

## Applications of Machine Learning

- Machine Learning is **already integrated into our lives** and is not just a future concept.
- Common **Business-to-Consumer (B2C)** examples of ML include Facebook friend recommendations and YouTube/Amazon product and video recommendations.
- Today I explored some **Business-to-Business (B2B) applications**, where ML is used within a product to help a business operate and generate higher profits compared to B2C applications.
- ML is a technology working across many sectors, including Law, Transport, Manufacturing, Banking, and Social Media. It is also utilized in space exploration, the medical field, and defense.

Five key sectors where ML is used for B2B applications:

### 1- Retail Sector

Machine Learning is crucial for the proper functioning of retail and e-commerce companies.

#### Sales Forecasting and Inventory Management:

- E-commerce sites like Amazon (which sells 350 million to over 600 million) conduct large sales events.
- It is impractical and costly to increase stock for all products before a sale.
- Data Scientists use historical sales data and event data (like the Great Indian Festival).
- They run **ML algorithms** and **Data Mining** to generate insights, predicting which products will sell more, informing decisions on which stock to increase. Errors in this prediction can lead to significant financial losses.

#### Targeted Marketing and Customer Profiling:

- Retailers like Big Bazaar or Spencers ask for phone numbers during billing, primarily to **track buying behavior**.
- Customer purchases (e.g., health-related items, spicy foods) are used to **create a customer profile** based on their interests (e.g., health-conscious).
- This crucial data is then sold to advertisers (e.g., gyms). Advertisers are willing to pay more because sending targeted messages (e.g., 100 members interested in health) yields far better conversion rates than randomly bulk-messaging 100,000 people.
- This is an example of the principle: **"If you are not paying for the product, then you are the product"**.

#### Product Placement:

- ML is used to determine the optimal position of products on shelves/product pages.
- This involves **Association Rule Mining**, calculating the correlation between products. If the correlation is high, the products are stocked next to each other (e.g., the historical example of [diapers and beer](#)).

## 2- Banking and Finance Sector

ML is extensively used in lending, financial planning, and trading.

### Loan Sanctioning and Risk Assessment:

- Loan applications are first processed by an **ML algorithm** before being reviewed by a loan officer.
- The ML algorithm **compares the applicant's profile to the profiles of past defaulters** (individuals who failed to repay loans).
- A strong correlation or high similarity triggers a "red alarm," leading the ML model to predict a high probability (e.g., 63%) of default, resulting in profile rejection.
- ML is also applied to decide optimal branch locations, launch promotion plans, and implement specific financial plans in cities. This sector also includes ML applications in Insurance, the Share Market, and Machine Learning Trading.

## 3. Transportation Sector

ML helps optimize logistics, demand management, and routing.

### Dynamic Pricing:

- Surge pricing occurs during specific times (e.g., morning or evening commutes), raising fares to double or triple the normal rate.
- This dynamic pricing is driven by **demand forecasting**. If an area has high demand and low supply (many customers booking cabs but few drivers nearby), it becomes a surge zone.
- To maintain supply, the company (Uber/Ola) incentivizes nearby drivers with extra pay (e.g., 3.2X earnings) to travel to the high-demand region.
- The **extra money required for these driver incentives is charged directly to the customer** via surge pricing.
- ML is also used in logistics for **delivery routing optimization** (finding the most efficient routes for delivery executives) and in services like Google Maps.

## 4. Manufacturing Sector

ML is transforming manufacturing, particularly through automation and predictive analytics.

### Predictive Maintenance (Tesla Example):

- Tesla's highly automated factories use robotic arms for car manufacturing. Since Tesla takes bookings months in advance, any halt in production (e.g., a broken engine-installing robot) is unacceptable due to the risk of customer complaints and bad word of mouth.
- Tesla installs **IoT-based sensors** in its robotic arms to continuously monitor metrics like temperature, RPM, and pressure.
- Since device failures happen gradually (e.g., RPM slightly decreasing), ML detects these subtle changes.

- If a fault is predicted, engineers are immediately dispatched to fix the device *before* it actually breaks down.
- This proactive approach is known as **Predictive Maintenance** (as opposed to standard maintenance after a fault occurs).

## 5. Social Media Sector

Machine Learning plays a major role in helping social media companies offer services and insights to other businesses, enabling smarter marketing, improved audience targeting, and brand management.

### Targeted Advertising and Customer Segmentation:

- Social media companies like Meta (Facebook, Instagram) and LinkedIn provide advertisers with ML-driven tools to reach the right audience.
- ML algorithms analyze user demographics, interests, and engagement history to cluster users into precise segments.
- Businesses can target these segments for better conversion rates and reduced ad spend waste.
- Example: Facebook's Lookalike Audience uses ML to identify new potential customers similar to a company's existing clients.

### Brand Monitoring and Sentiment Analysis:

- Businesses use ML-powered tools (e.g., Sprout Social, Brandwatch) to track brand mentions, sentiment, and customer feedback across platforms.
- Sentiment analysis models classify online discussions as positive, negative, or neutral, allowing companies to react quickly to public opinion.
- This helps brands manage reputation and make data-driven marketing decisions.

### Trend Forecasting and Influencer Identification:

- ML analyzes large volumes of posts, hashtags, and engagement data to detect emerging trends early.
- Businesses use these insights for timely campaigns or product launches.
- ML also helps brands identify influencers whose followers match their target demographics, maximizing campaign impact.