

CST 476-2 Deep Learning

Lab Sheet 07

Activity: Human Activity Recognition Using 1D CNN

Aim:

The aim of this lab session is to implement a 1D CNN for classifying activities based on sensor data from the Human Activity Recognition Using Smartphones dataset.

Dataset:

Human Activity Recognition Using Smartphones Dataset

Description of the Dataset:

The dataset consists of sensor readings from accelerometers and gyroscopes captured at a frequency of 50Hz. The data includes six classes of human activities: walking, walking upstairs, walking downstairs, sitting, standing, and lying. The dataset has pre-split training and test sets for benchmarking.

Tasks:

- Load the dataset files for training and testing data (X_train.txt, X_test.txt, y_train.txt, y_test.txt).
- Normalize the sensor readings using standard scaling.
- Reshape the data to fit the input format of a 1D CNN.
- Design a 1D CNN architecture using Keras.
- Ensure the architecture includes Conv1D layers, pooling layers, and dense layers suitable for multi-class classification.
- Use ReLU as the activation function in hidden layers and softmax in the output layer.
- Compile the model with an appropriate optimizer and loss function for classification.
- Train the model on the training dataset and validate it on the test dataset.
- Evaluate the model's performance on the test dataset.
- Display and interpret accuracy and loss metrics.
- Plot training and validation accuracy and loss graphs over epochs.
- Generate a confusion matrix to visualize the model's classification performance.
- Experiment with the model by adjusting hyperparameters.