

# Introduction to AI & MLOps

# Data Science

## Why, What, Where and How?

### Disclaimer:

- Only working definitions
- No clear agreeable-to-all definitions and subject classification
- No one right answer, and there are no 100% wrong answers
- Everything depends on the context



# Data Science

## Are DS, AI & ML same?

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# What is Data Science?

2022

People also ask	
What is the difference between data science machine learning and artificial intelligence?	▼
Is AI and ML part of data science?	▼
How is data science related to artificial intelligence?	▼
What is the relationship between artificial intelligence and machine learning?	▼
Which is best AI or ML?	▼
Should I study AI or data science?	▼
Which is the application of AI?	▼
Is machine learning part of AI?	▼
What should I learn first AI or ML?	▼
Is AI a good career?	▼
What should I learn first in data science?	▼
Can data science be self taught?	▼
Can I learn Data Science in 3 months?	▼

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What is the salary of an AI specialist?	▼
Does AI require coding?	▼
Is artificial intelligence a good career?	▼
Is artificial intelligence course difficult?	▼
Is machine learning a good career?	▼
Can a data scientist become AI engineer?	▼
What is the average salary of an AI engineer?	▼

Feedback

# Understanding ML, AI & DS

“

Data, Data, Everywhere

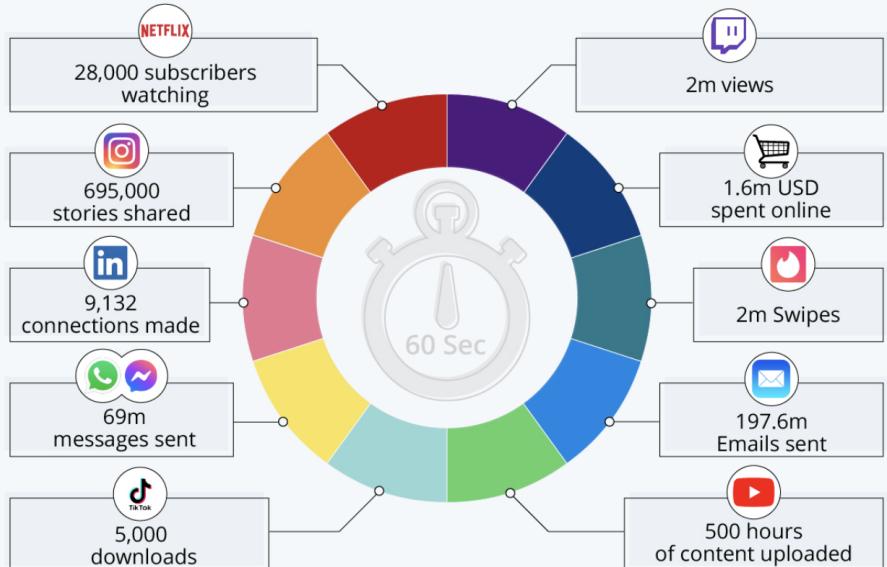
# Data Everywhere

## Data

- something raw, meaningless,
- structured, unstructured
- numbers, text, symbols, pixels, voxels, audio, video, etc

### A Minute on the Internet in 2021

Estimated amount of data created on the internet in one minute



Source: Lori Lewis via AllAccess

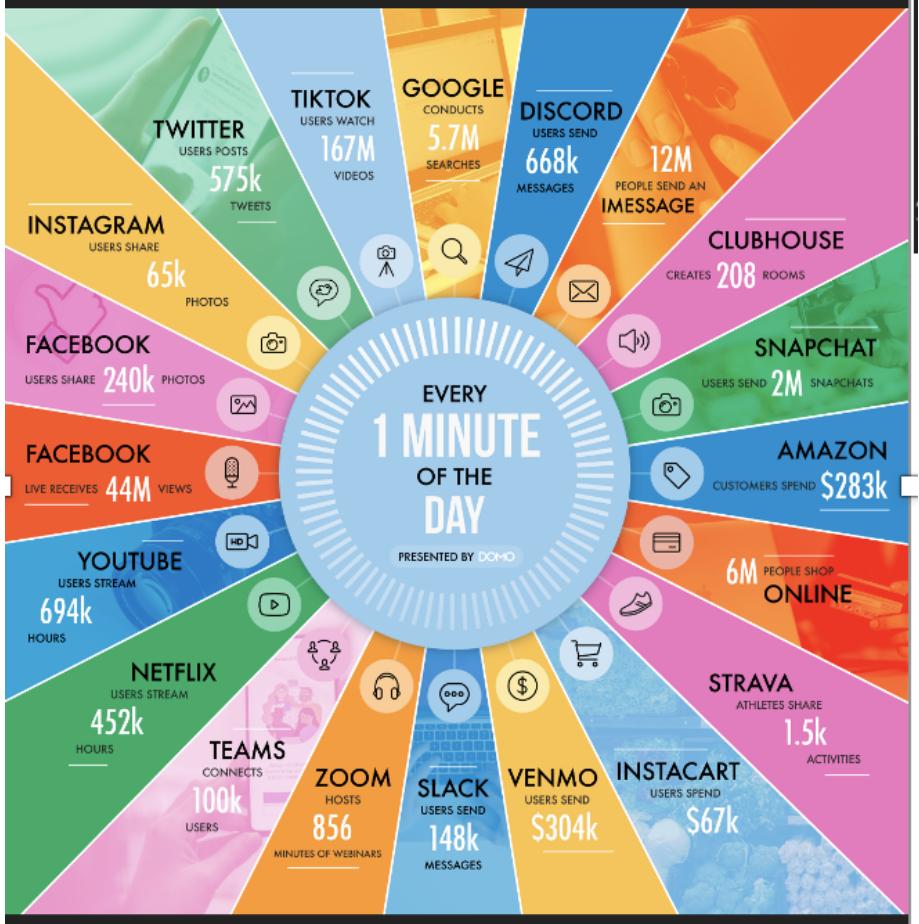


statista

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# Data Everywhere

science driving healthcare politics  
sports policies media  
autonomous e-commerce  
social

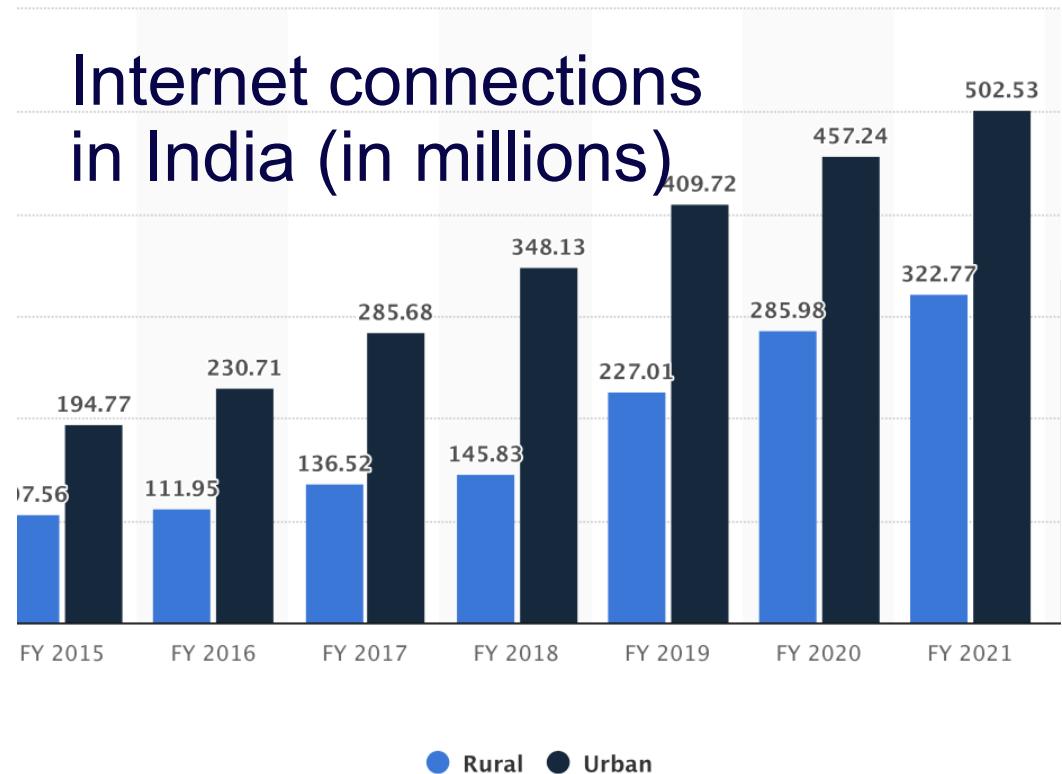
finance public



# Data Everywhere

Data to grow ...

## Internet connections in India (in millions)



## Data

- becomes information when converted into a useful form (pre-processing, cleaning, transformation, reduction, discretization, storage: csv, tsv, XML, RSS, JSON),
- Eg.: 1964, 2056, 5898, MFF, 36, 40, 23, 8575, 10500, 2520



Cust. Id	Gender	age	Monthly Income (\$)
1964	M	36	8575
2056	F	40	10500
5898	F	23	2520

## Analysis

- analysis refers to hands-on data exploration and evaluation
- looks backward, providing a historical view
- Explains how? why? in the past



## Analytics

- explores potential future events, predictions
- qualitative analytics = analysis + intuition
- quantitative analytics = models build from analysis + algorithms

Analysts  $\neq$  Analytics

Data Analysis  $\neq$  Data Analytics

Business Analysis  $\neq$  Business Analytics

# Artificial Intelligence

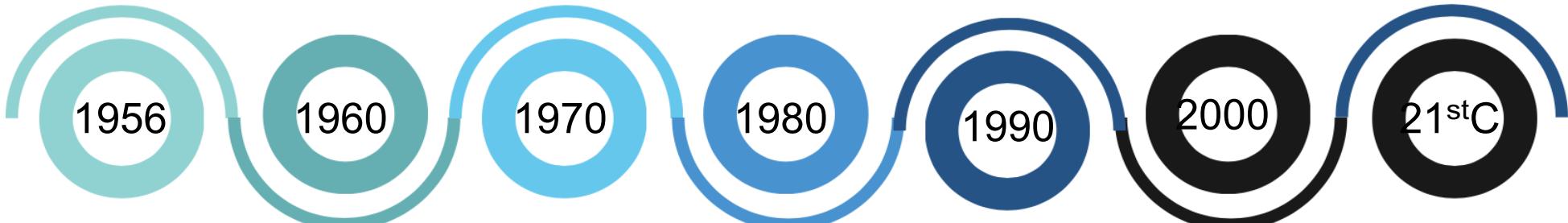
- Simulating human knowledge and decision-making with computers, e.g, self-driving cars.
- AI but not ML?
  - E.g., line follower robot, symbolic reasoning: high-level human-readable representation of problems and logic (rarely used?)
- Today, ML is the only form of ~~AI~~ being applied.

Simple AI:

```
if b > 39:  
    print("Pass")  
else:  
    print("fail")
```

# A Brief History of AI

Claim: In 20yrs, AI can do whatever a human can do



Field of AI  
was born

AI-winter

Revived by  
expert systems

LISP system  
collapse.  
Longer AI-  
winter

**DS revived AI:**  
Advances in ML,  
supercomputers,  
improved algorithmic,  
data access, open-  
source tools, cloud  
computing etc

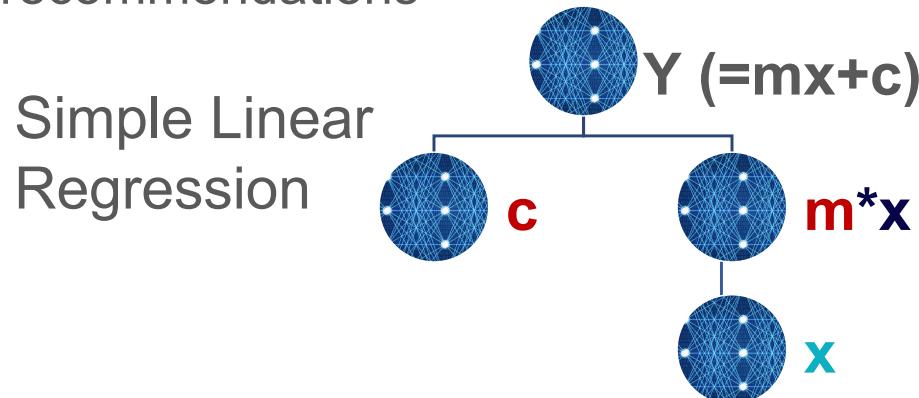
# A Brief History of AI

## From Logic to Learning

- The evolution of AI: From rule-based systems to learning algorithms.
- How AI has transformed industries and daily life.
- The rise of Machine Learning: AI that improves with data.

# Machine Learning

- The ability of machine to make predictions without being explicitly programmed
- Creating and implementing algorithms to receive data and process it to
  - make predictions
  - analyse patterns
  - provide recommendations

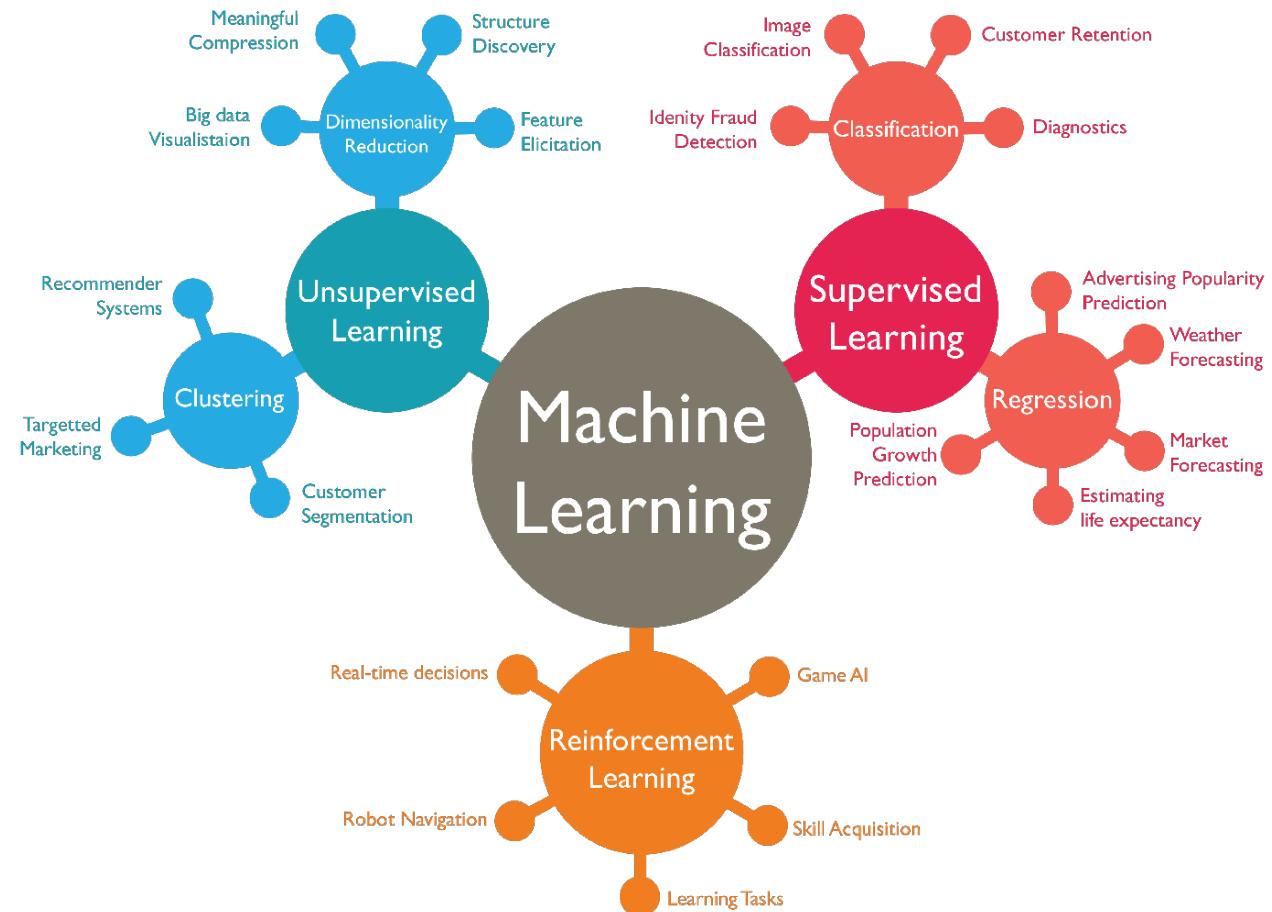


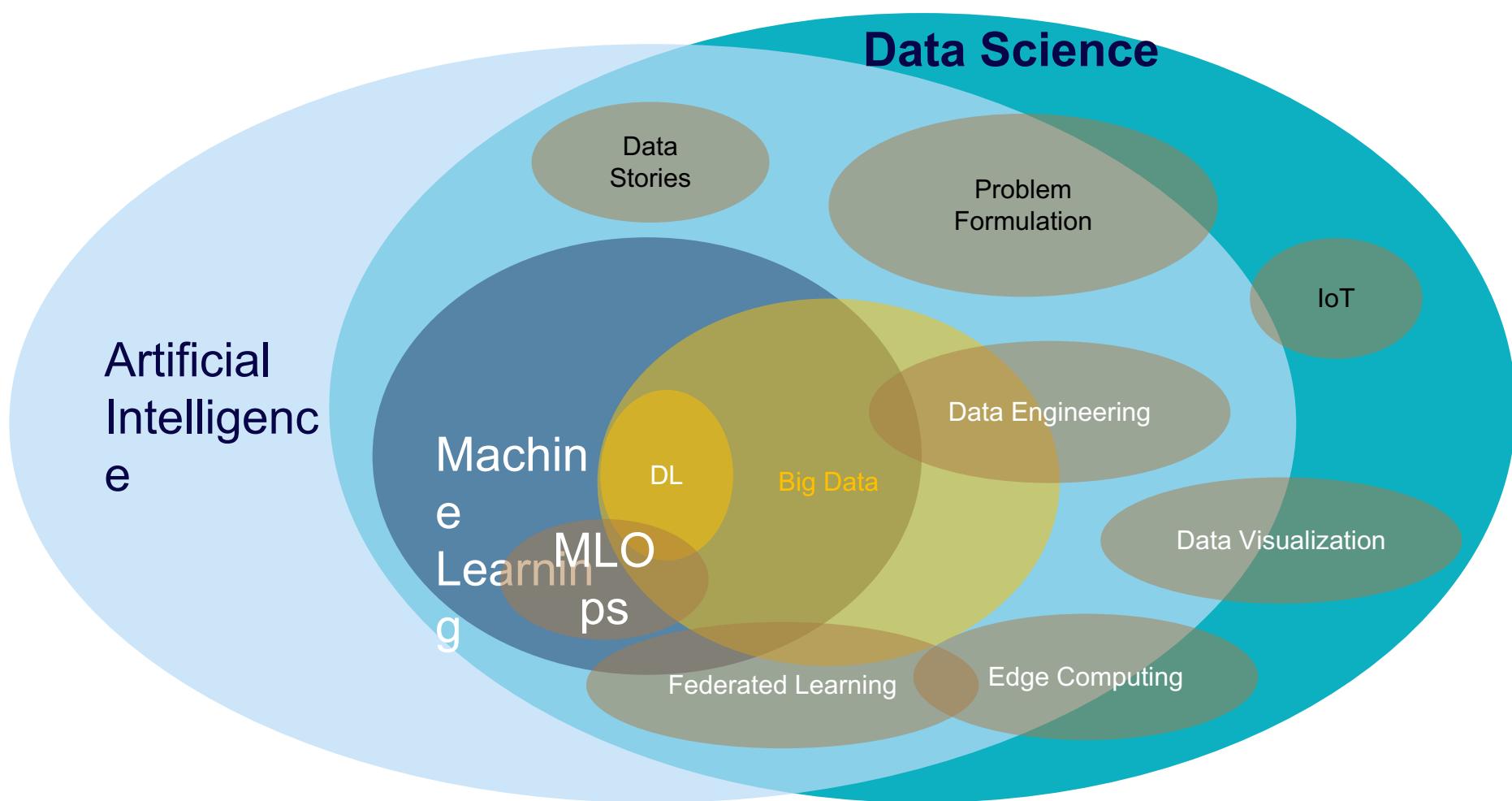
# Machine Learning

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# Machine Learning



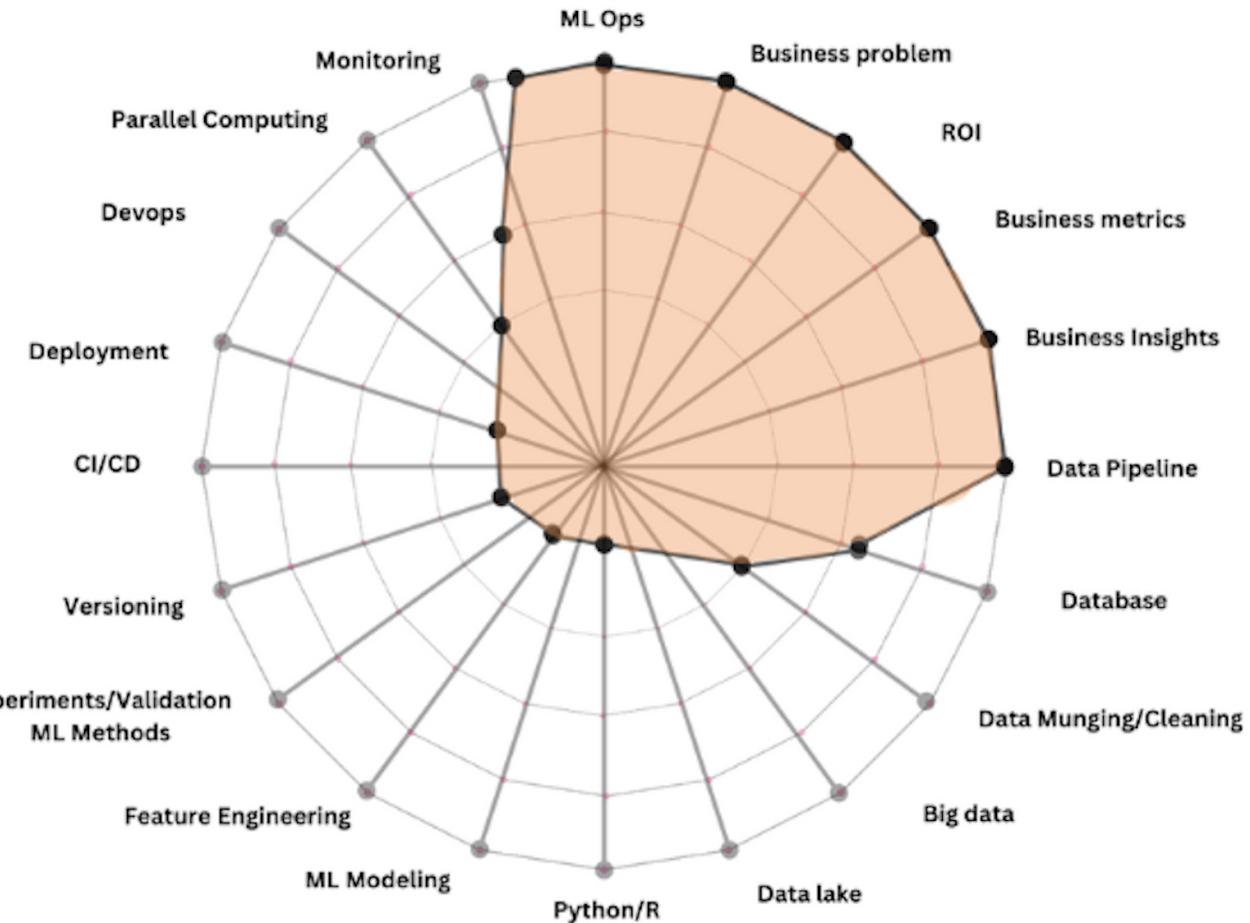


# Career Paths

AI, ML and Data Science

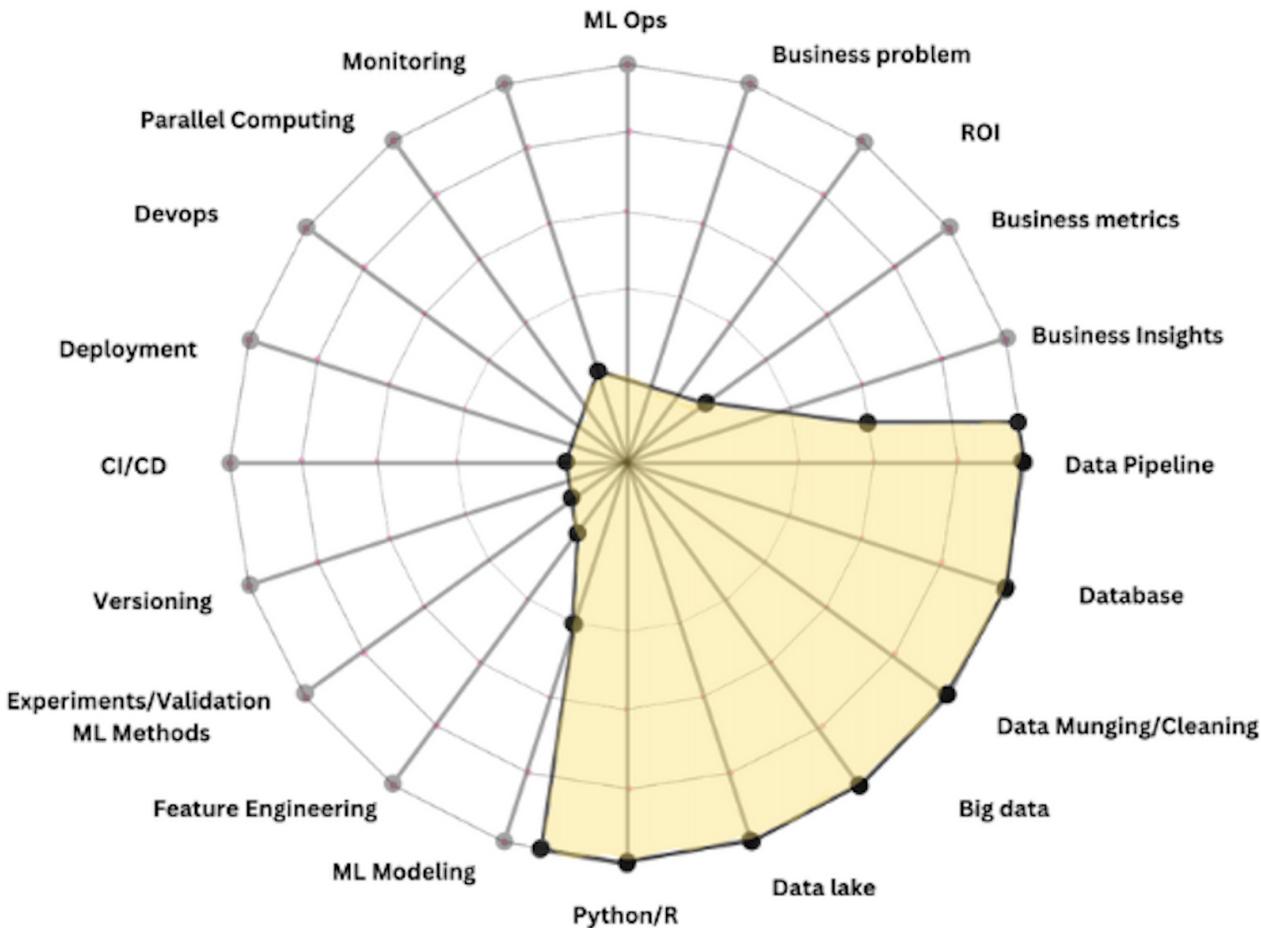
# AI Systems

Subject Matter Experts



# AI Systems

# Data Engineers



## Data Engineer



### Data Capture

transforms data  
into a useful  
format for  
analysis

Collection,



### Software *solutions*

advanced  
programming  
and system  
creation

creating  
software solutio



### Big Data

creating  
software solutio  
ns around big  
data

create data  
pipelines



### Skills

MySQL, MongoDB,  
Scala, Dask, Apache  
Spark, Hadoop

Hadoop, MapReduce,  
Hive, Pig, Data  
streaming, NoSQL,

## Senior Data Engineer Salaries in Bangalore

Updated 4 Mar 2024



Base Pay Range

₹13L - ₹25L/yr

Average Base Pay

779 salaries



Additional Cash Compensation ⓘ

Average: ₹1,11,20,407    Range: ₹28,80,000 - ₹1,93,60,814

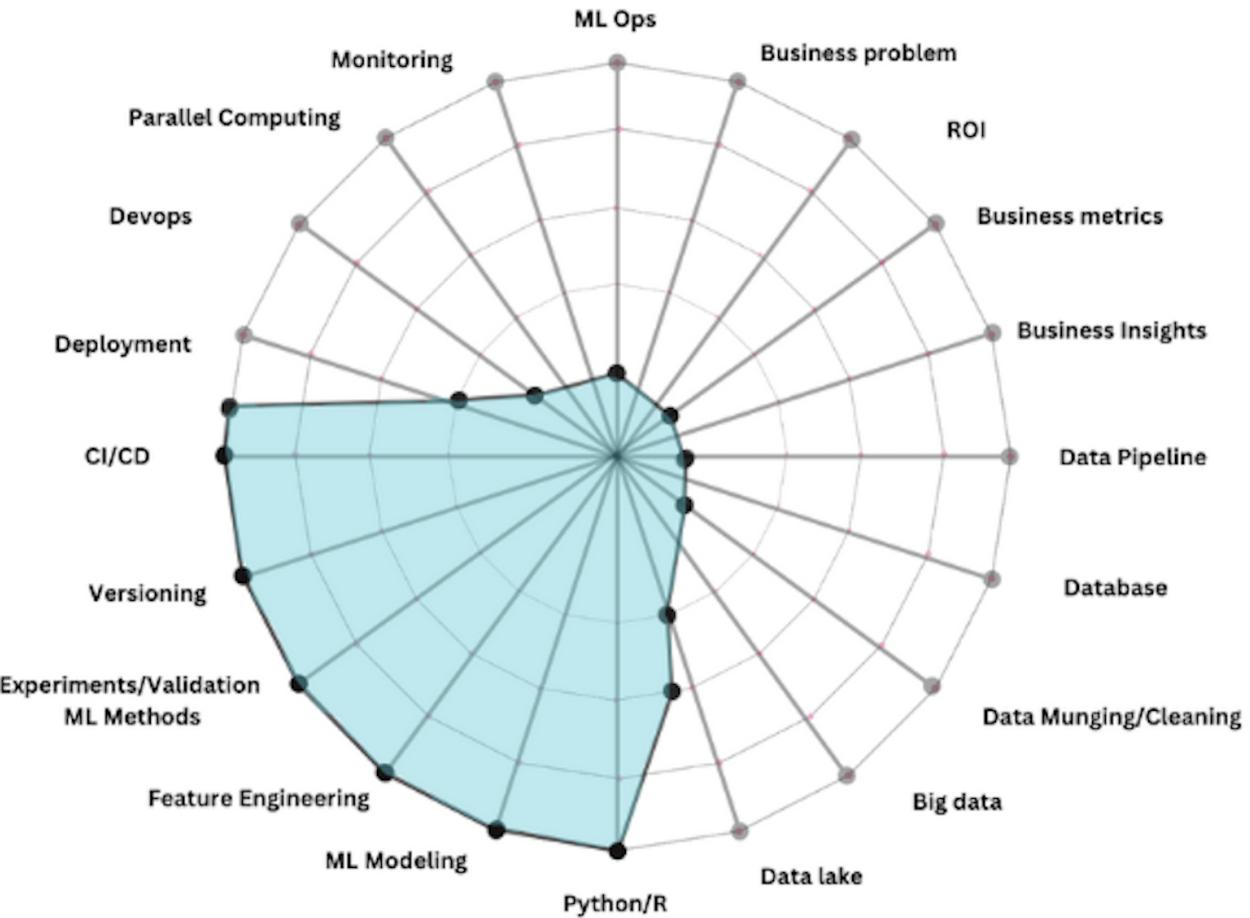
The average salary for Senior Data Engineer is ₹1,29,57,747 per year in the Bangalore. The average additional cash compensation for a Senior Data Engineer in the Bangalore is ₹1,11,20,407, with a range from ₹28,80,000 - ₹1,93,60,814. Salaries estimates are based on 779 salaries submitted anonymously to Glassdoor by Senior Data Engineer employees in Bangalore.

# Career Paths

## Data Engineer

# AI Systems

## Data Scientists



# Career Paths

## Data Scientist



### ML Expert

Data analyst who applies ML/AI

picked up programming out of necessity



### Domain Expert

Interact with business side  
understand the domain enough  
to make insights



### Data Story

Verbally and visually  
communicate complex  
results in a way that the  
business can understand and  
act on them



### Skills

R, create ML models

# Senior Data Scientist Salaries in Bangalore

Updated 4 Mar 2024

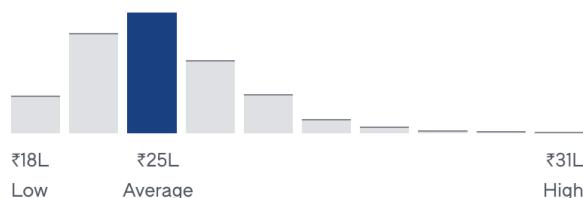


Base Pay Range

₹18L - ₹31L/yr

Average Base Pay

1,010 salaries



No additional cash compensation has been reported for this role

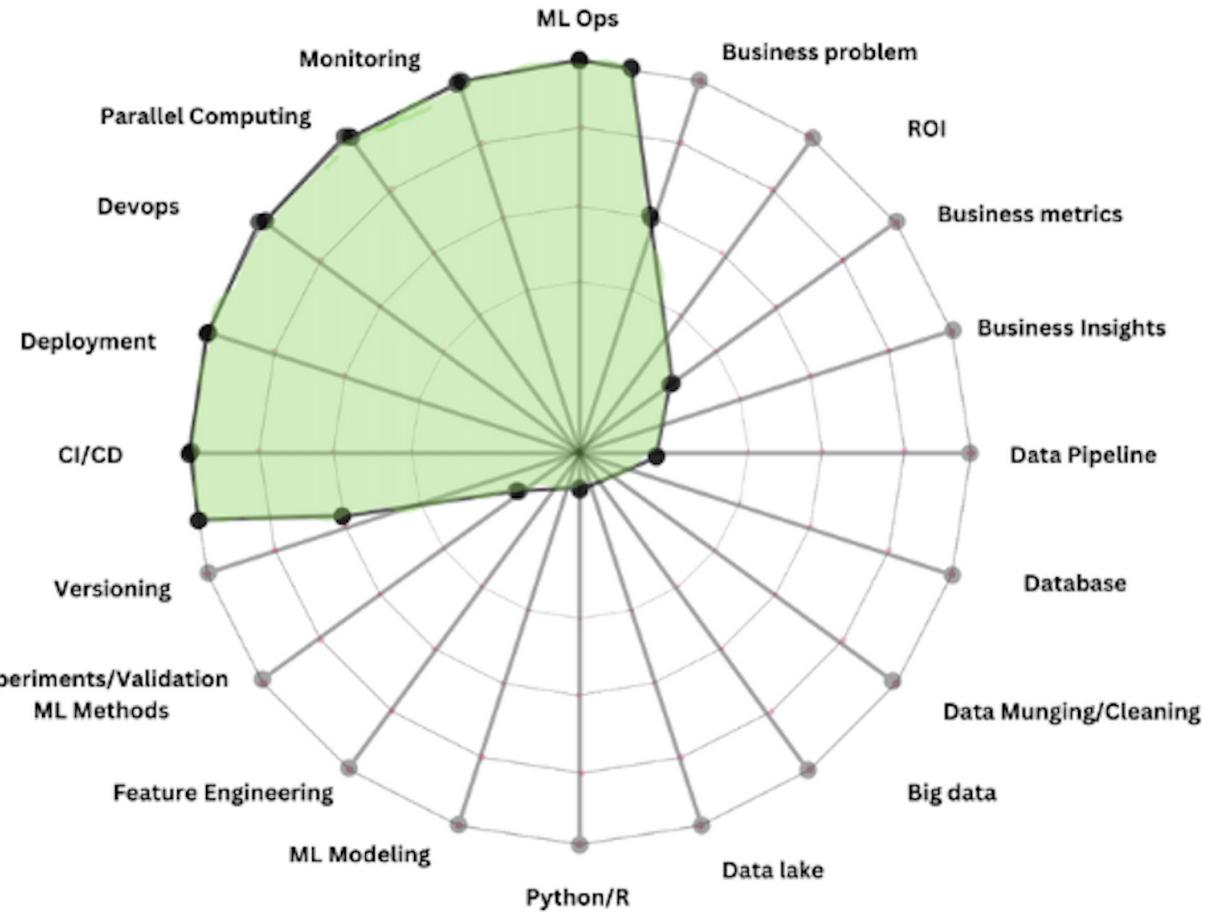
**How much does a Senior data scientist make in Bangalore, India?** The average salary for a Senior data scientist is ₹25,00,000 in Bangalore, India. Salaries estimates are based on 1,010 salaries submitted anonymously to Glassdoor by Senior data scientist employees in Bangalore, India.

# Career Paths

## Data Scientist

# AI Systems

ML Engineers



# Career Paths

# ML Engineer

- **Cloud Native ML Platform** : AWS SageMaker, Azure ML Studio, GCP AI Platform
  - **Containerized Workflow**: Docker, Kubernetes, public and private containers
  - **Serverless technology**: AWS Lambda, AWS Step Functions, Google Cloud Functions, Azure Functions
  - **Special hardware for ML**: GPUs, TPUs, A14, AWS Inferentia Elastic inference
  - **Big data platforms**: Databricks,

# Career Paths

## ML Engineer

### ML Engineer Salaries in Bangalore

Updated 1 Mar 2024

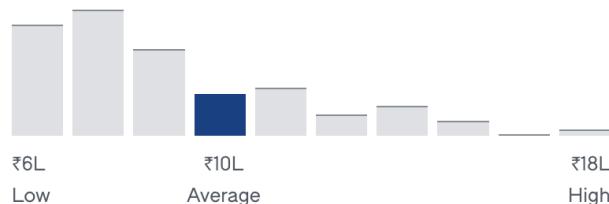


Base Pay Range

₹6L - ₹18L/yr

Average Base Pay

132 salaries



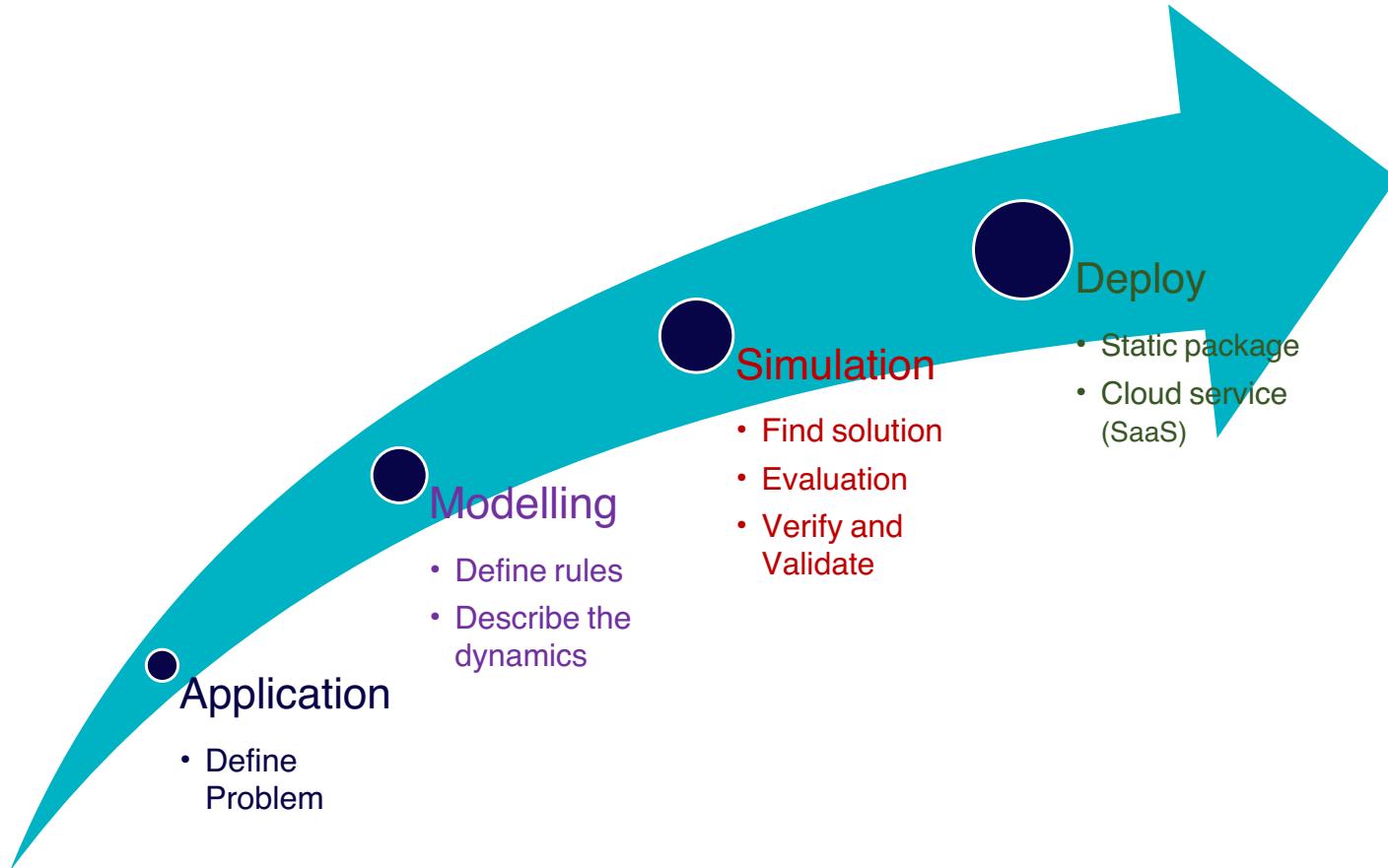
No additional cash compensation has been reported for this role

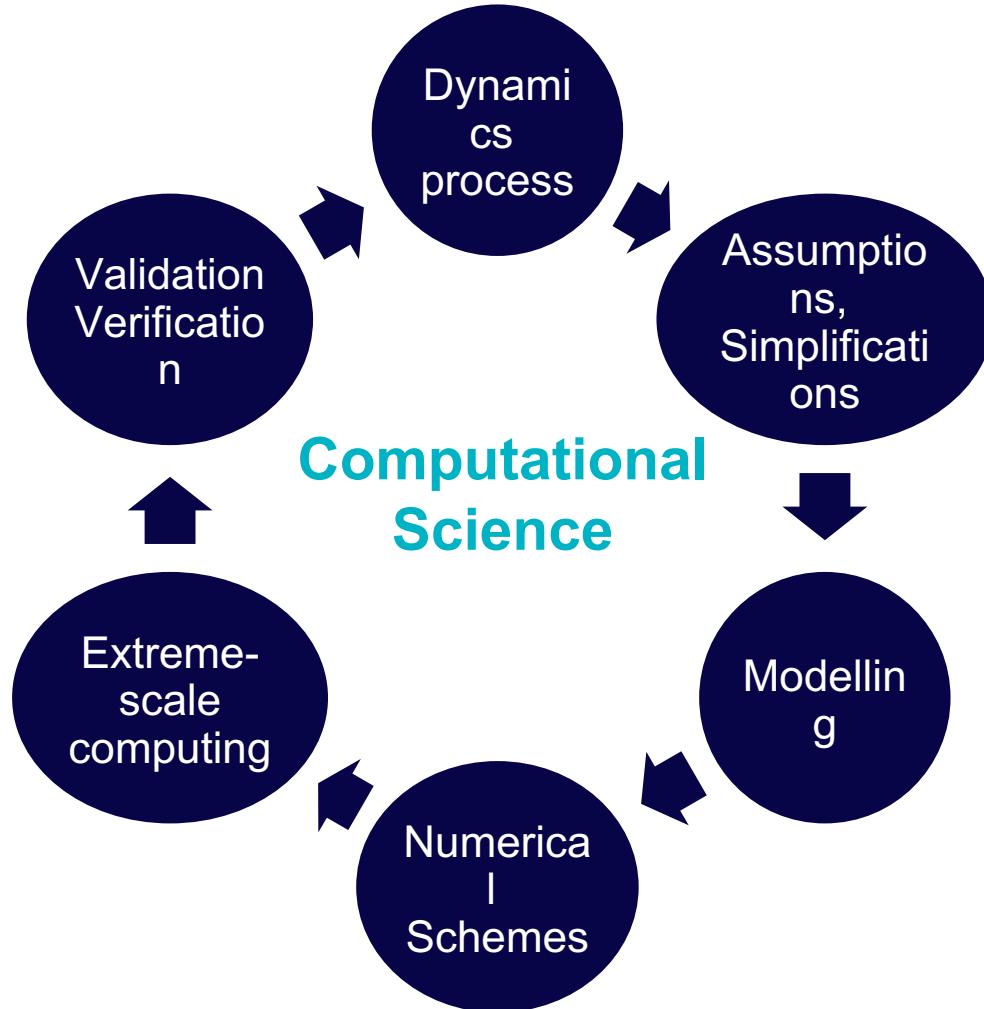
**How much does a MI engineer make in Bangalore, India?**

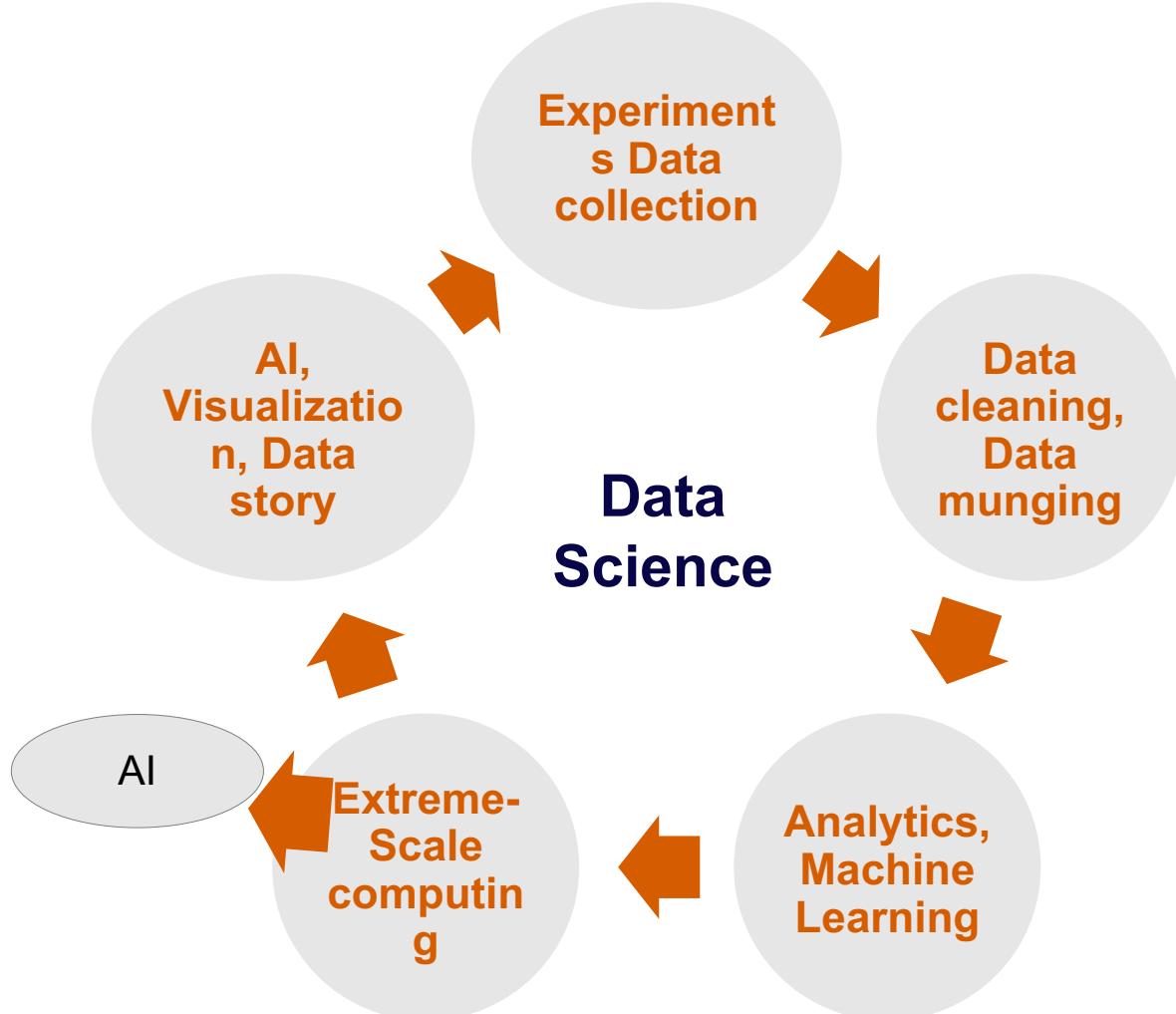
**How much does a MI engineer make in Bangalore, India?** The average salary for a MI engineer is ₹10,00,000 in Bangalore, India. Salaries estimates are based on 132 salaries submitted anonymously to Glassdoor by MI engineer employees in Bangalore, India.

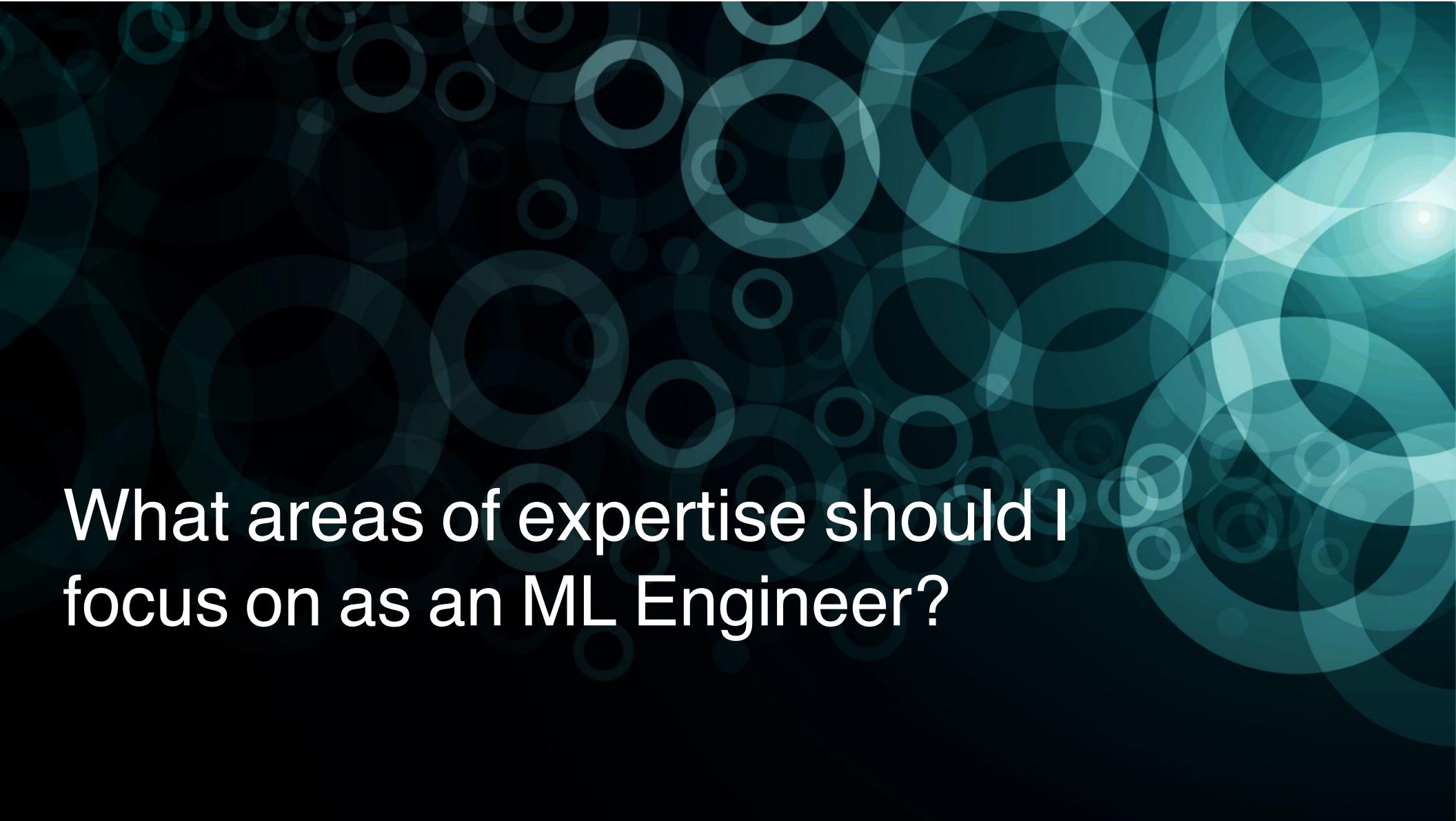
# Computational Science Vs. Data Science

I am not a Software Engineer;  
Can I become an ML Engineer?



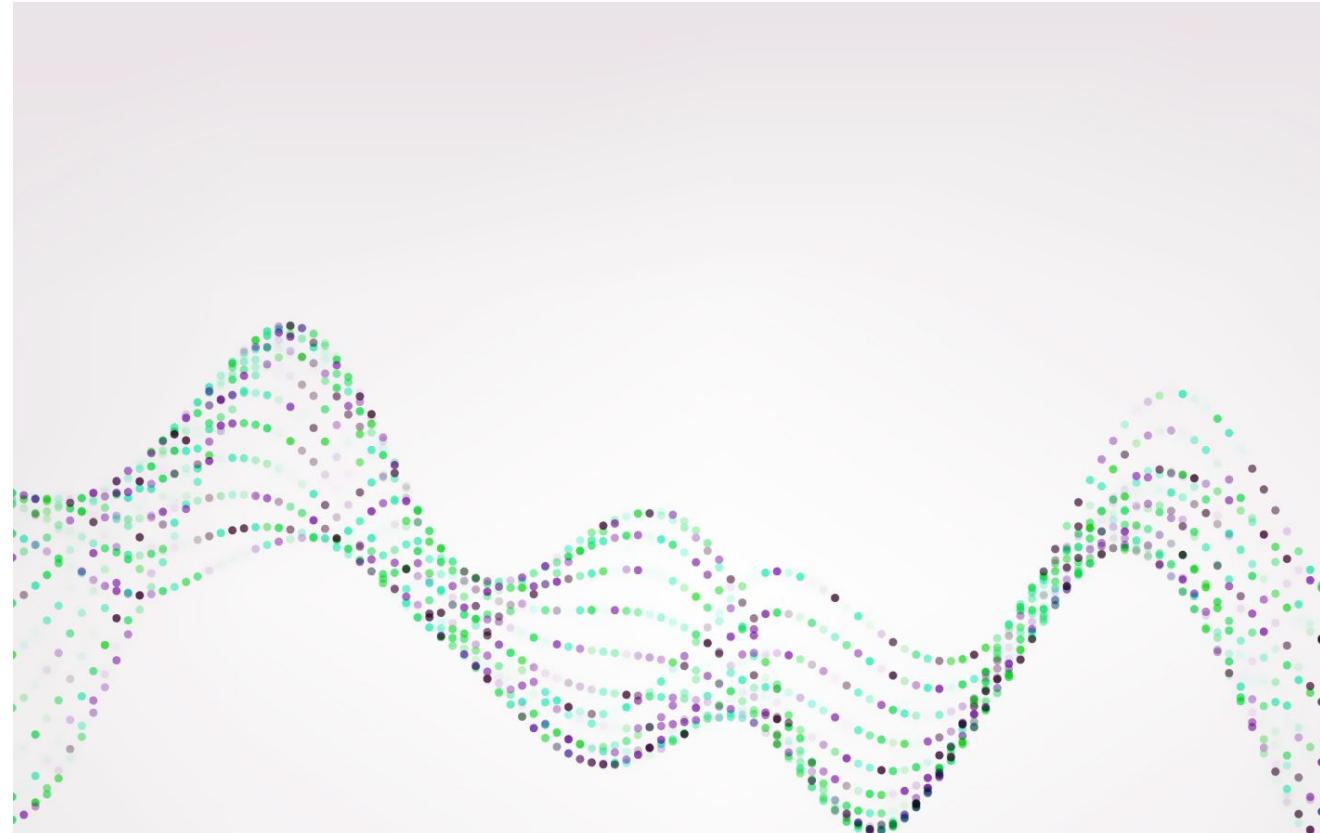




The background of the slide features a dark teal or black gradient. Overlaid on this are numerous semi-transparent, overlapping circles of varying sizes. These circles are primarily a lighter shade of teal, creating a sense of depth and motion. Some circles are more prominent in the foreground, while others are smaller and located further back.

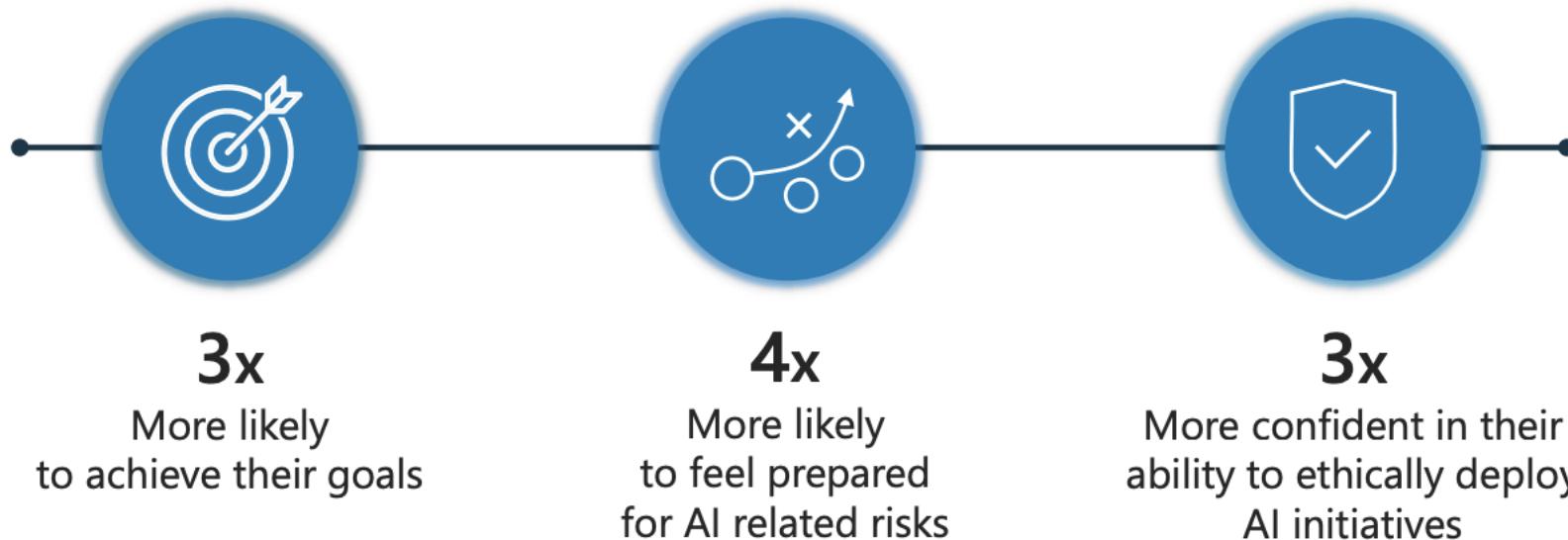
What areas of expertise should I  
focus on as an ML Engineer?

# MLOps



# MLOps

In one survey, [Deloitte](#) found that organizations that strongly followed an MLOps methodology were...





# MLOps

- McKinsey found that companies without a formalized MLOps process often took 9 months to implement a model.
- In comparison, companies applying MLOps could deploy models in 3 to 12



Don't ask data scientists or IT to drive your AI strategy.



Senior business leaders should drive it based on the core business strategy in partnership with data scientists.



Don't over-index on efficiency goals. Balance efficiency targets with growth- and innovation-oriented goals.



- MLOps is a core function of Machine Learning engineering, focused on streamlining the process of taking machine learning models to production, and then maintaining and monitoring them.
- MLOps is a collaborative function, often comprising data scientists, devops engineers, and IT.



- MLOps, are best practices for businesses to run AI successfully with help from an expanding smorgasbord of software products and cloud services.

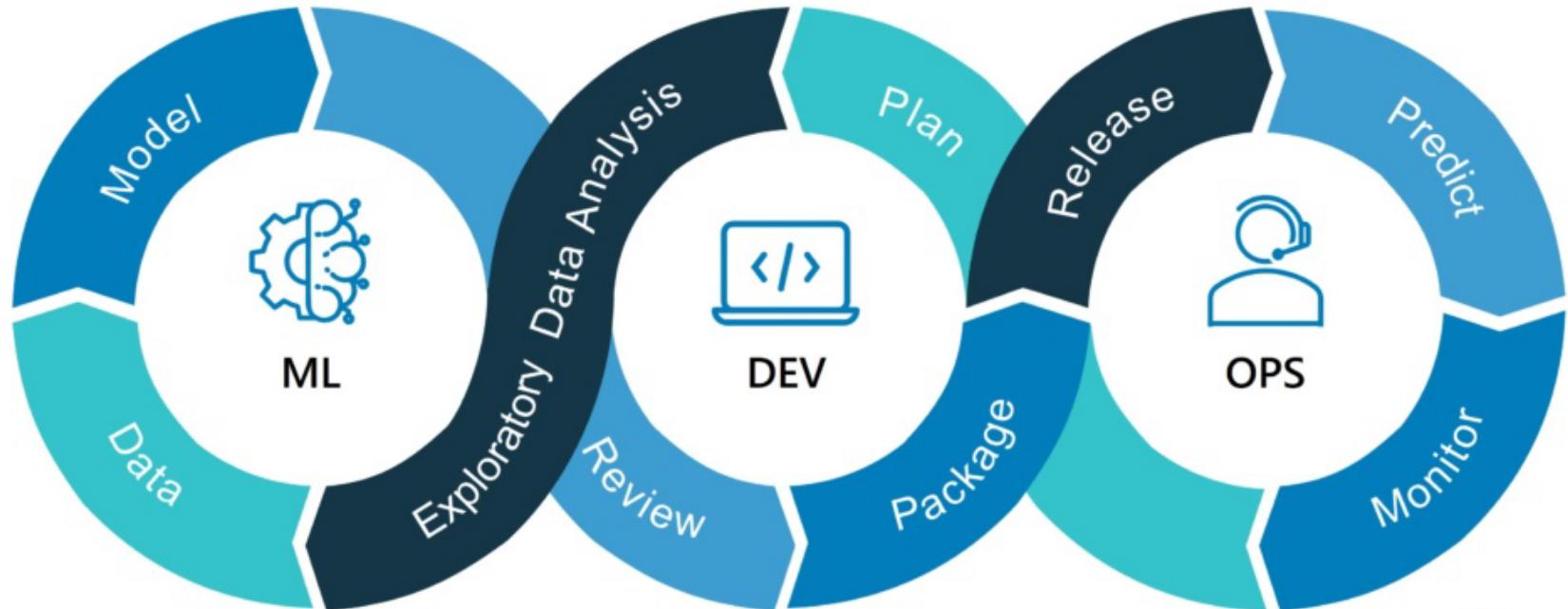


- Machine Learning Operations (MLOps) is a set of policies, practices, and governance that are put in place for managing machine learning and artificial intelligence solutions throughout their lifecycle.
- MLOps is an ML engineering culture and practice that aims at unifying ML system development (Dev) and ML system operation (Ops).
- Practicing MLOps means that you advocate for automation and monitoring at all steps of ML system construction, including integration, testing, releasing, deployment and infrastructure management.



- MLOps is based on DevOps principles and practices that increase the efficiency of workflows. Examples include continuous integration, delivery, and deployment. MLOps applies these principles to the machine learning process, with the goal of:
  - Faster experimentation and development of models.
  - Faster deployment of models into production.
  - Quality assurance and end-to-end lineage tracking.
- MLOps is a set of practices and tools that automate, manage, and scale the entire lifecycle of machine learning models, combining principles from DevOps and data engineering to streamline development, deployment, and maintenance.

## What is it?



# Welcome to AI & MLOps !