

TASK 1

DATA :-

For task 1, all the columns other than CSC are dropped. Also the rows that have higher no. of nan and zero values are also dropped. This results in a (1191431, 38) dataset. A 70-30 split is done on this dataset (70% for training and 30% for testing). For CNN model, data is padded with 2 zero columns and each row is transformed into a 2D array of shape (5, 8) where row represents a CSC station and each column represents a feature. Nan values are removed from the dataset by substituting them with average values of their respective columns.

MODEL :-

The FC model consists of 9 layers of size 32, 128, 256, 512, 1024, 512, 256, 128, 32. The last layer has a single neuron to predict the value of momentum. Each layer is followed by a dropout layer with dropout ratio = 0.2 and uses ReLU activation. Adam optimizer with default parameters along with learning rate = 0.00004. Batch size = 1024 and no. of epochs = 50 were used.

For CNN model 3 1d convolutional layers were used with kernel_size = 8 and no. of filters as 32, 32, 16 respectively. Then a max pooling with pool_size = 3 is done. After that, the output is passed through a FC model similar to the first FC model with learning rate = 0.0001.

TRAINING AND PREDICTION :-

The models are trained in such way that they predict the magnitude of momentum only and not the direction of hit. So, while training both FC model and CNN model, absolute values of momentum were used. After training is complete, both the models are tested on the data which includes discarded data points and test set. For the FC model, accuracy obtained = 67.91%. For the CNN model, accuracy obtained = 77.194%. Since no. of particles with low momentum is very high, so the CNN model predicts every particle having low momentum.

TASK 2

DATA :-

For task 2, similar to task 1 all the columns other than CSC are dropped and rows that have higher no. of nan and zero values are also dropped. Resultant dataset of size (1191431, 38) split as 70-30 (70% for training and 30% for testing). For CNN model, similarly data is padded with 2 zero columns and each row is transformed into a 2D array of shape (5, 8) where row represents a CSC station and each column represents a feature. Nan values are also handled similarly by substituting average values.

MODEL :-

The FC model consists of 9 layers of size 32, 128, 256, 512, 1024, 512, 256, 128, 32. The last layer has a 3 neurons to predict the value of momentum, phi and eta angle. Each layer is followed by a dropout layer with dropout ratio = 0.3 and uses ReLU activation. Adam optimizer with default parameters along with learning rate = 0.00002. Batch size = 1024 and no.of epochs = 50 were used.

For CNN model 3 1d convolutional layers were used with kernel_size = 8 and no.of filters as 32, 32, 16 respectively. Then a max pooling with pool_size = 3 is done. After that, the output is passed through a FC model similar to the first FC model with learning rate = .

TRAINING AND PREDICTION :-

Both the models are trained and tested in a similar way as in task 1. For the FC model, accuracy = 73.381% . For the CNN model, accuracy = 77.194% . Since no.of particles with low momentum is very high, so the CNN model predicts every particle having low momentum similar to task 1.