# Types of Models

## 1. Statistical Models

**Definition:**  
These models rely on mathematical equations and probability distributions to describe relationships between variables and make predictions.

**Examples:**

* **Linear Regression:** Predicts a continuous outcome based on input variables.
* **Logistic Regression:** Predicts binary outcomes (e.g., yes/no, true/false).

**Real-World Use Cases:**

* **Finance:** Predicting stock prices or credit risk.
* **Healthcare:** Estimating disease risk based on patient data.
* **Marketing:** Forecasting sales based on advertising spend.

## 2. Machine Learning Models

**Definition:**  
Algorithms that learn patterns from data and improve their performance over time without being explicitly programmed.

**Examples:**

* **Decision Trees:** Simple tree-like models for classification and regression.
* **Random Forests:** Ensemble of decision trees for better accuracy.
* **Support Vector Machines (SVM):** Finds the best boundary to separate classes.

**Real-World Use Cases:**

* **Fraud Detection:** Identifying unusual transactions.
* **Customer Segmentation:** Grouping users based on behaviour.
* **Spam Filtering:** Classifying emails as spam or not.

## 3. Deep Learning Models

**Definition:**  
Neural networks with multiple layers that can learn hierarchical representations of data, especially useful for unstructured data like images and text.

**Examples:**

* **CNNs (Convolutional Neural Networks):** Great for image recognition.
* **RNNs (Recurrent Neural Networks):** Designed for sequential data like time series or language.
* **Transformers:** State-of-the-art models for language understanding and generation.

**Real-World Use Cases:**

* **Medical Imaging:** Detecting tumours in X-rays or MRIs.
* **Speech Recognition:** Powering virtual assistants like Siri or Alexa.
* **Language Translation:** Google Translate and similar tools.

## 4. Generative Models

**Definition:**  
Models that learn the underlying distribution of data and generate new, similar data samples.

**Examples:**

* **GANs (Generative Adversarial Networks):** Create realistic images or videos.
* **Diffusion Models:** Used in high-quality image generation (e.g., DALL·E).
* **LLMs (Large Language Models):** Generate human-like text (e.g., ChatGPT).

**Real-World Use Cases:**

* **Art & Design:** AI-generated artwork and fashion.
* **Content Creation:** Writing articles, generating code, or composing music.
* **Synthetic Data:** Creating data for training models when real data is scarce.