**MODULE 1**

**Chapter 2: An Overview of Business Intelligence, Analytics, Data Science, and AI**

**Artificial Intelligence - Concepts, Drivers, Major Technologies, and Business Applications**

**Major AI Technologies and Some Derivatives**

Artificial Intelligence comprises several **core technologies** and their **derivatives**, which form the foundation of modern AI applications.

**1. Machine Learning (ML)**

* Enables computers to **learn from data without explicit programming**.
* Includes supervised, unsupervised, and reinforcement learning.
* *Example*: Predicting loan defaults using past customer data.

**2. Deep Learning (DL)**

* Subset of ML based on **artificial neural networks**.
* Excels at image recognition, speech processing, and natural language tasks.
* *Example*: Face recognition systems like Apple’s Face ID.

**3. Natural Language Processing (NLP)**

* Focuses on enabling machines to **understand and generate human language**.
* Applications: chatbots, voice assistants, text summarization, sentiment analysis.
* *Example*: Siri, Alexa, and Google Assistant.

**4. Computer Vision**

* AI systems that can **analyze and interpret images/videos**.
* Used in autonomous vehicles, healthcare imaging, and security.
* *Example*: Detecting tumors in MRI scans.

**5. Robotics and Intelligent Agents**

* Robotics integrates AI for **autonomous decision making and control**.
* Intelligent agents can operate in dynamic environments (e.g., warehouse robots).

**6. Expert Systems**

* Knowledge-based systems that use **rules and reasoning** to make decisions.
* *Example*: Medical diagnosis support systems.

**Derivatives**

* **Speech recognition & synthesis** (voice-based control).
* **Recommendation engines** (Netflix, Amazon).
* **Edge AI** (running AI models on devices rather than cloud).

**AI Support for Decision Making**

AI supports decisions at **all organizational levels** — operational, tactical, and strategic.

**Key Contributions**

1. **Automation of Routine Decisions**
   * AI can replace repetitive, rule-based tasks.
   * *Example*: Automated credit scoring in banks.
2. **Enhanced Decision Quality**
   * AI provides data-driven insights, reducing human bias.
   * *Example*: AI in medical diagnosis improving accuracy.
3. **Speed and Efficiency**
   * Real-time processing enables faster responses.
   * *Example*: Fraud detection during online transactions.
4. **Handling Complexity**
   * AI can analyze large-scale, multidimensional data beyond human capacity.

**Technology Insight 2.2: Schrage’s Models for Using AI to Make Decisions**

Michael Schrage proposed **models of AI-supported decision making**:

1. **AI as a Decision Support Tool**
   * AI provides recommendations, but human makes the final decision.
   * *Example*: Doctor using AI diagnostic suggestions.
2. **AI as a Decision Partner**
   * Human and AI collaborate, sharing responsibility.
   * *Example*: Stock traders using AI predictions with human judgment.
3. **AI as a Decision Maker**
   * AI makes independent decisions in defined contexts.
   * *Example*: Autonomous vehicles navigating traffic.

**Implication**: Organizations must carefully choose which model suits their **risk, ethics, and accountability** framework.

**AI Applications in Various Business Functions**

AI is applied across **multiple business domains**, enhancing efficiency, profitability, and customer experience.

**Analytics in Action 2.1: How EY, Deloitte, and PwC Are Using AI**

* **EY (Ernst & Young)**:
  + Uses AI for auditing and fraud detection.
  + AI reviews contracts and identifies anomalies.
* **Deloitte**:
  + Uses cognitive AI systems for tax compliance and regulatory checks.
* **PwC (PricewaterhouseCoopers)**:
  + Uses AI for risk assessment, financial analysis, and client advisory.

**Outcome**: Big Four firms demonstrate AI’s role in **accounting, auditing, and compliance**.

**AI Applications in Financial Services**

1. **Fraud Detection**
   * AI detects unusual transaction patterns.
   * *Example*: Banks flagging suspicious credit card use.
2. **Credit Risk Assessment**
   * AI models evaluate borrower profiles and predict default risk.
3. **Algorithmic Trading**
   * High-frequency trading with AI predicting stock trends.
4. **Customer Service**
   * AI chatbots provide 24/7 banking support.

**AI in Marketing, Advertising, and CRM**

1. **Personalized Marketing**
   * AI recommends products based on customer data.
   * *Example*: Amazon’s product recommendations.
2. **Targeted Advertising**
   * AI analyzes user behavior to serve customized ads.
   * *Example*: Google Ads and Facebook Ads.
3. **Customer Relationship Management (CRM)**
   * AI integrates with CRM systems (like Salesforce) to analyze customer sentiment, predict churn, and suggest actions.
4. **Brand Engagement**
   * Chatbots, sentiment analysis, and social media AI monitoring customer opinions.

**Conversational AI — Chatbots**

**What Is a Chatbot**

* A **chatbot** is a computer program that simulates conversation with human users, especially over the Internet.
* It uses **Natural Language Processing (NLP)** and AI to understand queries and provide responses.
* Chatbots can be **rule-based** (scripted answers) or **AI-powered** (learn and adapt).
* *Examples*: Amazon Alexa, Google Assistant, Apple Siri, customer support chatbots on websites.

**Chatbot Evolution**

1. **Early Chatbots**
   * 1960s: *ELIZA* (one of the first chatbots, mimicked a psychotherapist).
   * 1970s: *PARRY* (simulated a patient with schizophrenia).
2. **2000s**
   * Rule-based chatbots for customer service (scripted, keyword-driven).
3. **Modern AI-Powered Chatbots**
   * Use NLP, machine learning, and cloud AI platforms.
   * Capable of context-aware, multi-turn conversations.
   * Integrated into messaging apps, mobile apps, and enterprise systems.

**Components of Chatbots and the Process of Their Use**

1. **User Interface** – Web, mobile app, or messaging platform (WhatsApp, Slack).
2. **Input Processing (NLP)** – Converts user’s speech/text into structured data.
3. **Dialog Manager** – Controls conversation flow and maintains context.
4. **Knowledge Base/Backend Integration** – Provides responses using databases, APIs, or AI models.
5. **Response Generation** – Text, voice, or action (booking a ticket, processing payment).

**Process**:

* User sends a query → NLP processes input → Dialog Manager interprets intent → System fetches information → Response delivered.

**Drivers and Benefits**

**Drivers (Why Businesses Adopt Chatbots)**

* 24/7 availability
* Instant response to customer queries
* Cost reduction in customer service
* Ability to handle high volumes simultaneously

**Benefits**

* **Improved Customer Engagement** – Faster, personalized responses.
* **Operational Efficiency** – Automates repetitive tasks (FAQs, order tracking).
* **Scalability** – Serves millions of users without extra human staff.
* **Data Insights** – Collects customer interaction data for analytics.
* **Revenue Growth** – Increases conversions via personalized recommendations.

**Representative Chatbots from Around the World**

* **Amazon Alexa** – Smart home and personal assistant.
* **Google Assistant** – Voice-controlled AI assistant.
* **Apple Siri** – Mobile and smart device assistant.
* **Cortana (Microsoft)** – Enterprise productivity assistant.
* **Mitsuku (Kuki)** – Conversational chatbot that won the Loebner Prize Turing Test multiple times.
* **Banking Bots** – HDFC EVA, Bank of America’s Erica.
* **E-commerce Bots** – Sephora Virtual Assistant, Domino’s Pizza Bot.