**Assignment 2: Group 9-16**

**PS2: Wake Word Classification Between Two Keywords**

**Objective:**  
Design and evaluate a **wake word classification system** that can **differentiate between two predefined wake words** using the **Picovoice Porcupine Wake Word Dataset**, and evaluate model performance using **accuracy and confusion matrix**.

**Instructions:**

**Once completed, Submit the deliverables (code, and print all outputs inside the notebook) mentioned below in one single file per group**.

You can use Google Colab notebooks. Explanations can be mentioned inside the code itself.

**Step-by-Step Instructions**

**Step 1: Environment Setup (1 mark)**

* Install audio processing and ML libraries:
  + librosa, numpy, scikit-learn
* Verify that WAV audio files can be **read and processed**.
* Use T4 GPU in colab if required

**Step 2: Dataset (2 marks)**

* **Source:** <https://drive.google.com/drive/folders/1YJdfuEw1r--QElCI4IpihsPOfPtJGhxA?usp=sharing>
* **2 wake words audio samples are given** (e.g., **"Alexa"** and **"jarvis"**).
* **Download all 30 audio samples** for both wake words:
* Assign **class labels**:
  + 0 → Alexa
  + 1 → jarvis

**Step 3: Feature Extraction (3 marks)**

* Extract **MFCC** or **Log-Mel Spectrogram** features for each audio file.
* Normalize features and ensure **consistent audio length** (pad or trim).
* Split dataset into **training (70%) and testing (30%)**.

**Step 4: Train Wake Word Classifier (5 marks)**

* **Goal:** Classify **which wake word** was spoken.
* **Model:**
  1. SVM using MFCC features
* Train model on **2 classes with train set: Alexa vs. jarvis**

**Step 5: Evaluate Model (4 marks)**

1. Test on the **30% test set**.
2. Create a **confusion matrix** like:

| **Predicted \ Actual** | **Alexa** | **jarvis** |
| --- | --- | --- |
| Alexa | … | … |
| jarvis | … | … |

1. Compute and report:
   * **Overall Accuracy (%)**
2. Write a **short summary** of your findings:
   * Which wake word is **easier to classify**?
   * Any **misclassification patterns**?

**Deliverables**

1. **Organized dataset folder** with 2 wake word classes
2. **Feature extraction & model training notebook/report**
3. **Confusion matrix + Accuracy summary**
4. **Short discussion of results**