Rough Report:

Aim: The objective is to replicate the results Prabhat got from training FastGRNN models.

Dataset used: Google speech for the 10 speech classes, the other three were provided by Prabhat)

Classes: 13 classes (yes, no, right, left, on, off, down, up, go, stop, cough, crackle, wheezes)

Background Noise included: No, **Normalized Data:** Yes (normalization done by program)

Our best result:

Test Accuracy: 89.062 %

Validation Accuracy: 91.602% (vs 93.7% accuracy by Prabhat)

Training Accuracy: 92.145 %

Time Taken: 10637.13s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.012 **lr_min**: 0.0005 gamma: 1)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35

(We have tested pretty less models due to computational constraints, we are trying to set up our environment on HPC servers, so the best is yet to come)

All the results:

Result 1:

Test Accuracy: 85.938%

Validation Accuracy: 80.729%

Training Accuracy: 83.668 %

Time Taken: 4268.18s

Configuration:

Learning rate: (**scheduler**: Cosine Annealing**. lr_max**: 0.005 **lr_min**: 0.0005)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 70

Max Rolling Length: 235

Result 2:

Test Accuracy: 84.961%

Validation Accuracy: 86.523%

Training Accuracy: 86.033%

Time Taken: 3433.71s

Configuration:

Learning rate: (**scheduler**: Constant**. lr_max**: 0.005 **lr_min**: 0.005)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 70

Max Rolling Length: 235

Result 3:

Test Accuracy: NA (* Terminated early because it was taking very long time)

Validation Accuracy: 91.016% (51st epoch)

Training Accuracy: NA*

Time Taken: Long (Changing Max Rolling length made it very slow after 35 epochs)

Configuration:

Learning rate: (**scheduler**: Constant**. lr_max**: 0.003 **lr_min**: 0.003)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35

(Note: setting max rolling increases accuracy after the 35th epoch but takes a lot of time after that this caused me to terminate)

Result 4:

Test Accuracy: 86.719 %

Validation Accuracy: 88.867%

Training Accuracy: 87.665 %

Time Taken: 9625.07s

Configuration:

Learning rate: (**scheduler**: Constant**. lr_min**: 0.003 **lr_max**: 0.003)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 50

Max Rolling Length: 38

(Note: This was an attempt to get accuracy as high as previous one it reached pretty close but not over 90%)

Result 5:

Test Accuracy: 90.234%

Validation Accuracy: 91.211%

Training Accuracy: 91.823 %

Time Taken: 10346.51s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.01 **lr_min**: 0.005)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35

Note: It has been very fast (In terms of accuracy from 8.203% to 75.195% in 35 epochs). I set the scheduler argument to exponential but for some reason it is 0.01 throughout. It reached around 90 quite early but then it was just oscillating. -> will reduce learning rate to 0.006 next time.

Result 6:

Test Accuracy: 90.774 %

Validation Accuracy: 89.648%

Training Accuracy: 89.648%

Time Taken: 10638.93s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.006 **lr_min**: 0.0005)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35

(Note: Still oscillating in the 88-91 region, probably need to lower the learning rate even more?)

Result 7:

Test Accuracy: 89.258%

Validation Accuracy: 90.430%

Training Accuracy: 90.720%

Time Taken: 22336.93s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.006 **lr_min**: 0.0005)

NN Structure: (**No. of layers**: 3, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35

(Note: Only changed the number of layers this time to see the effect, takes a lot of time!)

Result 8:

Test Accuracy: 88.672 %

Validation Accuracy: 87.500%

Training Accuracy: 88.276 %

Time Taken: 2979.32s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.004 **lr_min**: 0.0005)

NN Structure: (**No. of layers**: 1, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35

(**Note:** Much faster than all the others, but could not touch 90)

Result 9:

Test Accuracy: 78.320 %

Validation Accuracy: 82.031%

Training Accuracy: 80.071 %

Time Taken: 3437.64s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.001 **lr_min**: 0.0005)

NN Structure: (**No. of layers**: 1, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35 (Not at all recommended, pretty bad results)

Result 10:

Test Accuracy: 85.547 %

Validation Accuracy: 88.672%

Training Accuracy: 88.063 %

Time Taken: 11144.42s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.002 **lr_min**: 0.0005)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 71

Max Rolling Length: 58

(**Note**: Changed back to 2 layers that was taking optimal time and had good accuracy, also kept learning rate low and increased epochs to reduce the oscillations at the end but at the same time reach around 90% validation accuracy, Disappointing results nonetheless.)

Result 11:

Test Accuracy: 83.398 %

Validation Accuracy: 85.938%

Training Accuracy: 85.582 %

Time Taken: 10103.42s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.01 **lr_min**: 0.0005 gamma: 0.999)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35

(Note: Introduced a new variable gamma, this was not there to input which was pretty absurd, so I added another argument in order to take this as an input. Learning rate 0.01 – 0.005 roughly from epoch 0 to epoch 34 after that the rate increased… probably rolling increases the number of iterations per epoch.)

Result 12:

Test Accuracy: 88.672%

Validation Accuracy: 91.602%

Training Accuracy: 90.761%

Time Taken: 10178.06s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.008 **lr_min**: 0.0005 gamma: 1)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35

Result 13:

Test Accuracy: 89.062 %

Validation Accuracy: 91.602%

Training Accuracy: 92.145 %

Time Taken: 10637.13s

Configuration:

Learning rate: (**scheduler**: Exponential**. lr_max**: 0.012 **lr_min**: 0.0005 gamma: 1)

NN Structure: (**No. of layers**: 2, **Batch size**: 128, **Hidden units**: 128)

Epochs: 51

Max Rolling Length: 35