

Applications in Different Sectors

- Retail Sector
 - ML helps predict product demand, optimize stock levels, and personalize recommendations on platforms like Amazon and Flipkart.
 - Targeted marketing and customer profiling enhance user engagement and increase sales.
- Banking and Finance
 - ML is used for credit risk assessment, loan sanctioning, fraud detection, and investment strategies.
 - Helps automate decision-making processes and personalize financial products.
- Transportation
 - Applications include dynamic pricing, demand forecasting, route optimization, and driver dispatching (examples: Ola, Uber).
 - Predictive analytics improve operational efficiency and customer satisfaction.
- Manufacturing
 - Automation using ML-driven robotic arms in assembly lines increases productivity and quality control.
 - Predictive maintenance anticipates machine failures, reducing downtime and repair cost.
- Consumer Internet
 - Platforms like YouTube and social media use ML for content recommendation, sentiment analysis, and personalized experiences.
 - Sentiment analysis on review sites (e.g., IMDb) helps understand user opinions and improve services.

Key Insights

- ML is deeply integrated into both B2C (business to customer) and B2B (business to business) environments, fuelling profits and innovation.
- It influences multiple facets of modern life, from e-commerce and banking to transportation and entertainment, often in ways users may not directly realize.
- The technology continues to evolve and proliferate, driving smarter and more adaptive systems across sectors.

Machine Learning Development Life Cycle (MLDLC)

Key Steps in the Machine Learning Life Cycle

1. Gathering Data
 - Collect relevant data required for solving the problem; quality and quantity of data are essential.
2. Data Preparation
 - Clean, preprocess, and format data to handle missing values, duplicates, and inconsistencies for better model training.
3. Data Wrangling
 - Explore and transform data, including feature engineering and selection, to highlight important aspects for the model.
4. Analyse Data (Exploratory Data Analysis - EDA)
 - Use statistical and visualization techniques to understand data distribution, relationships, and patterns.
5. Train the Model
 - Use appropriate algorithms with training data to build models that learn data patterns.
6. Test the Model
 - Evaluate model performance on test data to assess accuracy and generalization ability.
7. Deployment
 - Integrate the trained model into a production environment where it can make predictions on new data.
8. Beta Testing and Optimization (Additional Steps)
 - Conduct beta testing with real users to gather feedback, refine the model, optimize parameters, and improve performance.

Four key data science and machine learning job roles:

Data Engineer, Data Analyst, Data Scientist, and Machine Learning Engineer

Data Engineer

- Responsible for collecting, organizing, and preparing data for analysis and use by others.
- Works on building and maintaining data pipelines, databases, and data warehouses.
- Requires strong software and database knowledge, familiarity with data architecture, and programming skills.
- Critical role for ensuring high-quality data availability for ML models and analytics.

Data Analyst

- Entry-level role focused on translating numerical and raw data into understandable reports and insights.
- Proficient in tools like Excel, SQL, and programming basics (e.g., Python).
- Works closely with business teams to analyze past data trends and assist in decision making.
- Can progress toward data engineering or data science roles with experience.

Data Scientist

- Senior role that builds predictive models using advanced techniques like machine learning, clustering, and neural networks.
- Develops actionable business insights by analyzing data and collaborating with analysts and engineers.
- Requires deep expertise in statistics, ML algorithms, and strong programming skills.
- Often responsible for end-to-end data product development including model deployment.

Machine Learning Engineer

- Focuses on taking machine learning models created by data scientists and productionizing them.
- Works on model optimization, integration into applications/websites, and model maintenance.
- Requires expertise in both software engineering and ML, bridging gaps between data science and software development teams.

Summary Comparison

Role	Focus	Skills Required	Seniority
Data Engineer	Data infrastructure and pipelines	Software dev, databases, big data tools	Junior to Mid-Level
Data Analyst	Data cleaning, reporting, basic insights	Excel, SQL, basic programming	Entry-Level
Data Scientist	Advanced modeling, analytics, insights	ML, statistics, programming	Senior
ML Engineer	Model deployment and engineering	Software engineering, ML, system design	Mid-Level to Senior