***MTC CHEATSHEET FOR GEN AI***

**By :**

**ME**

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Generative AI Cheat sheet

## Generative AI vs. Normal AI

* **Generative AI**:
  + **Practical Example**: GPT-4 generates human-like text by predicting the next word in a sentence based on previous words.
  + **How it works**: Uses models like transformers to learn from vast amounts of data. During training, it adjusts its parameters to minimize the difference between its predictions and actual outcomes.
* **Normal AI**:
  + **Practical Example**: A spam filter classifies emails as spam or not spam.
  + **How it works**: Uses algorithms like decision trees or neural networks to learn patterns from labeled datasets (e.g., emails marked as spam/not spam).

## Types of Machine Learning

1. **Supervised Learning**:
   * **Practical Example**: Predicting house prices.
   * **How it works**: The model is trained on a dataset with input features (e.g., size, location) and labeled output (price).
2. **Unsupervised Learning**:
   * **Practical Example**: Customer segmentation.
   * **How it works**: The model identifies patterns or groups in data without labels (e.g., grouping customers based on purchasing behavior using clustering algorithms like K-means).

**Types of Supervised Machine Learning**

1. **Classification**:
   * **Practical Example**: Email spam detection.
   * **How it works**: The model learns to classify emails as spam or not spam by training on a labeled dataset. It uses algorithms like logistic regression or support vector machines.
2. **Regression**:
   * **Practical Example**: Predicting house prices.
   * **How it works**: The model learns to predict continuous values. Linear regression, for example, fits a line to the data points to make predictions.

### ML in GEN AI

Regression

* **Practical Example**: Predicting house prices.
* **How it works**:
  + **Step 1**: Collect data (e.g., house size, number of rooms, price).
  + **Step 2**: Split data into training and test sets.
  + **Step 3**: Train a linear regression model to find the best-fit line (y = mx + b).
  + **Step 4**: Use the model to predict prices for new houses.

## Cost Function

* **Practical Example**: Mean Squared Error (MSE) in linear regression.
* **How it works**:
  + **Step 1**: Measure the error between predicted and actual values.
  + **Step 2**: Square the errors to avoid negative values.
  + **Step 3**: Average the squared errors to get the MSE.
  + **Goal**: Minimize the MSE to improve model accuracy.

## Gradient Descent

* **Practical Example**: Optimizing the parameters of a linear regression model.
* **How it works**:
  + **Step 1**: Initialize model parameters (weights).
  + **Step 2**: Compute the gradient of the cost function with respect to the parameters.
  + **Step 3**: Adjust the parameters in the opposite direction of the gradient.
  + **Step 4**: Repeat steps 2-3 until the cost function converges to a minimum value.

## Use of Machine Learning in Generative AI

* **Training Models**:
  + **Practical Example**: Training GPT-4 to generate text.
  + **How it works**:
    - **Step 1**: Collect a large corpus of text data.
    - **Step 2**: Preprocess the data (tokenization, normalization).
    - **Step 3**: Train a transformer model by predicting the next word in a sequence.
    - **Step 4**: Fine-tune the model on specific tasks (e.g., answering questions).
* **Applications**:
  + **Text Generation**: Chatbots that generate human-like responses.
    - **How it works**: The model uses learned patterns to generate coherent and contextually relevant text based on input prompts.
  + **Image Generation**: DALL-E creating images from text descriptions.
    - **How it works**: The model learns the relationship between text and image features to generate visual content.
  + **Music Generation**: AI composing new music tracks.
    - **How it works**: The model analyzes patterns in musical compositions and generates new pieces following similar patterns.

This cheat sheet should help you understand how these concepts work behind the scenes. If you have any questions or need further details, feel free to ask to us!



## Microsoft Tech Club

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