1. Define a function `extract\_feature(file\_name)`:

a. Load audio file.

b. Extract MFCC, chroma, and mel features.

c. Return combined features.

2. Define a function `load\_data()`:

a. Initialize lists `x` and `y`.

b. For each audio file in the dataset directory:

i. Extract the emotion from the file name.

ii. If the emotion is not one of the observed emotions, skip the file.

iii. Extract features using `extract\_feature(file)`.

iv. Append features to `x` and emotion label to `y`.

c. Return `x` and `y` as numpy arrays.

3. Load and preprocess data:

a. Load data using `load\_data()`.

b. Convert `x` and `y` into a DataFrame.

c. Save the DataFrame to a CSV file.

d. Load the CSV file and separate `x` (features) and `y` (labels).

e. Normalize `x` using `MinMaxScaler`.

4. Split data into training and testing sets:

a. Split `x` and `y` into training and testing sets using `train\_test\_split`.

5. Define and train machine learning models:

a. Define a Support Vector Machine (`SVC`).

b. Define a Multi-Layer Perceptron (`MLPClassifier`).

c. Define two TensorFlow neural networks.

d. Train each model using the training data.

6. Evaluate each model's performance:

a. Use the test data to evaluate the accuracy of each model.

7. Use `RandomizedSearchCV` for hyperparameter tuning:

a. Define hyperparameter search space for the MLP model.

b. Perform random search for the best parameters.

8. Define a class `final\_model` for ensemble method:

a. Implement a function `predict\_1(x)` that predicts a single data point.

i. Use predictions from the different models.

ii. Return the most frequent prediction or consensus.

b. Implement a function `predict(x)` that applies `predict\_1(xi)` to each data point in `x`.

c. Implement a function `test\_score(x\_test, y\_test)` that evaluates the ensemble model.

9. Calculate the final model's accuracy on the test data:

a. Use the ensemble model to predict labels for the test data.

b. Calculate accuracy using `accuracy\_score(y\_true=y\_test, y\_pred=pred)`.

c. Print the final accuracy.

10. Output the results and continue optimization if necessary.