# Report

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## Action Classification Using RNN(LSTM)

**Basic Network Architecture:**

```
self.input_dim = 75         #Input Dimension
self.hidden_dim = 100       #Number of hidden  layers

SequenceClassify(
  (project_layer): Linear(in_features= self.input_dim ,
out_features=100, bias=True)
  (recurrent_layer): LSTM(100, self.hidden_dim , batch_first=True)
  (classify_layer): Linear(in_features= self.hidden_dim ,
out_features=10, bias=True)
)
```

**Model 1**: Basic model with following hyperparameters and architecture:

For epoch= 1, learning rate = 1e-3, hidden layers = 100, optimizer = SGD:

Results:

train Epoch: 0, Loss: 2.3094, Accuracy: 11.35

val Epoch: 0, Loss: 2.3131, Accuracy: 11.25

**Model 2**: Basic model with following hyperparameters and architecture and increased number of epochs to 11:

For epoch= 11, learning rate = 1e-3, hidden layers = 100, optimizer = SGD:

Results:

train Epoch: 10, Loss: 2.3045, Accuracy: 8.15

val Epoch: 10, Loss: 2.3042, Accuracy: 10.00

**Model 3**: Optimizer changed to Adam optimizer and got better result:

For epoch= 11, learning rate = 1e-3, hidden layers = 100, optimizer = Adam:

Results:

train Epoch: 10, Loss: 0.7557, Accuracy: 73.45

val Epoch: 10, Loss: 0.9173, Accuracy: 66.00

**Model 4**: Increased number of epochs to 21 for Model 3:

For epoch= 21, learning rate = 1e-3, hidden layers = 100, optimizer = Adam:

Results:

train Epoch: 20, Loss: 0.5289, Accuracy: 80.90

val Epoch: 20, Loss: 0.7806, Accuracy: 73.00

**Model 5**: Increased number of hidden layers to 500 for Model 4:

For epoch= 21, learning rate = 1e-3, hidden layers = 500, optimizer = Adam:

Results:

train Epoch: 20, Loss: 0.3252, Accuracy: 87.20

val Epoch: 20, Loss: 0.8071, Accuracy: 77.25

**Best Result:**

**Model 6**: Increased number of hidden layers to 1250 and epoch to 26 for Model 5:

For epoch= 26, learning rate = 1e-3, hidden layers = 1250, optimizer = Adam:

Results:

train Epoch: 25, Loss: 0.2243, **Accuracy: 91.95**

val Epoch: 25, Loss: 0.6970, **Accuracy: 79.25**

**Overall Results and Conclusion:**

1. Increasing the number of hidden layers improved the model accuracy but after 1250 to 1500 hidden layers it started decreasing.
2. Adam Optimizer performed better than SGD Optimizer.
3. Changing Learning rate was not giving any satisfying results on validation set.
4. We got **Best Validation Accuracy = 79.25% for Model 6.**