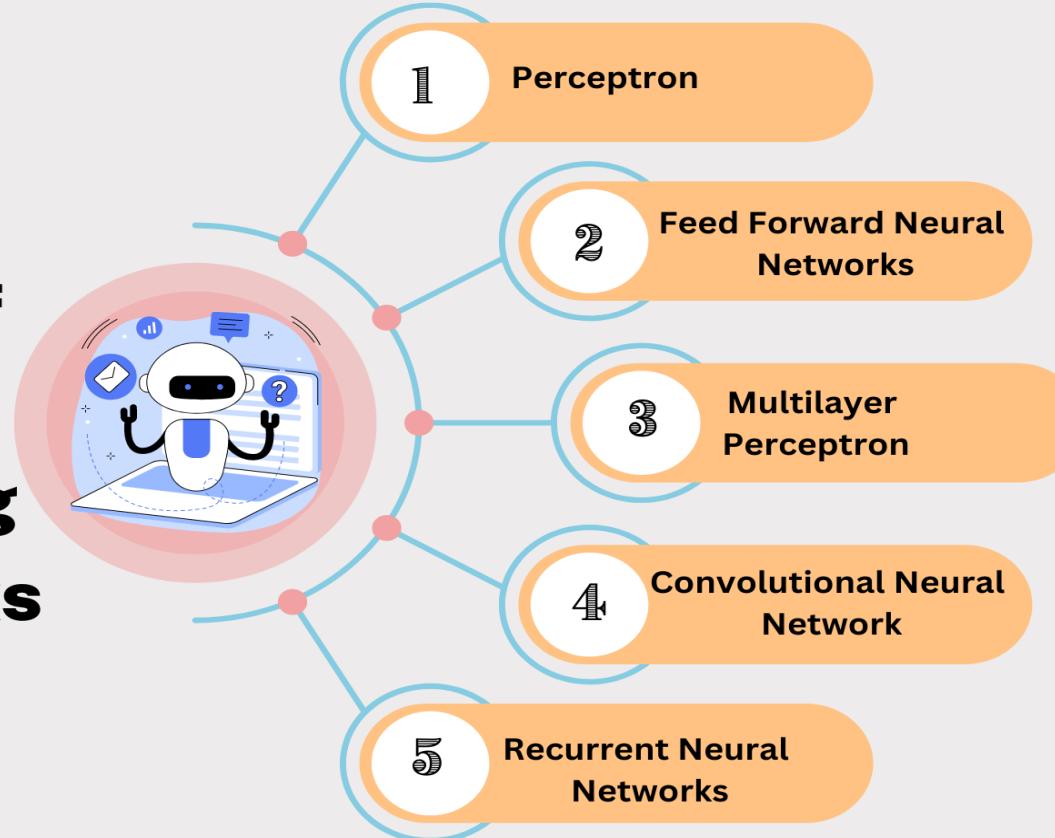
<https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-ml/>

<https://cloud.google.com/learn/artificial-intelligence-vs-machine-learning?hl=en>

Basics - What is DL-Deep Learning

Deep learning is a subset of machine learning that focuses on utilizing neural networks to perform tasks such as classification, regression, and representation learning.

Types of Deep Learning Networks



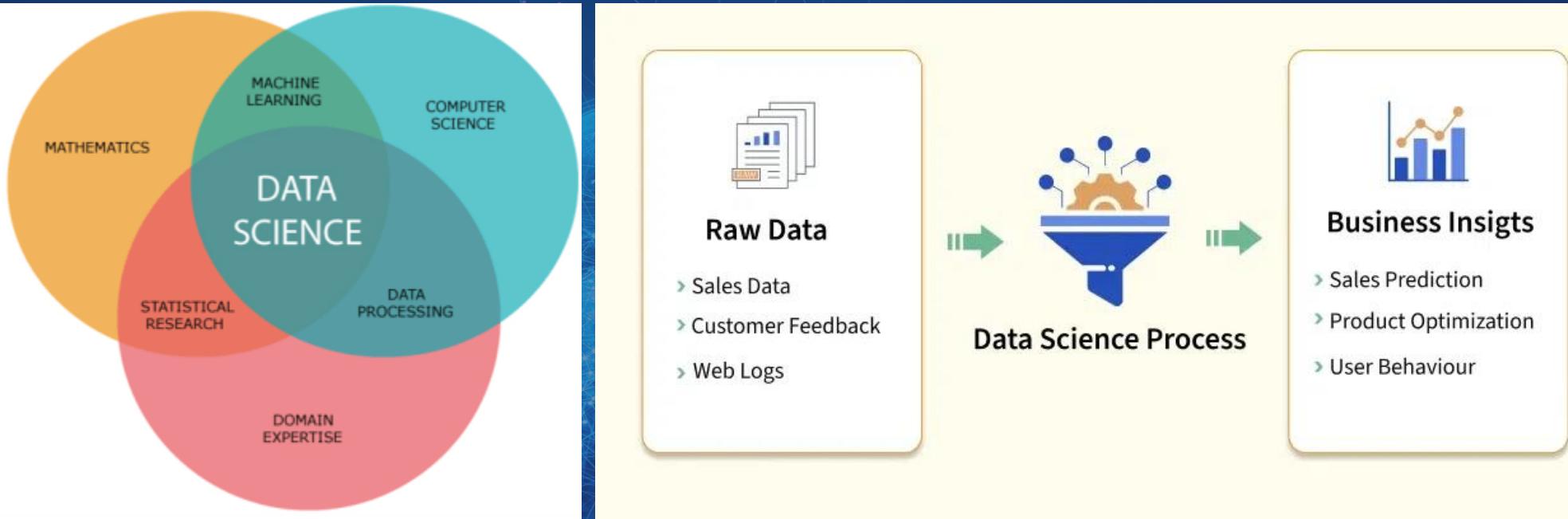
References:

<https://aws.amazon.com/what-is/deep-learning/>

<https://www.ibm.com/think/topics/deep-learning>

<https://cloud.google.com/discover/what-is-deep-learning?hl=en>

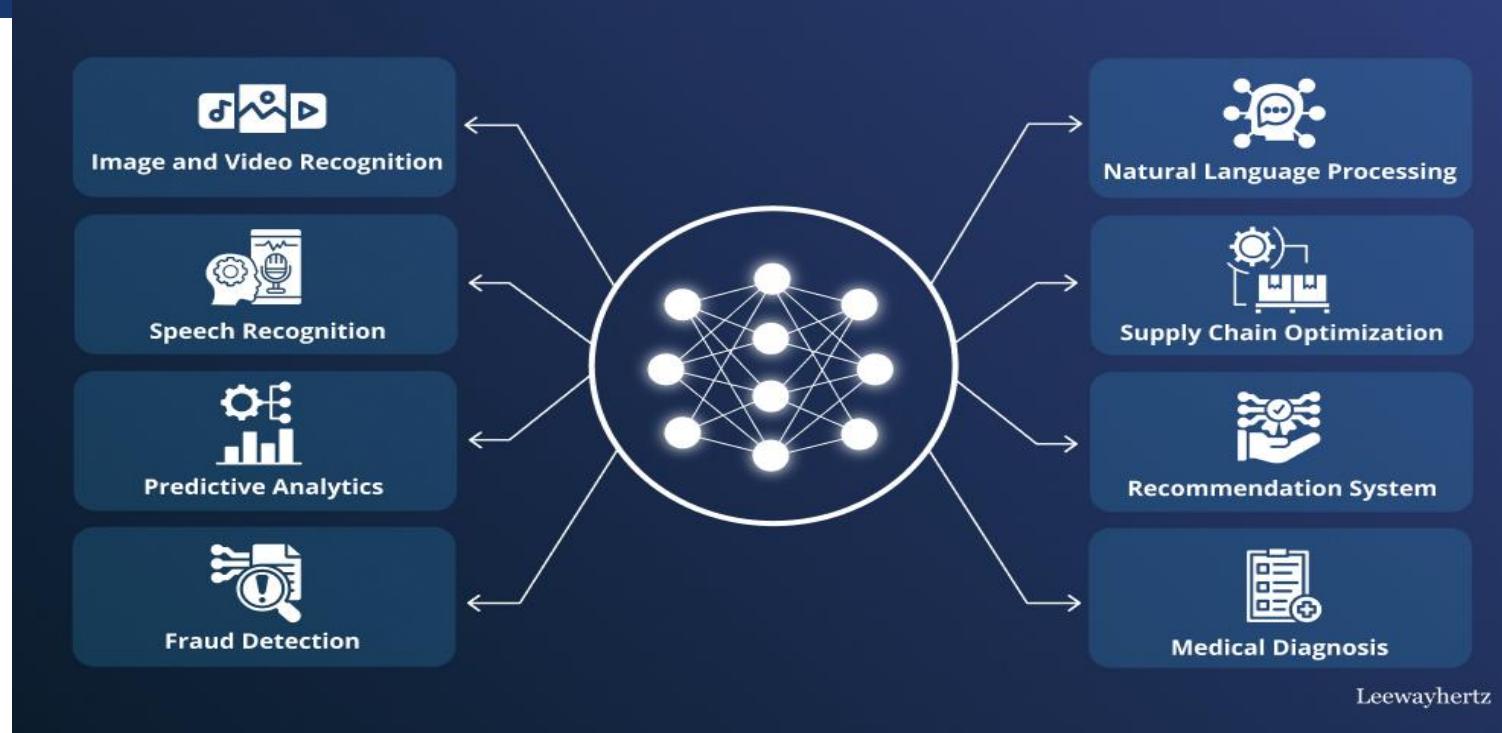
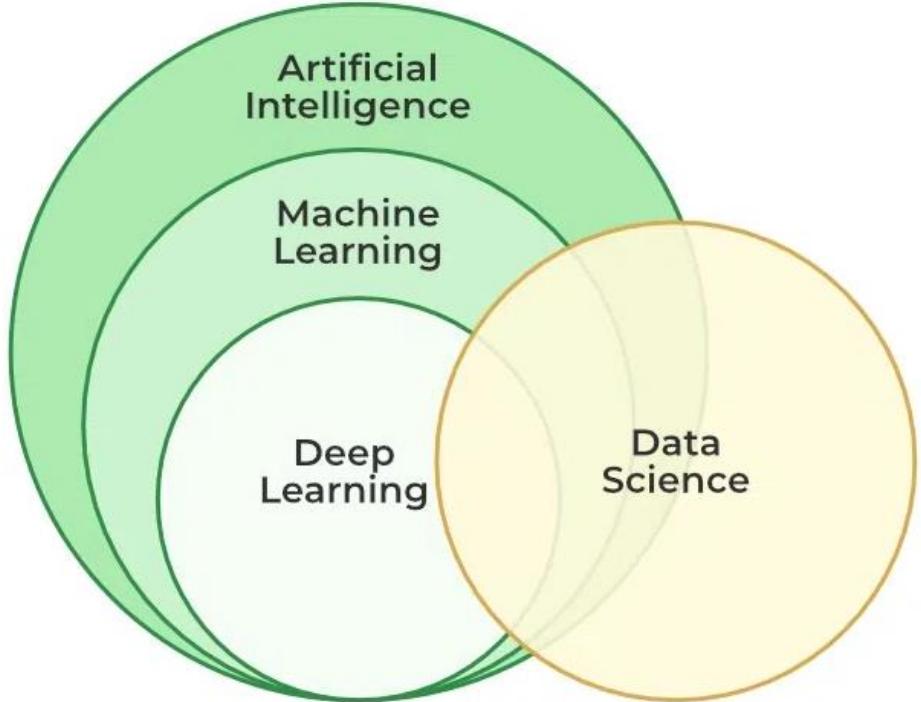
Basics – What is Data science



References:

- <https://medium.com/analytics-vidhya/introduction-to-data-science-28deb32878e7>
- <https://www.ibm.com/think/topics/data-science>
- <https://www.geeksforgeeks.org/data-science/>
- <https://ischoolonline.berkeley.edu/data-science/what-is-data-science/>
- <https://www.datacamp.com/blog/what-is-data-science-the-definitive-guide>

Big Picture –Applied Use Cases



References:

<https://cloud.google.com/discover/ai-applications?hl=en>

<https://www.ibm.com/think/topics/artificial-intelligence-business-use-cases>

<https://www.leewayhertz.com/ai-use-cases-and-applications/>

Use Cases

- ❑ Traffic signal – monitoring and schedule management
- ❑ Traffic challan – signal break – speed limit monitoring system
- ❑ Autonomous cars , self driving car - safe driving . Collision detection
- ❑ M-Tag scan and deduction of fee – on ring road , motorway
- ❑ Prescription on medical industry – based on machine learning
- ❑ Legal support – for based on Law – rules and cases history

Challenges of AI

AI challenges

Data Privacy and Security

Sensitive data protection

Limited Data Availability

Data scarcity issues

Bias in AI Algorithms

Discriminatory outcomes risk

Autonomy and Control of AI Systems

Decision-making authority

Lack of Transparency

Decision-making clarity

High Energy Consumption

Environmental impact concern

AI Misuse and Malicious Applications

Cybersecurity threats

Privacy in AI Surveillance

Monitoring ethical concerns

High Implementation Costs

Financial investment barrier

Integration with Legacy Systems

Compatibility challenges

Explainability of AI Systems

Understanding AI decisions

Fairness in Automated Decision-Making

Equitable outcomes focus

References:

<https://www.simplilearn.com/challenges-of-artificial-intelligence-article>

<https://www.geeksforgeeks.org/top-challenges-for-artificial-intelligence/>

<https://www.upgrad.com/blog/top-challenges-in-artificial-intelligence/>

Your Professional Career – Why AI Important



The report, which analysed over half a billion job ads from 15 countries, suggests that AI could allow many nations to break out of persistent low productivity growth, generating economic development, higher wages, and enhanced living standards.

The report finds that for every job posting requiring AI specialist skills (i.e., machine learning) in 2012, there are now seven job postings.¹ PwC research also finds that growth in jobs demanding AI skills has outpaced all jobs since 2016, with postings for jobs requiring AI skills growing 3.5x faster than for all jobs.

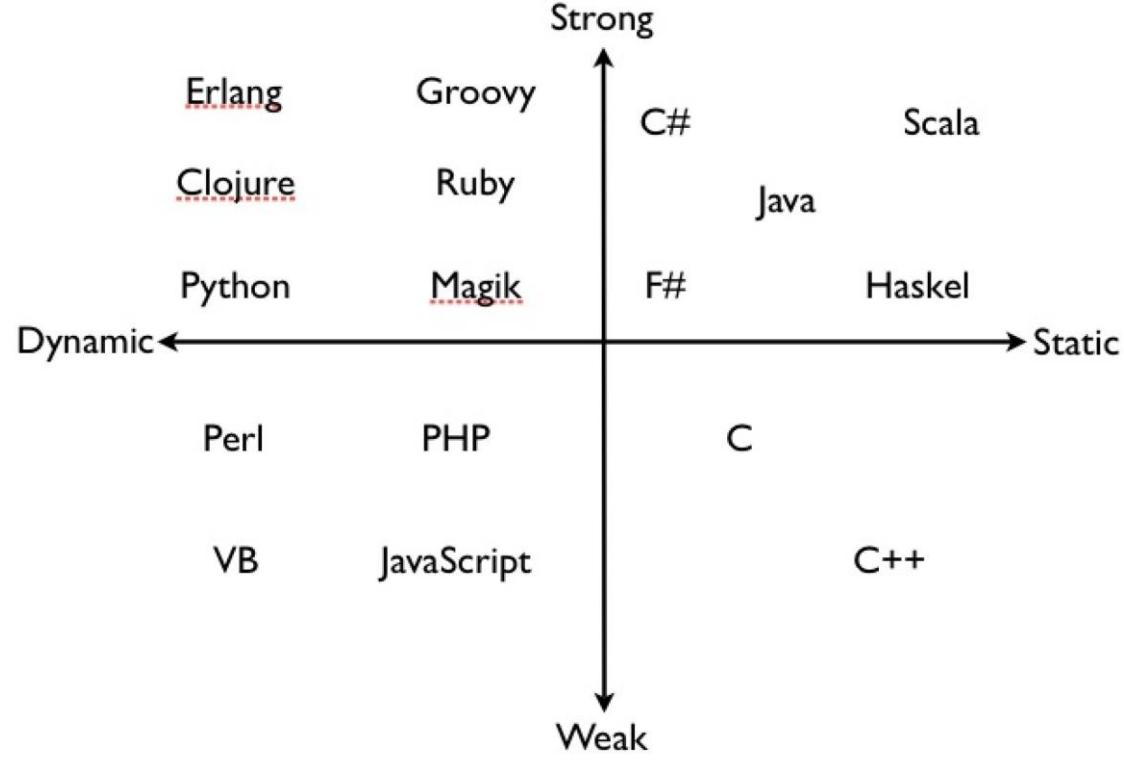
The findings also highlight economic opportunity for labour forces: jobs that require AI skills carry up to a 25% average wage premium in some markets.

Skills sought by employers are changing much faster in occupations more exposed to AI, with old skills disappearing – and new skills appearing – in job ads at a 25% higher rate than in occupations less exposed to AI. To stay relevant in these occupations, workers will need to demonstrate or acquire new skills.

References:

- <https://www.wgu.edu/blog/ai-careers-guide-jobs-artificial-intelligence2503.html>
- <https://mitsloan.mit.edu/ideas-made-to-matter/why-future-ai-future-work>
- <https://csuglobal.edu/blog/why-ai-important>

Development Background



Strongly typed vs weakly typed Programming languages:

<https://99x.io/europe/resources/blog/strongly-vs-weakly-typed-languages>

<https://www.linkedin.com/advice/0/what-difference-between-strongly-weakly-typed-eqwl/>

<https://medium.com/@fedor.selenskiy/static-dynamic-vs-strong-weak-typing-a-common-misconception-d050f24b7db9>



Structured vs Object oriented - Programming Languages

<https://www.geeksforgeeks.org/difference-between-structured-programming-and-object-oriented-programming/>

<https://dzone.com/articles/decoding-the-nuances-structured-vs-object-oriented>

<https://www.tutorialspoint.com/difference-between-structured-and-object-oriented-programming>

Structured Programming	OOP
<ul style="list-style-type: none">• Emphasizes on algorithm• Follows top-down approach• Pass the data around the system openly• No object created• Exp : C prog , COBOL	<ul style="list-style-type: none">• Emphasized on data• Follows bottom-up approach• Pass the data securely with access specifiers• Object created• Exp : C++ , Java

Development Background - 2

Compiled		Interpreted	
PROS	CONS	PROS	CONS
ready to run	not cross platform	cross-platform	interpreter required
often faster	inflexible	simpler to test	often slower
source code is private	extra step	easier to debug	source code is public

Compiled vs Interpreted Programming Languages

<https://www.freecodecamp.org/news/compiled-versus-interpreted-languages/>

<https://www.geeksforgeeks.org/difference-between-compiled-and-interpreted-language/>

<https://byjus.com/gate/difference-between-compiled-and-interpreted-language/>



Open Source vs Close source - Development / Culture

<https://edu.gcfglobal.org/en/basic-computer-skills/open-source-vs-closed-source-software/1/>

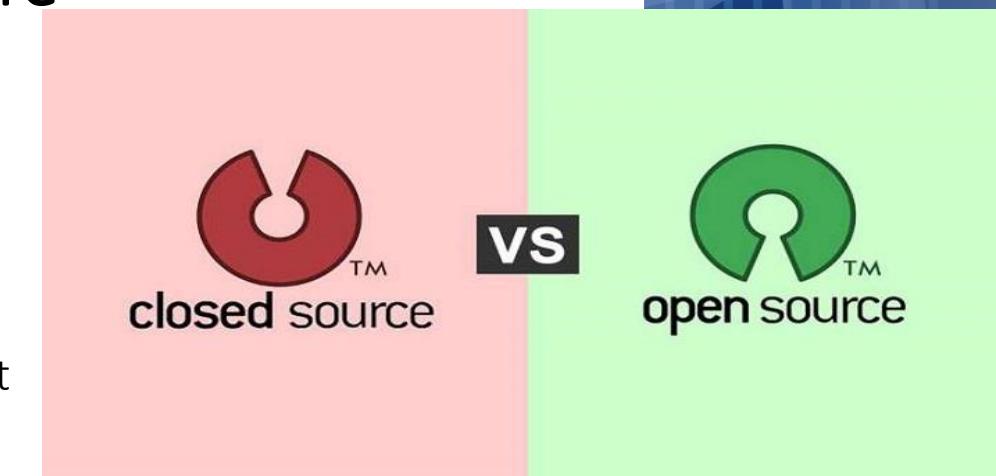
<https://www.pingcap.com/article/open-source-vs-closed-source-software-benefits/>

https://www.splunk.com/en_us/blog/learn/open-vs-closed-source-software.html

Open Source as business Strategy- example

Open Source – with custom build by each vendor. Foundation and its variant

M&A process – Company culture



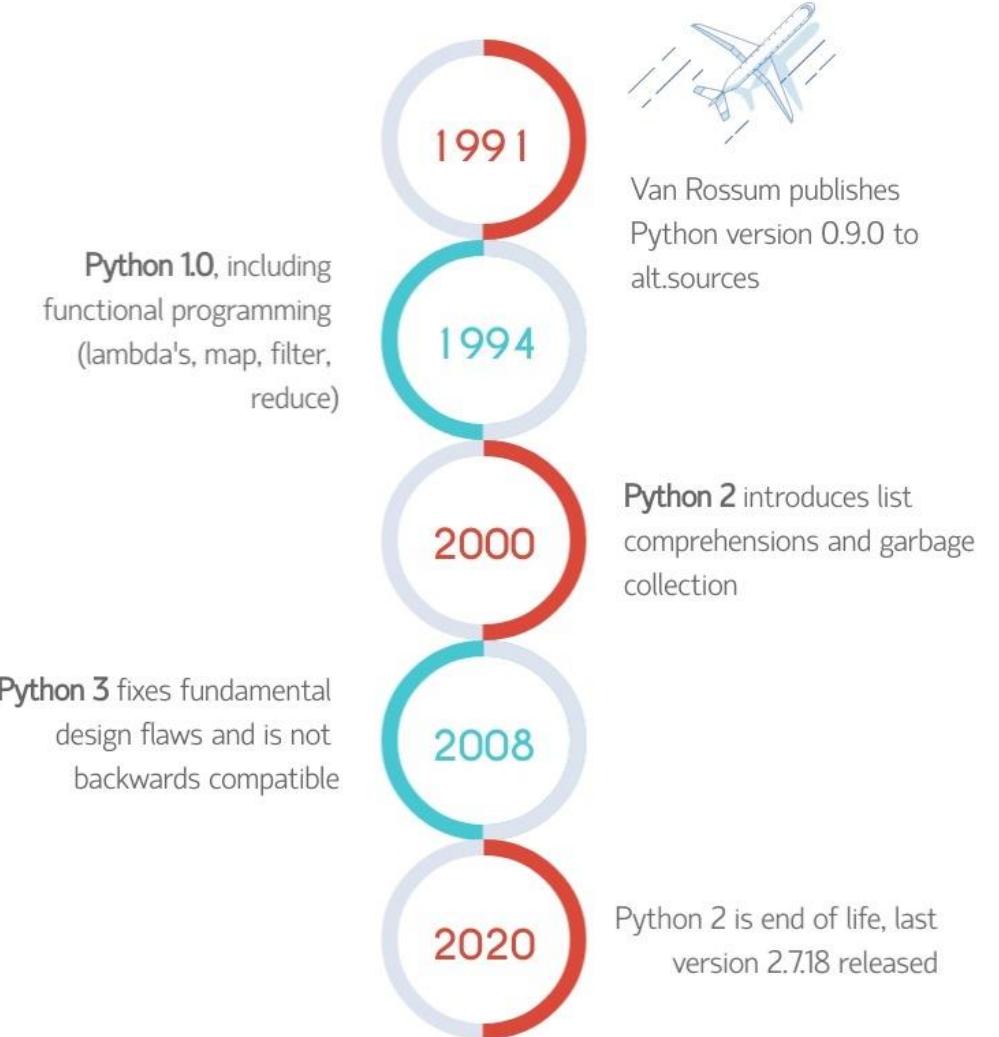
Development– The Python - Way

- ❑ IDE: Visual Studio Code
- ❑ IDE Extension: Python by Microsoft
- ❑ Python version : 3.13.2
- ❑ Source Code Repository : GitHub
- ❑ Code Debugger: Build-in
- ❑ System Requirements – how to find
- ❑ Feature – Release notes
- ❑ Known Issues
- ❑ Using Google and LLMs

Resources:

<https://wiki.python.org/moin/BeginnersGuide/Programmers>

Python History



What is expected in this Course?

- ❑ In-depth - Theoretical Foundation for AI / ML / DL
- ❑ Python – deep dive as development platform – core development/programming stack
- ❑ Development in NUMPY
- ❑ Development in Pandas
- ❑ Development in Seaborn
- ❑ Development in Scikit-learn
- ❑ Development in TensorFlow
- ❑ Development in Keras
- ❑ Machine Learning – Algorithm design, analysis , exploration, investigation and development
- ❑ Deep Learning – Neutral Network - Algorithm design, analysis , exploration, investigation and development



Which Global Companies Use Python?

 Spotify	Spotify
 Google	Google
 Quora	Quora
 Uber Technologies Inc	Uber Technologies Inc
 Stripe	Stripe
 Facebook	Facebook
 Google uses python extensively	Google uses python extensively

 Instagram	Instagram
 Dropbox	Dropbox
 Amazon	Amazon
 Industrial Light & Magic	Industrial Light & Magic
 Instacart	Instacart
 Facebook and instagram use ...	Facebook and instagram use ...

 Netflix	Netflix
 Reddit	Reddit
 NASA	NASA
 Pinterest	Pinterest
 PayPal	PayPal
 Netflix uses python	Netflix uses python



References:

<https://jaydevs.com/top-companies-that-use-python/>

<https://trio.dev/companies-using-python/>

<https://brainstation.io/career-guides/who-uses-python-today>

Which Software Houses in Pakistan- Use Python?



Arbisoft ✅
📍 Lahore, Pakistan
🏢 United States

If you can imagine it, we can build it



Astoe Company ✅
📍 Lahore, Pakistan

Astoe Company is a leading digital company that specializes in providing innovative software solutions and optimization services.



BearPlex ✅

BearPlex ✅
📍 Lahore, Pakistan

A software development company that brings your tech dreams come true with top-notch website and SaaS solutions!



ZASOLPK
IT SOLUTIONS

ZaSolPK IT Solutions ✅
📍 Lahore, Pakistan

Empower Businesses Globally Found by Zain Sardar, ZaSolPk IT Solutions is a leading IT service provider delivering innovative and tailored solutions.



DESIGNBUB

Design bub ✅
📍 Islamabad, Pakistan
🏢 Pakistan

Your hub for professional logo, web, and graphic design services, transforming ideas into stunning visuals.



Prob N Tech ✅
📍 Faisalabad, Pakistan

Prob N Tech: Your partner in smart IT solutions—empowering growth through AI, automation, and innovation. Let's elevate your business. 🛠️💡

References:

<https://techbehemoths.com/companies/python/pakistan>

<https://www.sortlist.com/s/python-development/pakistan-pk>

<https://superbcompanies.com/categories/python-development-companies-in-pakistan/>

<https://themanifest.com/pk/software-development/python-django/companies>



Which Global Software Houses in Pakistan- Planning Big on AI?

<https://systems ltd.com/services/generative-ai>

<https://systems ltd.com/services/advanced-analytics>

<https://www.xavor.com/ai-ml-solutions/>

<https://netsoltech.com/products/transcend-ai-labs>

<https://www.alphabold.com/solutions/artificial-intelligence/>

<https://arbisoft.com/solutions/data/generative-ai>

<https://arbisoft.com/solutions/data/deep-learning>

<https://arbisoft.com/solutions/data/machine-learning>

<https://arbisoft.com/solutions/data/science>

<https://nextbridge.com/ai-machine-learning/>

<https://nextbridge.com/computer-vision/>

<https://www.techlogix.com/data-analytics-ai/>

<https://northbaysolutions.com/services/generative-ai-ml/>

<https://www.afiniti.com/products/experienceai/>



- BI Product oriented vs BI Neutral Career Strategy
- Data science – Product oriented vs Data science Neutral Career Strategy
- AI Product oriented vs AI Neutral Career Strategy
- ML Product oriented vs ML Neutral Career Strategy
- DL Product oriented vs DL Neutral Career Strategy
- Employment vs Entrepreneurship strategy
- Freelancing to company establishment
- Freelancing – Upwork vs Fiverr
- AI tools vs AI development stack
- LLM based vertical trained – business model
- On Premises VS On Cloud - AI – services Stacks

Confused...– Don't be – Just Focus on this course

- Small baby steps towards AI enabled Professional orientation
- Prefer Iterations, progressiveness over Idealism and perfection
- Not just theory, Practical / Programming / Development oriented AI approach
- Join for – AL Full stack course – refine and redefine – your future
- Will put your hands – into full scale AI development stack course
- A baby bird in nest, will have to jump for the first time, with risk of falling – to Fly high in the sky. Need to take risk, need to be bold , need to be brave to face the professional orientation challenges.



Thank you - for listening and participating

- Questions / Queries
- Suggestions/Recommendation
- Ideas.....?

Shahzad Sarwar
Cognitive Convergence
<https://cognitiveconvergence.com>

- Movies about AI-Artificial Intelligence-Robots
<https://www.imdb.com/list/ls500056453/>
https://en.wikipedia.org/wiki/List_of_artificial_intelligence_films
<https://www.top5.com/20-movies-about-artificial-intelligence-taking-over-the-world/>
<https://www.ranker.com/list/best-artificial-intelligence-movies-list/ranker-film>