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Team name on Kaggle leaderboard: Peacock Navigator

Part 1:

Answer the following questions briefly (no more than a few sentences), and provide output images where requested.

Show final results from training both your GAN and LSGAN (give the final 4x4 grid of images for both):

DC-GAN ***i)*** Spectral Normalization D: 0.7842, G:6.97

LS-GAN ***i)*** Spectral Normalization D: 0.02369, G:0.381

ii) No Spectral Normalization D: 0.07661, G:3.674

ii) No Spectral Normalization D: 0.05374, G:0.4591

The models for each of the four cases above were trained for 15 epochs each.

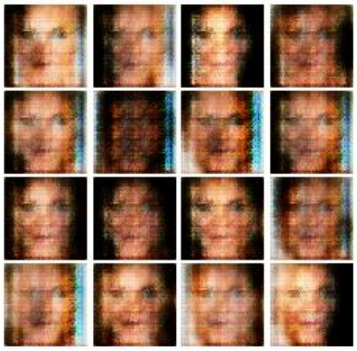
Discuss any differences you observed in quality of output or behavior during training of the two GAN models.

In general the LS GAN gives better results than the DC GAN. For example, when including spectral normalization, some DC GAN faces look like a portion of them contain a patch of another face, and the DC GAN faces look less formed than those in the LS GAN model. This is more evident when spectral normalization is not included, since DC GAN faces look more deteriorated than the LS GAN case

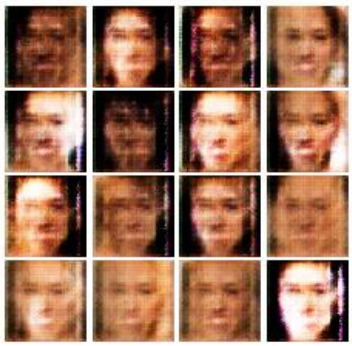
Do you notice any instances of mode collapse in your GAN training (especially early in training)? Show some instances of mode collapse (if any) from your training output.

Some mode collapse happened early in training. For example for DC GAN with no spectral norm, initially most of the faces generated by the algorithm alternate between all being serious, all smiling or all laughing (except for iter: 300) and facing straight. Most faces looked alike, with that being evident in the early stages of training as seen below. This happened for all GANs:

Iter: 300, D: 0.4915, G:3.744



Iter: 450, D: 0.1726, G:2.863



Iter: 600, D: 1.069, G:5.159

Iter: 750, D: 2.252, G:2.948

Iter: 900, D: 1.077, G:3.295

Iter: 1050, D: 0.6034, G:2.302

Discuss briefly how/whether spectral normalization helps generate higher quality images in your implementation. Ideally, you should show samples from models with and without normalization.

As seen in the first set of images, the faces produced with spectral normalization are of higher quality. For example, for DC GANs the spectral normalization images did not have such incomplete eyes or faces as in the no spectral normalization case. For the LS GANs the spectral normalization case looks more realistic overall than the other case, with the faces looking more sharp and less blurry.

Extra credit: If you completed the extra credit for this portion, explain what you did (describing all model changes and hyperparameter settings) and provide output images.

Part 2 (generation):

For part 2, folder "rnn" was renamed "rnnn" to avoid any clashing with the RNN class instance in the code named rnn.

Give the hyperparameters for your best network on classification task below. Note any other changes you made to the base network in addition to the hyperparameters listed in the table below.

The same network that resulted in the best classification test accuracy was used for generation:

Hyperparameter	Value
RNN type:	LSTM
Number of layers:	1
Hidden layer size:	100
Learning rate:	0.001

Give an example 1000 character output from your network:

The king a many on fortune and recun,
In in the company me so manisce,
Like hast knew the hustience in this?

Messenger:
Madam?

HORATIO:
O the present my couptening such oath thee,
Come to sayest you seement has fool,
For the would in the gentrerful warrant play
which mine, and in sub; and worth no men,--

SHIRON:
What it had still we missed expeither to read,
Of are and wear me for acquains the excellister not,
And till the Duke and accomsagies the life;
Little wood to of the man with all the went of liqus was him for
Which of yours: when she have marrions eat
That speat that these to a noed with my swear thire,
Whose cannot extrele found kis to disence
That their can the sword and a purden honests,

Ay way mother to the paderate with me!

LUCENTIUS:

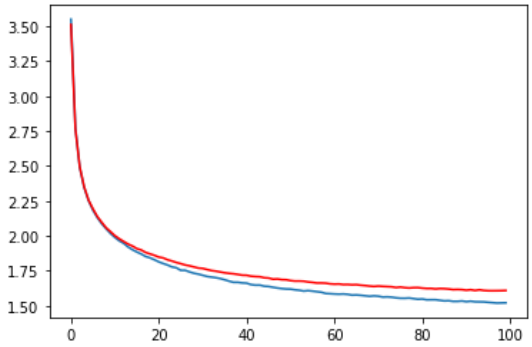
DON ADRIANO DE OF YORK:
When they know yet a care.

OTHELLO:
What in my sight; or mords.

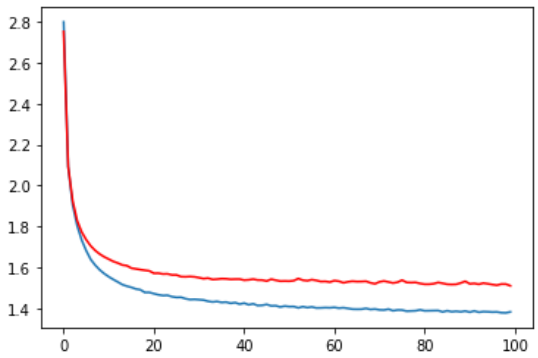
PANTHANUS:
Recons a nowal for the creature.

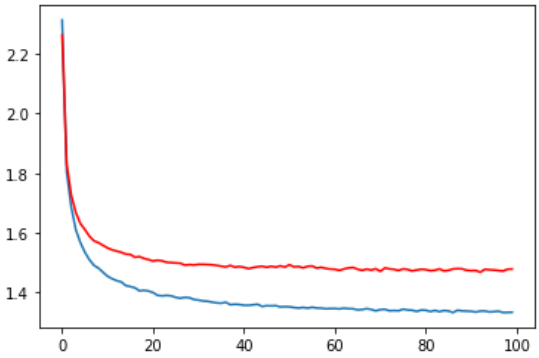
Second Senequing:
Sind, you have lion: he hight again not? and I lady
Doubt it thou shall not since in a

Insert the training & test loss plot from your RNN generation notebook below:



Two more variations were performed. The first had the default parameters but double the hidden layers (2), and the other had the default parameters but double hidden layer size (200). The plots and text are shown below in the same order they were mentioned:





Then for the offence, which with at our cartive
And shall I come delights than the temmed and let
the foot of the place of no madomar, sanchest acquess
weep the munder to come plink it busy
videry of the Caid forward.

PRINCE HENRY:
No, he will be not my wore the point say I
then too man the man all the fair long hold her, by my name,
And from her begined have her so marry with her
which not that rich one enate is the Emore's mind,
Wouldst Greek my world my sword, and see it.

BOTTITUS:
Why would see hurthing in his eyes and choose,
To be gross the palling but to speak them:
That you hear signor, or abrear! and in thy brother hast
the be in this lord, and say a wombing of her will obedies,
Parthed me better sorrow! unly our love with the fearful
for her noble thy head you main we would bender.

CORNEM:
How shall'st thy dear an his mock in thee.

PANDARUS:
My lord; nor blessing many shall o'erthy comes me, the still
drender.

PRINCE HENRY:
Well slander upon the state.

PANDARUS:
What is a

The name with our Roman callen safe as ever
one of thee to mare the prince comfort,
I'll make with my throat his body;
Where repent your stomach to the weaknireward, and
come as well then child the war is lord, my lord.

KING RICHARD III:
Let her ripe of the charged: but let me stay.

VALENTINE:
What should he stay, Lord Her own bore,
The maidens, and one of wine of all
From one of his cold much off come:
Therefore death, after his injured,
That I have fly the precious snart
And some forward courtesy of his power
Than of father, the world no return and the man,
I tell you gone too, the word, thou dost thou dares
sins forth most recomfortenance or in the cast of the
splitrious love to march and minute are a troubles.

KING CLAUDIUS:
While I came and I have renowning troop
Whithen get it in day to come to be these.

DUMAIN:
I will say are you a goodly queen
To be so ill, which not I come.

Posbraint:
He did you not ready them deeper, skip up in
Count or talk.

MISTRESS PAGE:
Ne here.

Firs

The former seems to use more archaic grammar than the latter which seems mostly modern. Moreover, the former uses more varied punctuation (e.g. exclamation mark, semicolon) than the latter. Both of the texts use words that mostly make sense by their own. Moreover, there are phrases in the texts make sense on their own, however they are out of context. Even though the 2-layer model seems to be the most coherent and with the most formal style, the "best-hyperparameter" model was picked as the best, because it has the most varied punctuation and uses more archaic-like phrases, but some words are unintelligible.

Extra credit: If you completed the extra credit for this portion, describe where your dataset came from, give an example from your training dataset (1000 characters), give an example output from your model trained on the dataset (1000 characters), and detail the hyperparameters you used to train a model on the dataset.

Part 2 (classification):

For part 2, folder "rnn" was renamed "rnnn" to avoid any clashing with the RNN class instance in the code named rnn.

Give the hyperparameters for your best network on classification task below. Note any other changes you made to the base network in addition to the hyperparameters listed in the table below. You should reach the Kaggle accuracy benchmark with your Kaggle submission. Your notebook evaluation results should be similar to your performance on Kaggle. Insert the confusion matrix image outputted from your best model, and report the corresponding accuracy:

Hyperparameter	Value
RNN type:	LSTM
Number of layers:	1
Hidden layer size:	100
Learning rate:	0.001

The plots are shown in Figure A. All networks were train for 9000 iterations.

Random chunk length from 10 to 50 was used for training, instead of fixed chunk length of 50. This made the training accuracy and testing accuracy be closer, since without random chunk length, training and testing accuracy could be 10% apart. Using random chunk lengths made the training and testing distributions more similar. Therefore training was more efficient since it also accounted for varying chunk length which means that the chunk length plays a smaller role in determining the language type, and the actual language features is what matters most.

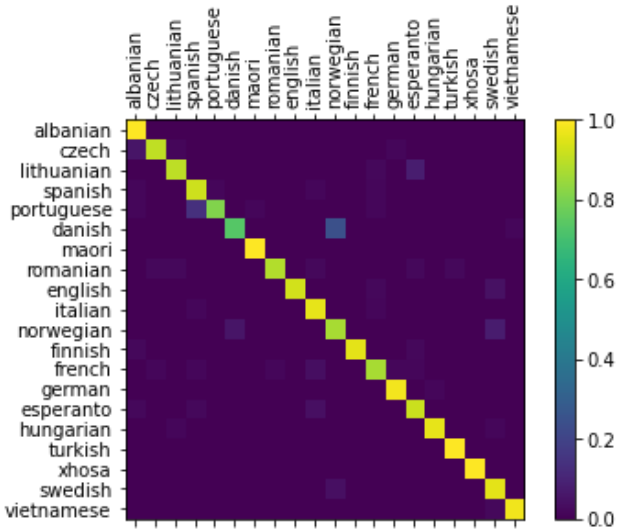
For example, for the default hyperparameters and fixed chunk length training accuracy was around 0.93 and testing accuracy around 0.81 (figure B), whereas for random chunk length training accuracy was around 0.88 and testing accuracy around 0.87 (figure C).

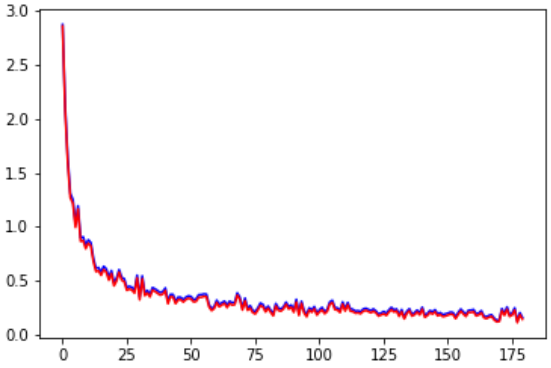
For random chunk length from 10 to 50, other variations that were performed are doubling the number of layers (figure D) and doubling the hidden layer size (figure E). Adding more layers was more effective than doubling the hidden layer size but marginally less effective than lowering the stepsize from 0.01 to 0.001 (figure A).

A) Best hyperparameters:

Test accuracy: 0.924

Loss plot:

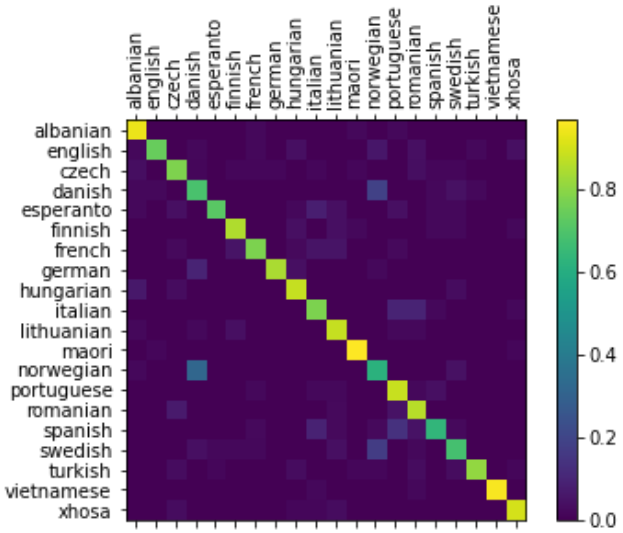


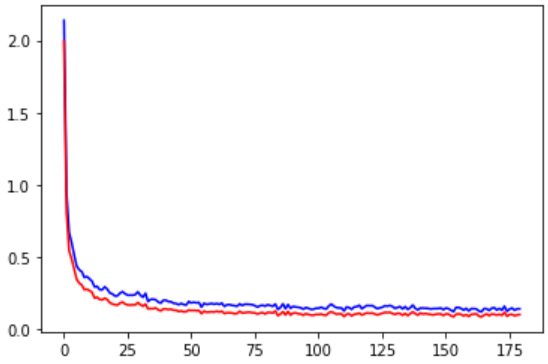


B) Default paramaters (fixed chunk length of 50):

Test accuracy: 0.811

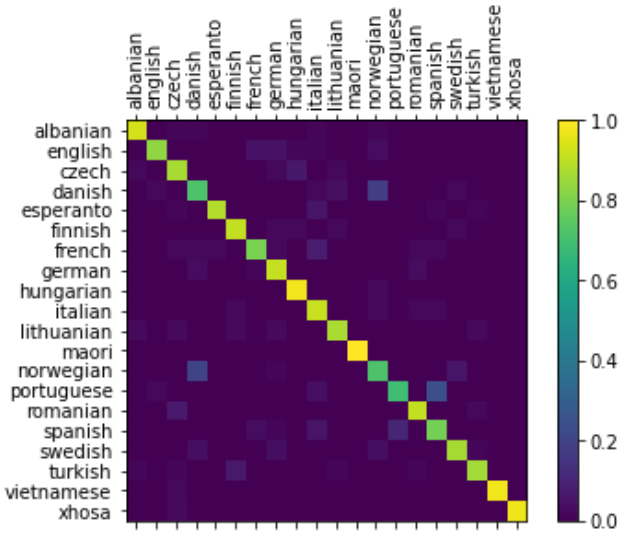
Loss plot:

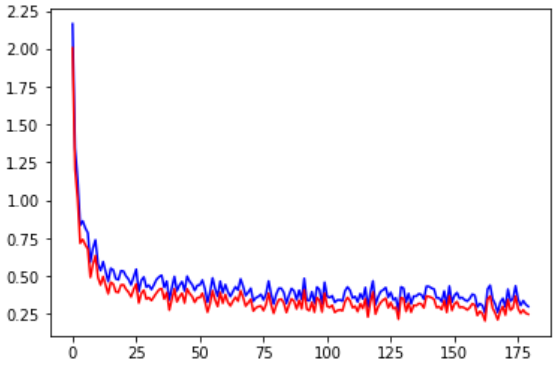




C) Default parameters (random chunk length):

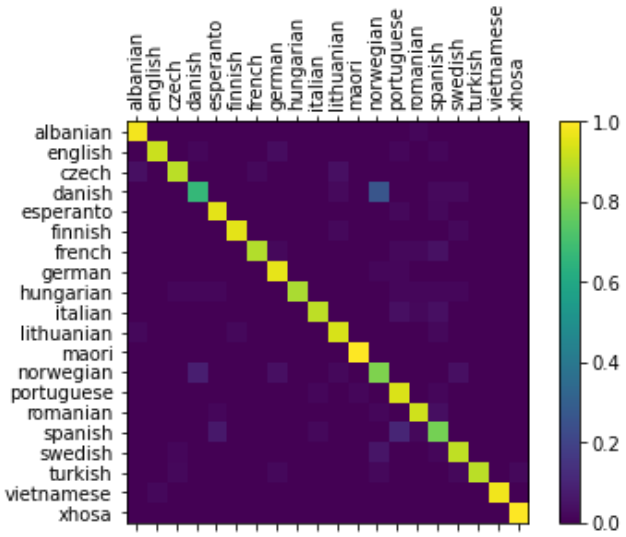
Test accuracy: 0.868 Loss plot:

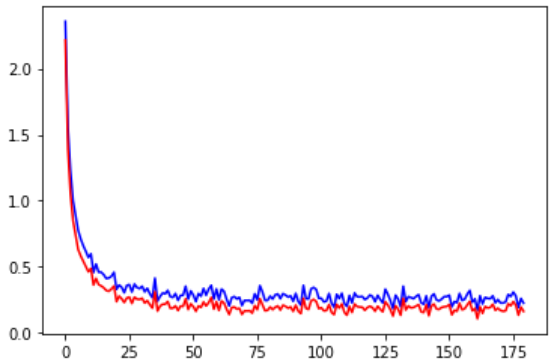




D) Default parameters except 2 hidden layers (random chunk length):

Test accuracy: 0.912 Loss plot:





E) Default parameters except hidden layer size of 200 (random chunk length):

Test accuracy: 0.854

Loss plot: