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САНКТ-ПЕТЕРБУРГСКИЙ ГОСУДАРСТВЕННЫЙ
ЭЛЕКТРОТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
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ОТЧЕТ
по лабораторной работе №8
по дисциплине «Искусственные нейронные сети»
Тема: Генерация текста на основе “Алисы в стране
чудес”

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Цель работы

Рекуррентные нейронные сети также могут быть использованы в качестве генеративных моделей.

Это означает, что в дополнение к тому, что они используются для прогнозных моделей (создания прогнозов), они могут изучать последовательности проблемы, а затем генерировать совершенно новые вероятные последовательности для проблемной области.

Подобные генеративные модели полезны не только для изучения того, насколько хорошо модель выявила проблему, но и для того, чтобы узнать больше о самой проблемной области.

Задачи

- Ознакомиться с генерацией текста
- Ознакомиться с системой Callback в Keras

Требования

1. Реализовать модель ИНС, которая будет генерировать текст
2. Написать собственный CallBack, который будет показывать то как генерируется текст во время обучения (то есть раз в какое-то количество эпох генерировать и выводить текст у необученной модели)
3. Отследить процесс обучения при помощи TensorFlowCallBack (TensorBoard), в отчете привести результаты и их анализ

Выполнение работы

1. Реализация модели ИНС для генерации текста

Была реализована модель из методических указаний. Листинг представлен ниже:

```
model = Sequential()
model.add(LSTM(256, input_shape=(X.shape[1], X.shape[2])))
model.add(Dropout(0.2))
model.add(Dense(y.shape[1], activation='softmax'))
model.compile(loss='categorical_crossentropy', optimizer='adam')
```

2. Написание собственного Callback, который будет показывать то как генерируется текст во время обучения

Для выполнения данного пункта был написан следующий Callback:

```
class IntermediateCallback(Callback):
    def on_epoch_end(self, epoch, logs=None):
        if epoch % 7 == 0:
            print(str(epoch) + "ep:\n")
            text_generation(self.model)
```

В конце каждой седьмой эпохи (количество эпох было увеличено до 43, чтобы равномерно отследить результат) мы указываем её номер для удобства анализа информации, затем вызываем функцию генерации символьной последовательности. Данная функция была представлена в методических указаниях и была вынесена для удобства, минимизации и оптимизации кода. Она получает лишь модель, что очевидно.

Полный пример работы приведен в приложение А. Рассмотрим 1, 22 и 43 эпохи:

```
1epoch:
Seed:
" hat is the use of a book,' thought alice 'without pictures or
conversations?'
```

so she was considerin "

aa a a

Done.

22epoch:

Seed:

" e picture.) 'up, lazy

thing!' said the queen, 'and take this young lady to see the mock
turtle, and "

the more to the toie to the tooe to the thit hadd and the whrt oaree an in
aank to the whrt oade to the wool and tan aolng to the tooe of the wood tf the
war th the war th the war of the was oo the woule the was to the whrt oare to
the whrt oare to the whrt oare to the whrt oare to the whrt oare to the whrt
oare to the whrt oare to the whrt oare to the whrt oare to the whrt oare to the

Done.

43epoch:

Seed:

" knuckles. it was opened

by another footman in livery, with a round face, and large eyes like a
frog; "

and the whste the was qolt as the could, and saed to the coororse the was
toiettiigg at the coole,

'at to the soeet sineg tein,' said the docm.

the west on alngeng to tee it au tnee, and the whrte tare and lot aegin
in a mora or tioe,

'tele toe sere then,' said the kons tuolly. 'i mont was the horshon of the
soielss tf the semeon if the seaeet se think thet saadit tat oo toeere thrh the
hadd.

Done.

Потери на 43 эпохе составили 1.7372 и генерация текста представляет собой большее количество переводимых слов, в каком-то смысле даже имеющих некую логику.

Рассмотрим теперь генерацию произвольной последовательности:

e as the woike,

'thene whst moce tored benneaney, she mock turtle reilied, 'and thet ale that mo then to teen to seyer oo the boorers to tay oo the seanen of the sreaen thye the toods, and she thotght it was to aegin as the could.

'a coonous so taa io a saree honeen,' she said to herself,

aoice was not no ht aamk to heare the west gioding aedin, and the thotght it aalk what all thet saae to be a lureer tf thes aioir an incers ano what soeers iate to sea the queen, she woile cenle toiet in the sooe of the grose of the goore of the thilg then, and the thite rabbit wety cloiouily, but she was aelitting to see it aaak tn the tteen. ''then'' saod the gryphon, and the gorphon and doon and tonked th the toeee thet see at the coulo,

anice could hear her hons that she was to tooe to hes oo the tooc oo the tool. and the thotght it was gorn a good doarter an in opoke, and the hoop th the gareen war toee ifr seseereng, and the white rabbit wese teten the whsle then sae of the sooco. ant the

Обратим внимание, что текст довольно осмысленный, перевод представляет собой некий странный рассказ, слова похожи на английские. Циклы отсутствуют.

3. Отслеживание процесса обучения при помощи TensorFlowCallback (TensorBoard)

Основная информация по данному инструменту была представлена в практическом задании №7. Приведем визуализацию в процессе обучения.

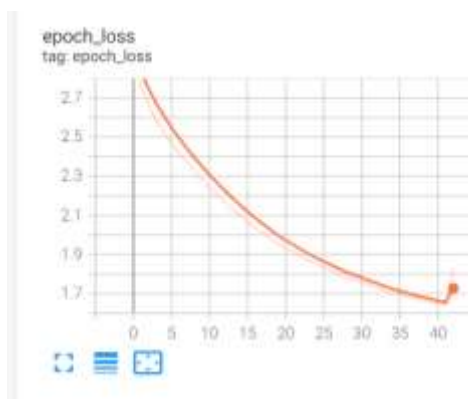
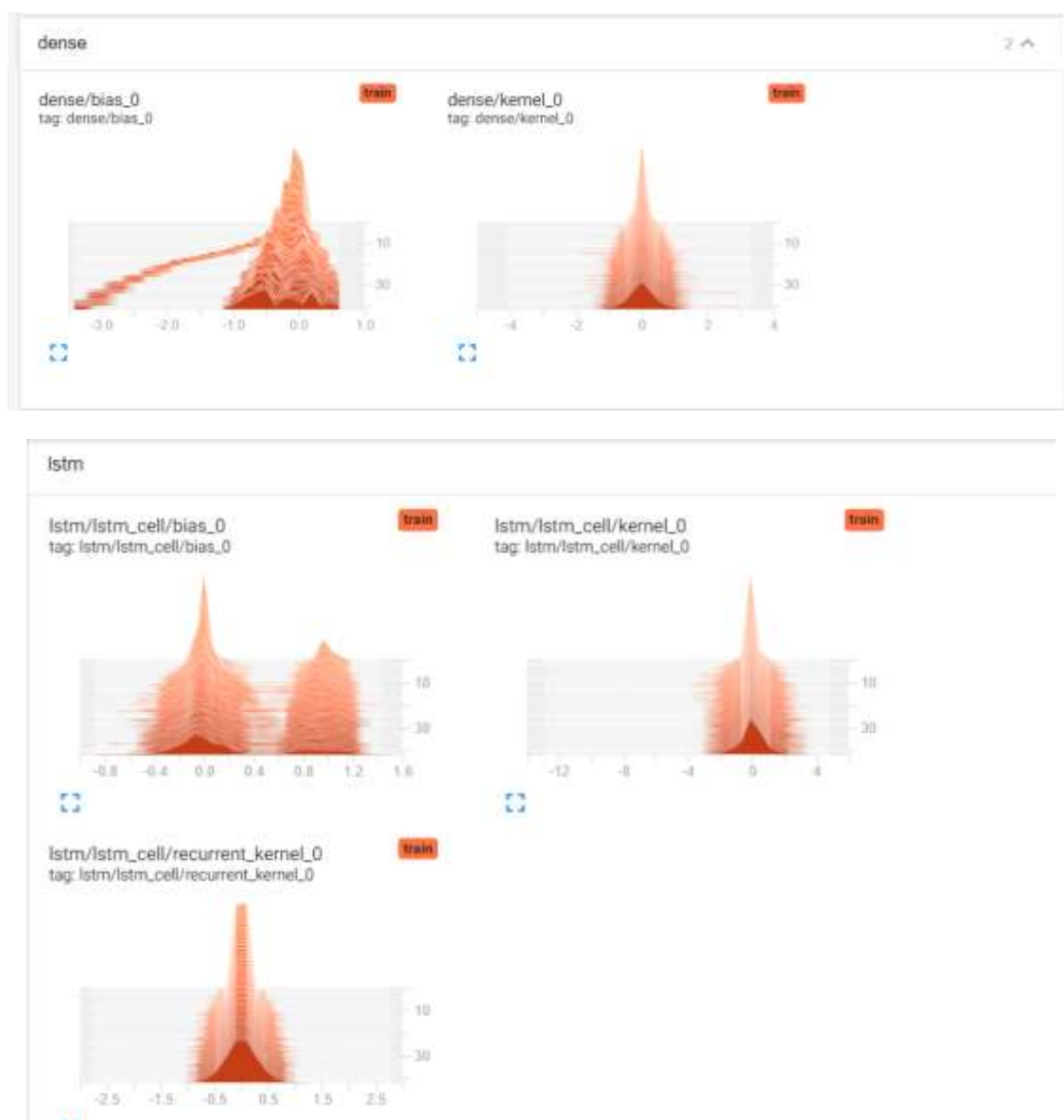


График потерь



Гистограммы активации

Выводы

В ходе выполнения работы была построена рекуррентная нейронная сеть, с помощью которой генерировались символьные последовательности. Полученные последовательности лишь стремились к полноценному тексту.

Также была изучена работа с реализацией собственного CallBack и знакомство с TensorBoard.

ПРИЛОЖЕНИЕ А

1epoch:

Seed:

" hat is the use of a book,' thought alice 'without pictures or
conversations?'

so she was considerin "

Done.

8epoch:

Seed:

" w taller, and the other side will make you
grow shorter.'

'one side of what? the other side of what "

' said the more and the soeen sas oo the whi oo tee thi soiee and the
soiee so the toiee and the soier sas oo the whi oo tee thi woiee the had
tottle to tee the was oo the was oo the was oo the was oo the was oo the was oo
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Done.

15epoch:

Seed:

" the jury-box with the edge of her skirt,
upsetting all the jurymen on to the heads of the crowd bel "

the toiee the had tottle to tee the tab iu the was oo the tooee and the
sar ho the woued the had to the tas oo the cadl, and the was to tee thet she had
to the ta bit to the thet she had tot to tee the tab iu the was oo the tooee
and the sar ho the woued the had to the tas oo the cadl, and the was to tee thet
she had to the ta bit to the thet she had tot to tee the tab iu the was oo the
tooee and the sar ho the woued the had to the tas oo the cadl, and the was to
tee thet she had to the ta bit to the thet she had tot to tee the tab iu the
was oo the tooee and the sar ho the woued the had to the tas oo the cadl, and
the was to tee thet she had to the ta bit to the thet she had tot to tee the
tab iu the was oo the tooee and the sar ho the woued the had to the tas oo the
cadl, and the was to tee thet she had to the ta bit to the thet she had tot to
tee the tab iu the was oo the tooee and the sar ho the woued the had to the tas
oo the cadl, and the was to tee thet she had to t

Done.

22epoch:

Seed:

" e picture.) 'up, lazy
thing!' said the queen, 'and take this young lady to see the mock
turtle, and "

the more to the toie to the tooe to the thit hadd and the whrt oaree an in
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Done.

29epoch:

Seed:

" tears again as she went on, 'i must be mabel after all, and
i shall have to go and live in that poky "

bo anl the toinssent!'

'io whu whu ao all was ' she kadt shi wast on tol on the tool on the
wools,

a ioot areed to be anred to the theet san so the whnte then she was oo the
wood of the woudd then she was to tee th the cank, and when she was aoling to
the thet sar so the wan to the wan oo the wood of the woodd the was oo the
woods, and saed to the coukouse tas oo the was of tiet sar to tee thet sas no
the wond of the woodd the was oo the woodd the was oo the woods, and saed to the
coukouse tas oo the was of tiet sar no the wond of the wood of the wood of the
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Done.

36epoch:

Seed:

" perhaps he can't help it,' she
said to herself; 'his eyes are so very nearly at the top of his head "

to hen ano aeains toee a fonders, and the sai ho the caree ii the caree
in the cale on her seadin thet sae it the harter, and the white rabbit wese
teatee of the table of the table of the war of thete the was to teek the har en
the caree.

'whll io she sabe thing ' said the caterpillar.

'ie toe thin i so het in ' said the manch hare.

'ie conrse the garter hareen,' said the manch hare.

'ied a tareer mf ati,m mn a said to aagine to aedin!' said alice, and she welt on to the whnt samd to the wante on the caree.

'what din tee then the brrcouse soink,' she said to herself, 'and that the mase then s ee a larter of teite of the breaessy war in the semeen ie the whilen in the dirtteneng toin it was toee ifrterf to tee it hat so eer aeaine the had aoeee th the sabde, ''iare toued be an all what d te tel,' said the caterpillar.

'ie toe thin i so het in ' said the manch hare.

'ie conrse the garter hareen,' said the manch hare.

'ied a tareer mf ati,m mn a said to aagine to aedin!' said ali

Done.

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" knuckles. it was opened

by another footman in livery, with a round face, and large eyes like a frog; "

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Done.