

Home Work 3
Course: Deep Learning
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Due: 15:30, December 24th, 2019

1. Simple_RNN

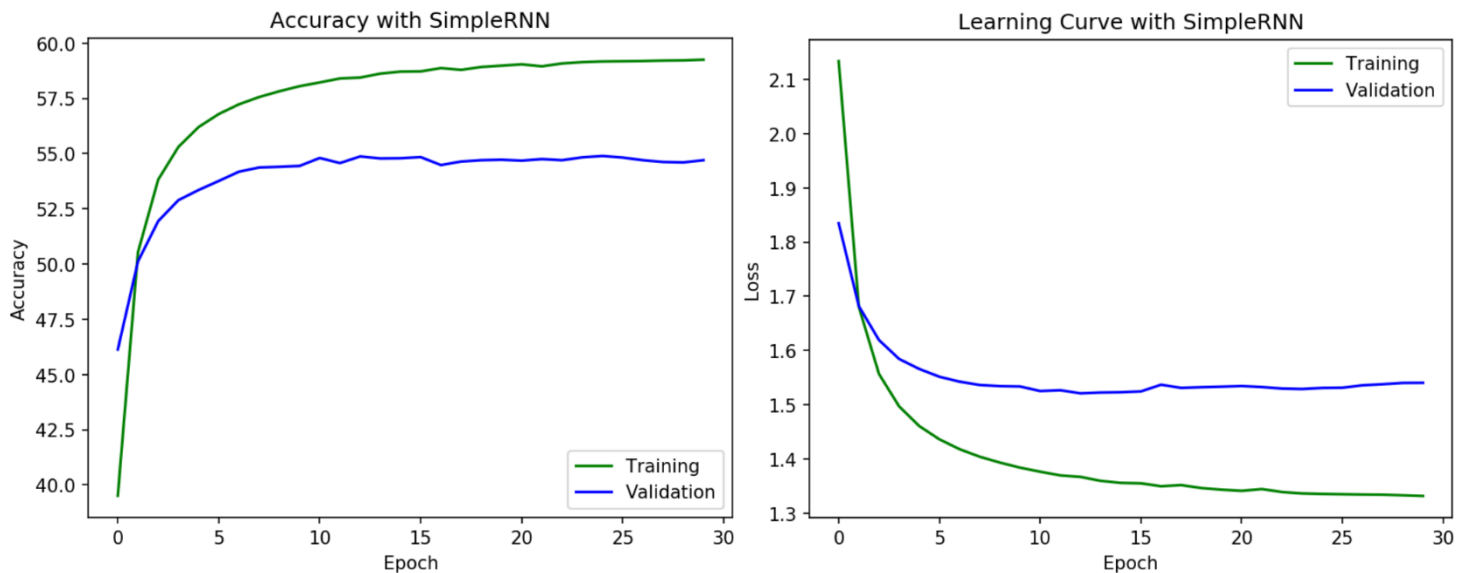
a) Network structure

Using simpleRNN

- Instead of using one-hot-vector, I use an embedding layer, which use a vector of size 256 to represent a character, which is easy to extend to a word-level.
- Batch Size: 64
- Num of Epoch: 30
- Optimizer: Adam
- Learning rate: default.
- Size of sequence: 100
- Size of Embedding layer: 256
- Size of hidden states: 1024
- Time/epoch: ~100 seconds/epoch (Training + validation)

Layer (type)	Output Shape	Param #
embedding (Embedding)	(64, None, 256)	17152
simple_rnn (SimpleRNN)	(64, None, 1024)	393728
dense (Dense)	(64, None, 67)	34371
		Total : 445,251

b) Learning curve & accuracy curve



	Training	Validation
Loss	1.3319	1.5404
Accuracy	59.25 %	54.7 %

c) Validation during training phase

Eth	Content
0th	Accuracy: 39.51 % Input : 'e, but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can' Output : ', but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can ' Predict: 'v aet t sonthin \nlot hhn e t whe Hou salr el ahet hovlher ta lonrh\nan orheeh tot Taasecdenn oonn'
1th	Accuracy: 50.54 % Input : 'e, but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can' Output : ', but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can ' Predict: 'w aut t sortain \nlot hhnge t whe Tou soar ul ahet lovther ta lourh If orhaey aot Teaconlenn oan '
10th	Accuracy: 58.22 % Input : 'e, but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can' Output : ', but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can ' Predict: 'v tet t portain e \nlot thnce I hhe Toursoar ul ahet lovther ta sons \nan orrity \naot nrrfuadeon oonn'
20th	Accuracy: 59.04 %

	Input : 'e, but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can' Output : ', but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can ' Predict: 'v aet t shntain e \nlot thnce t she Toursoar ul ahet hovther sa sous an orrity aot trrsuadion oon '
29th	Accuracy: 59.25 % Input : 'e, but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can' Output : ', but a certainty. Yet since I see\nyou fearful, that neither my coat, integrity, nor\npersuasion can ' Predict: 'v sut t pontain y \nlot thnce t she Tourtoar ul thet lovther ta lont an orrity \naor trrsuadion oon '

2. GRU

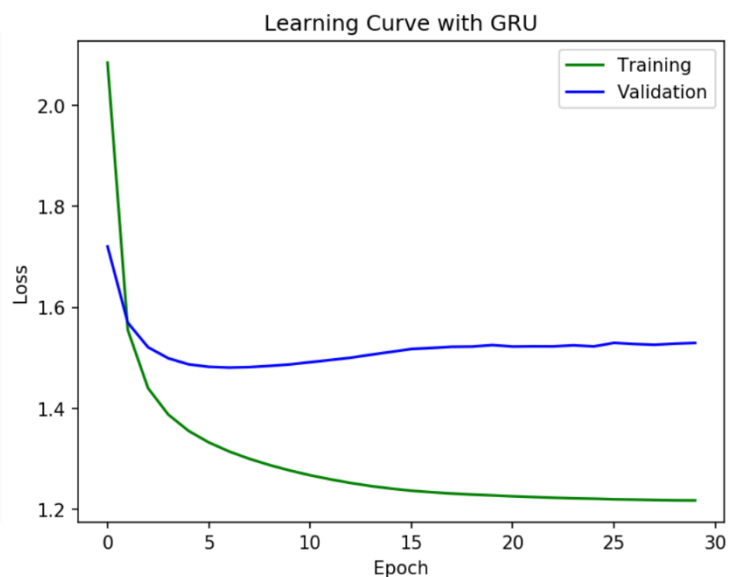
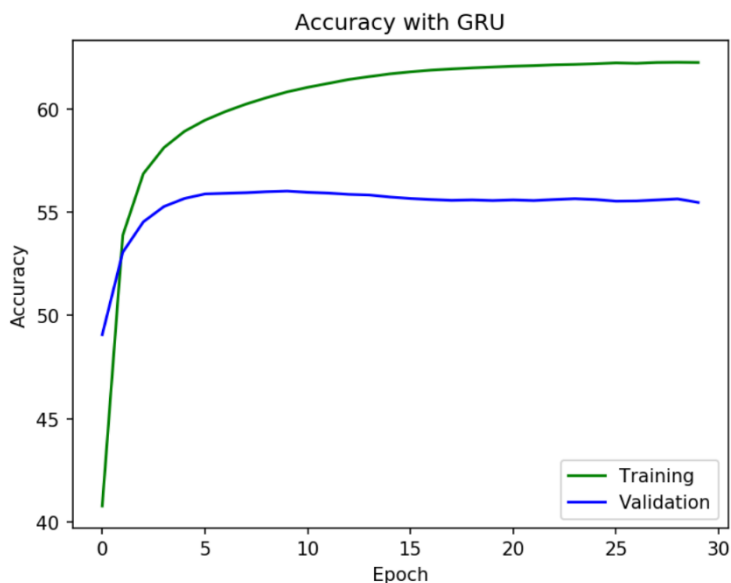
a) Network Structure

Using cuDNNLSTM

- All of the others setting is the same to simpleRNN & GRU

Layer (type)	Output Shape	Param #
embedding (Embedding)	(64, None, 256)	17152
cu_dnngru (CuDNNGRU)	(64, None, 512)	1182720
dense (Dense)	(64, None, 67)	34371
		Total : 1,234,243

b) Learning Curve & Accuracy Curve



	Training	Validation
Loss	1.2177	1.5295
Accuracy	62.24 %	55.47 %

c) Accuracy and Prediction during training phase

Eth	Content
0th	Accuracy: 40.78 % Input : 'ycus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Output : 'cus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Predict: 'hs_aha se ng an t hm aiktlr r tpterstarcyle \nth s teke ale Tnptoveer dnotf tncenteoed d thueuyss\n'
1th	Accuracy: 53.88 % Input : 'ycus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Output : 'cus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Predict: 'ehs,\n nahi se ng an t am aektlr r tpterstarcyri \nahs tike ate Tnptateer -notf tslnntuder r touelyd \n'
10th	Accuracy: 61.04 % Input : 'ycus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Output : 'cus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Predict: 'ehl,\n nahi sheing as t am aiktlr d tpterstarcyri: ths tike ise Tnmhaieer tp of msslnstderad woucle.,\n'
20th	Accuracy: 62.06 % Input : 'ycus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Output : 'cus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Predict: 'ehse\n nahi sheing ss I sm iektlr d wpder tarcuty, ahs tike ise T muaieer-tp of tsslnsiderad woucle.,\n'
29th	Accuracy: 62.24 % Input : 'ycus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Output : 'cus; who\nbeing, as I am, littered under Mercury, was likewise\na snapper-up of unconsidered trifles.' Predict: "ehse\n nahi sceing Is I tm aektlr d fpter tarcyri ahs nike ise\nT mhaiper tpoaf tsdlnsider'd foecler.\n"

3. LSTM

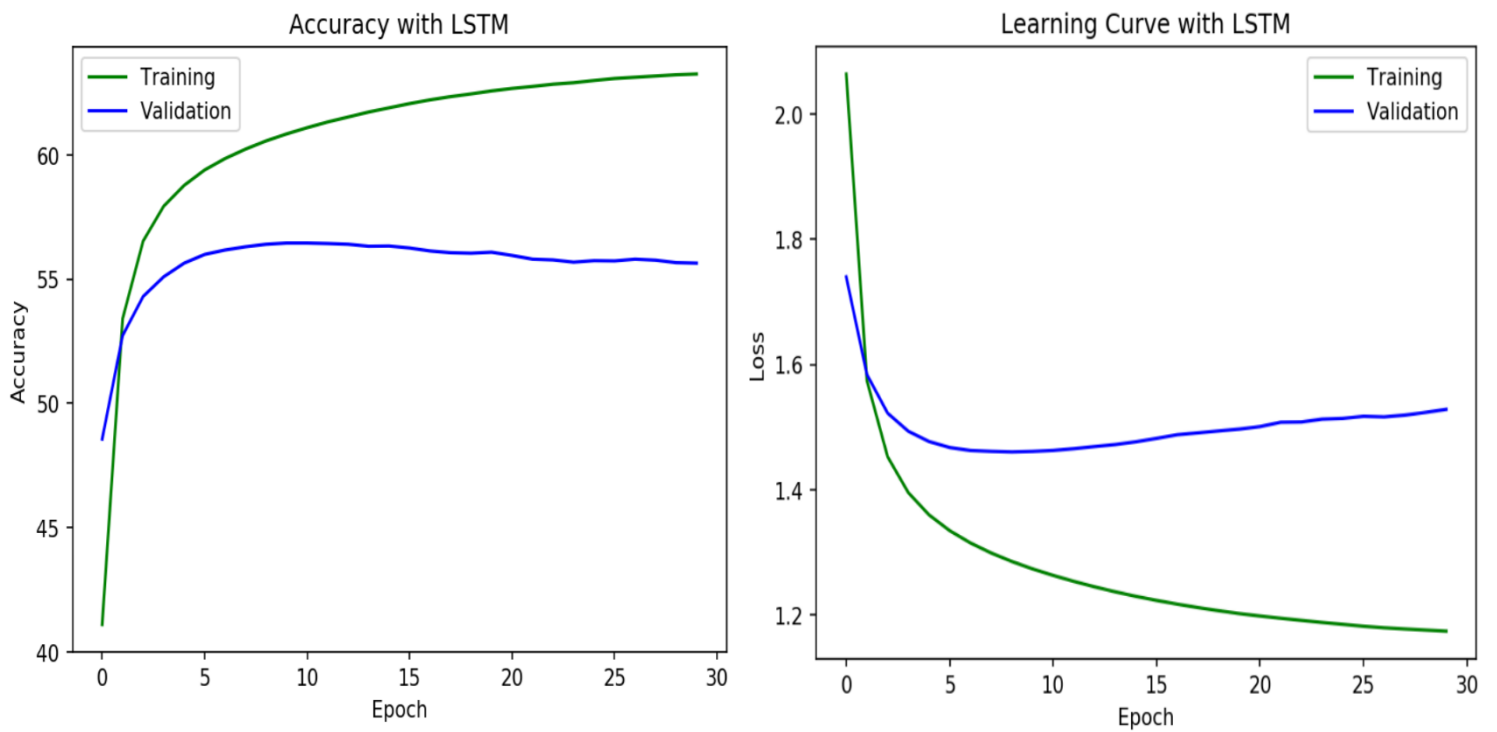
a) Network structure

Using cuDNNLSTM

- All of the others setting is the same to simpleRNN & GRU

Layer (type)	Output Shape	Param #
embedding (Embedding)	(64, None, 256)	17152
cu_dnnlstm (CuDNNLSTM)	(64, None, 512)	1576960
dense (Dense)	(64, None, 67)	34371
		Total : 1,628,483

b) Learning Curve & Accuracy Curve

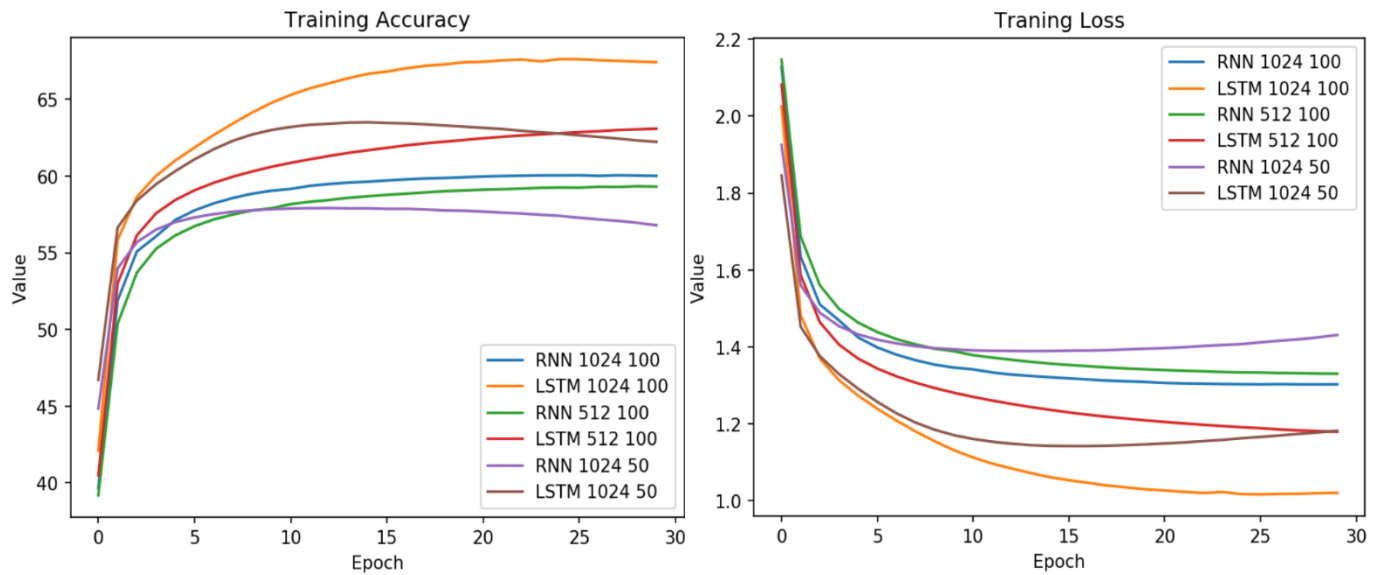


	Training	Validation
Loss	1.1737	1.5283
Accuracy	63.25 %	55.64 %

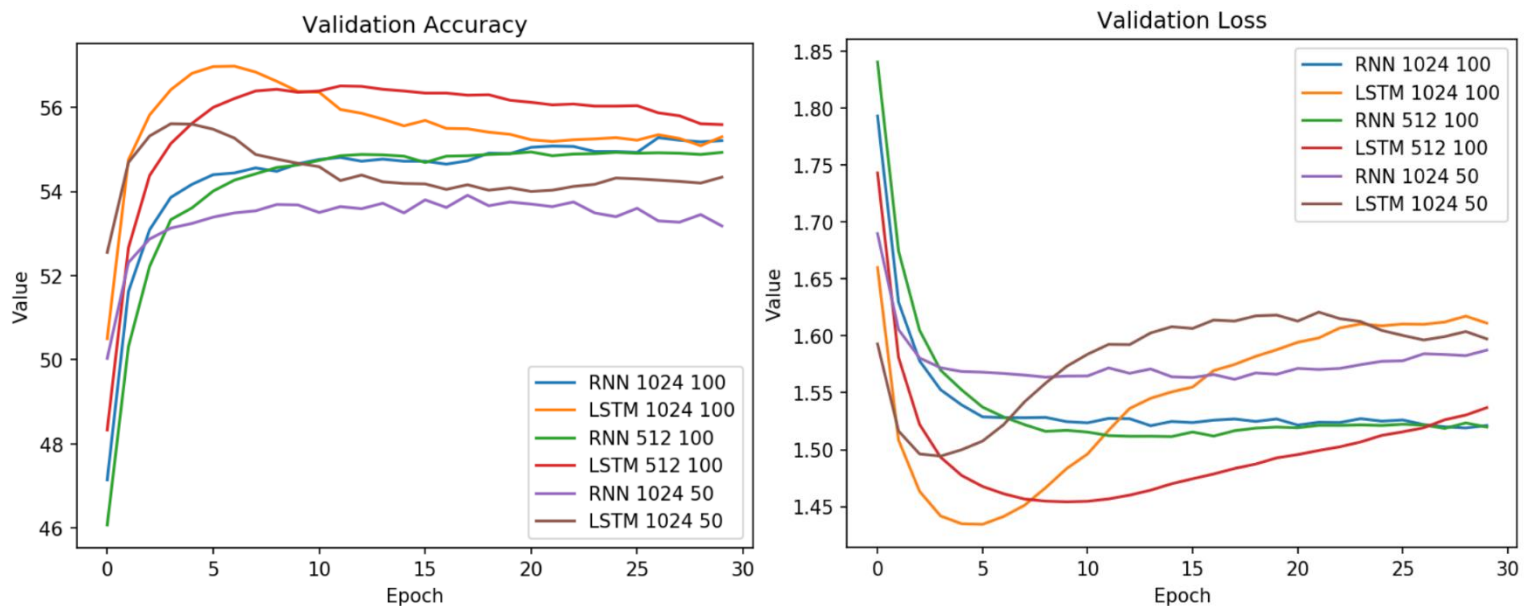
c) Accuracy and Prediction during training phase

Eth	Content
0th	<p>Accuracy: 41.1 %</p> <p>Input : "h of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA d"</p> <p>Output: " of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA di"</p> <p>Predict: "etuftiarh \n\ne e is the e tomsecissaoave aave t sose d \nAh tis h the sordng tf tyne on erytnens,\n\nnso"</p>
1th	<p>Accuracy: 53.41 %</p> <p>Input : "h of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA d"</p> <p>Output: " of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA di"</p> <p>Predict: 'etu teath \n\ne e is the e tomsedid ahape,aate a sosg d \nAh thseh the sortng of tyne onvinyenees,\n\nnmo'</p>
10th	<p>Accuracy: 61.09 %</p> <p>Input : "h of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA d"</p> <p>Output : " of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA di"</p> <p>Predict: "etu teath.\n\ne e cs the e tontides ahepe save s serk'd \nAh shlch the sortng of tyne onvirsaryes.\n\nnpa"</p>
20th	<p>Accuracy: 62.67 %</p> <p>Input : "h of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA d"</p> <p>Output : " of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA di"</p> <p>Predict: "eau testh \n\nere cs the e tomtines ahepy sate I serk'd \nTh salch the soyttg of tyne envarsaryes,\n\nnpa"</p>
29th	<p>Accuracy: 63.25 %</p> <p>Input : "h of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA d"</p> <p>Output : " of death.\nHere in these confines slily have I lurk'd,\nTo watch the waning of mine adversaries.\nA di"</p> <p>Predict: "emu teath \n\nere cs the e tomtenes nhepy save a serk'd \nAh shlch the soltng of tyne envarsiryes,\n\nnpi"</p>

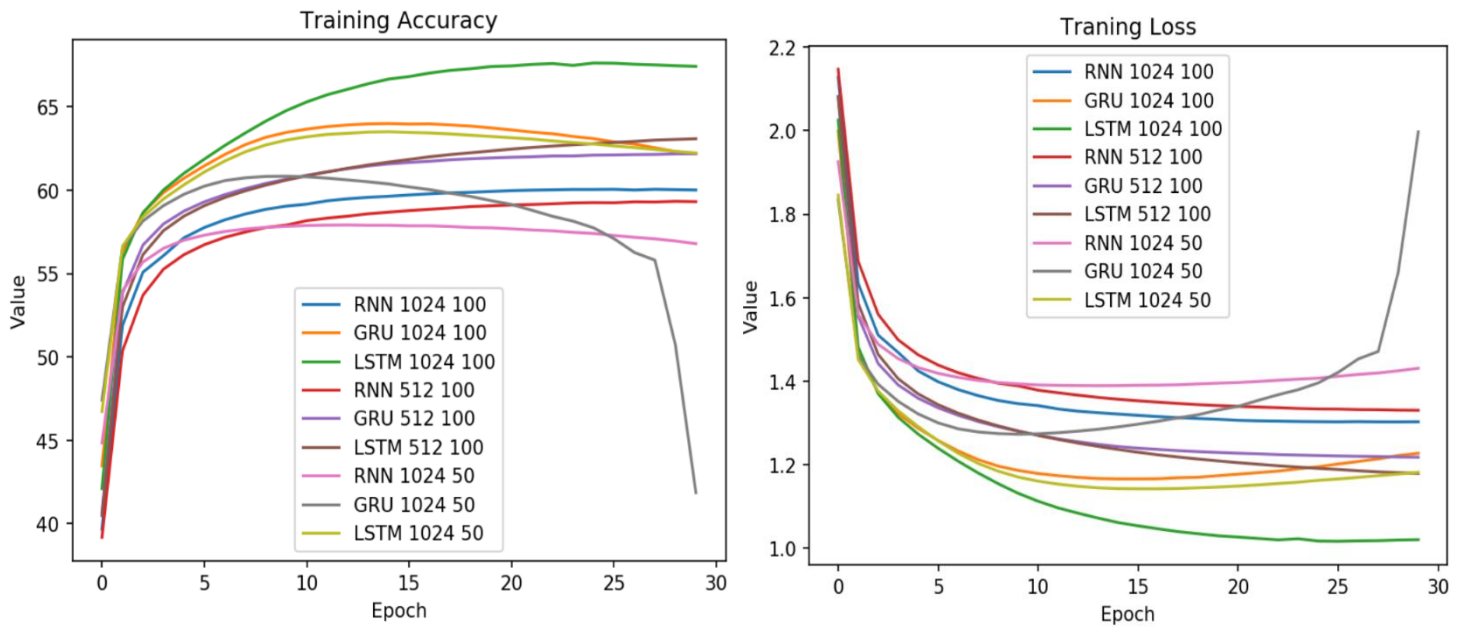
4. Compare SimpleRNN/GRU/LSTM with different size of sequence length and hidden state



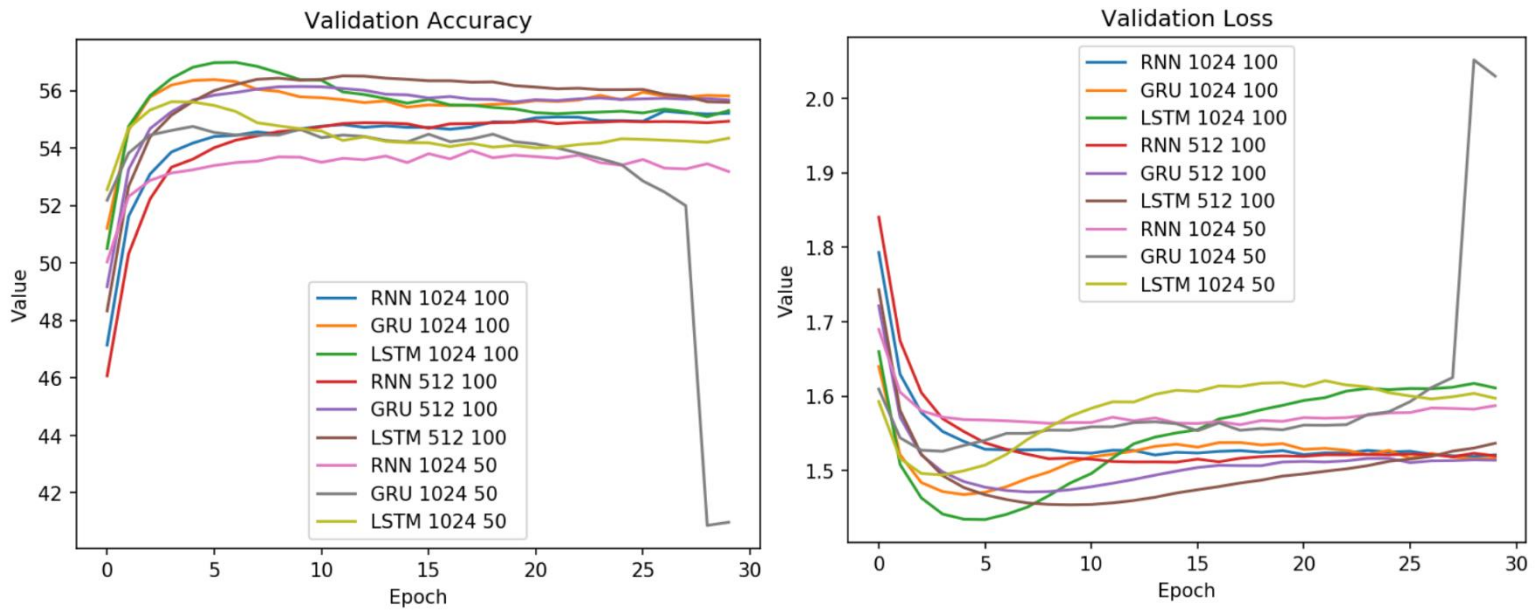
Comparison between RNN & LSTM on Accuracy and Loss function for Training



Comparison between RNN & LSTM on Accuracy and Loss function for Validation



Total Comparison (RNN, GRU and LSTM) on Accuracy and Loss function for Training



Total Comparison (RNN, GRU and LSTM) on Accuracy and Loss function for Validation

5. Generate Text

a) Simple RNN

ROMEO:

My turn.

FALSTAFF:

S y harm: we are a permanny! king, with the sin's weak him the listless cloudy Nupless islanded
thither will rest.

And be none o'er this flemy;

My babal true stroke, unkind by injurt.

Dhink particular city.

like this time are chain honest

Against

offendshionced and beasts into retaff.

That with it you here

For that faults.

When our oathst

Of the whole Floody sins.

ANTONY:

CLARENCE:

Where think, a light

That he hath a bearing whom unto your thought our prayers slandering the streams how the wine

Duke of England:

Thyself; if

your hands.

An icquainted four Britain, wh!

SIR HUGH EVANS:

Then my that with her! So satisty though Troilus, when We! a man she to my imagination
throw for 'Lore marching help him:

And, in this fabour then ere you reron to the body and figure would

Breaking the battle view to the disines of Desdemona e'en you list in his:

I am confounds; and still of dust.

And with a man, vouches:

Sit his sinner he cited forward with this honest hinger;

And I

JULIET:

O, de this nature.

And go to my sendey with captains here on William'ES:

I will here in their husband!

MISTRESS QUICKLY:

I am a general; still

To put us,

And carb'd already Galliors to make bold a weep.

Marry, knighted in each offend you, Glouceuly shall:

How can the old life.

Enex the French.

SHALLOW:

I have thought more of hirthorn with me a fearful excrect of fear, he shall be a thing by thy life's
nations of their stance
surporn in striffre.
How by his presence
Does Is to be.
Yet with me upon a to the streight. And son, if drive comfort his
of seages saving
The soul of words
And gentle hence
Are vein.
That there will I Caes, you know fruitfies.

ANTIPHOLUS OF SYRACUSE:
Wilt thou be self.

EDMUND:
He's so?

QUEEN GERTRUDE:
What, my lord.
But wherewoo, Biron
one, he sont unpassel Tiban:
But the duke strongly's king.
And in maditime was in
The princess seek his
English?

KING HENRY VI:
Which
Is quick every time.
Henceforth this pursue ere yet lies n them particular than the music:

b) GRU

ROMEO:
Where is my soul, then,
He'll speak to thee is, and amend as well ape.
To temperance, the mopess in England shake thee open
To fly himself
Should ask him--course; a vap she first!

HAMLET:
I have left you into my bachelor.

ROSENCRANTZ:
Please you--

GARDINER:
My lord, a cohe dog beter-time to choose
But to live to Caxer bause how you broken
Envited Lord EPHENRUS:
A unide Master Serving-master's uncities.

Messenger:
Look to't, to go ladit my Jew PAILLEN:
A most maskinone sport! I'll to the heavens.

Eating i' the ghost, by the gross slow use to tound the least,
Or thrive the supers is after venom, with thy bed of;
Between them descended.

TROILUS:
We move it, with true legions are you a heavenler gays?
The serving of his eyes upon me for my sword cozen'd:
I would tell my back and supposition love,
When ever kneel to her sepe of answer!
Yet, I will be follow'd heavy wink before me in his helm.

ASAMACHIO:
Good morrow, cousin, i' 'as men
But dimple thee all, which, with judgment,
And he

JULIET:
Here's a phy of most fair heart as service,
Stircups, courtly fairest ness my deserts,
As idlanging them not when hearget you, my city
Motion!

KING HENRY V:
Ay, masters, effected! you are accoatch when you go?

HAMLET:
Have merst no longer service to tell thee what I am shreven at game,
Where slave where he didst the general pronounce then were almost bear me!

DROMIO OF EPHESUS:
But the rear's life, he must counciest him to thee: or you,
So sweet my nature fleeve: beling not a
glance and calumnal lady.

DUCHESS:
God keep your hand, set a falcome I must
Presurting him there in man wealth to-day!

PAROLLES:
Ghostardness the swift apply of me better.

FALSTAFF:
Much unerpadder wretch.

SMINT:
Well, praise him with your acons!--see how I know it could but this fellow
As, hateful ten to any one MONTIA:
Why you'll make me welcome
To make them work above me? and the better
voat to wrong to pass my person enterpay nothing chaped--

ROSENCLANDET:
By Burgundy, the poor wife, to chase I last

c) LSTM

JULIET:

Confine, even to thy note.

LAERTES:

Welcome, Duncan; thy faith doth nothing were with them. They set him to his backward. Fare you well, my cousin Berkeley: And be revenged. They speak no more; but reserve that pain, The effects of my purpose shall good

KING HENRY V:

How now titus!

IAGO:

He shall not needs woo ner.

FALSTAFF:

'Fore God, a word with you: and if he look! come not meet withholds.

YORK:

And do you, sir? will you withdraw? an out of them; a ken time motion will be drunk

ACHILLES:

I r'my that I commit, I know not--have possess'd Our fortifut or tongue; but rather is A sweet Beggar loves you.

6. Code Explanation

- Run the file with 3 parameter RNNCell, numOfHiddenState, SequenceLenght

```
Ex >> python Simple_RNN.py LSTM
```

- Some parts of my code were implemented manually (Ex: run & calculate the loss value

or the accuracy batch by batch during the trancing phase.

- Therefore, the used version is tensorflow-gpu 1.5
- If there is any problem about running my code, please let me know via my email:

ndhuyvn1994@gmail.com