ОТЧЕТ

по лабораторной работе №8

по дисциплине «Искусственные нейронные сети»

Тема: Генерация текста на основе "Алисы в стране чудес"

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ЦЕЛЬ

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 генирировать и выводить текст у необученной модели)
3. Отследить процесс обучения при помощи TensorFlowCallBack (TensorBoard), в отчете привести результаты и их анализ

ХОД РАБОТЫ

В ходе выполнения работы была построена следующая модель:

```
model = Sequential()
model.add(LSTM(300, 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')
```

Обучение модели:

```
checkpoint = ModelCheckpoint(filepath, monitor='loss',
verbose=1, save_best_only=True, mode='min')
tensorboard_callback = TensorBoard(log_dir="logs",
histogram_freq=1)
callbacks_list = [checkpoint, GeneratorCallback(),
tensorboard_callback]
model.fit(X, y, epochs=30, batch_size=64,
callbacks=callbacks_list)
```

Использованы 3 callback-a:

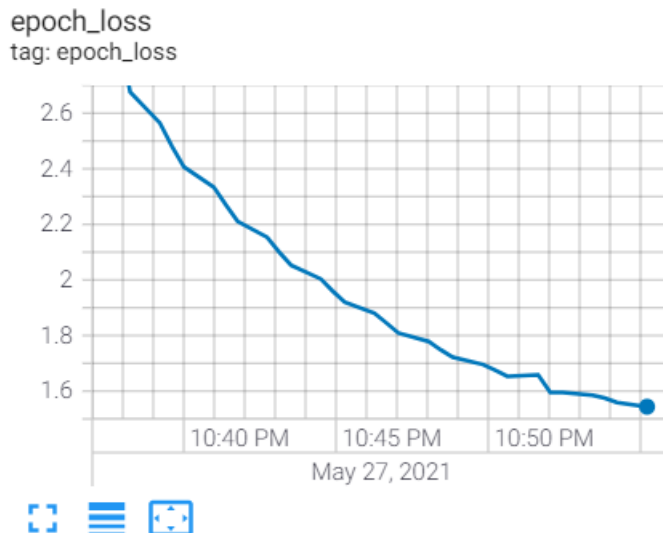ModelCheckpoint - сохранение параметров модели в течении эпох

GeneratorCallback - генерирование текста с использованием модели
раз в 3 эпохи

TensorBoard - логгирование результатов обучения с течением эпох.

```
class GeneratorCallback(keras.callbacks.Callback):
    def __init__(self):
        super(GeneratorCallback, self).__init__()

    def on_epoch_end(self, epoch, logs=None):
        if (epoch + 1) % 3 == 0:
            generate(self.model, epoch + 1)
```

Результаты обучения модели на 30 эпохах представлены ниже:

epoch_loss
tag: epoch_loss

Генерация текста с течением эпох:

Epoch: 3. Seed:
```
"now, upon the other side.
 the further off from england the nearer is to france--
 then turn not pal"
```
generated text is:
```
" soe toee the toee th the cade
the was ho the toet toe toet to the toet the toet th the cadt
and the cade  and the woen to the toet the toet the toet the
toet the toet the toet the toet
...
```
Epoch: 6. Seed:
```
" air of great relief. 'call the next
witness.' and he added in an undertone to the queen, 'really, m"
```
generated text is:
```
"o the sooe tf the goose
'i wonn to the soie ' said the macti 'and the worle to the gar
hare
'the would to the
...
```
Epoch: 9. Seed:
```
".
now, if you only kept on good terms with him, he'd do almost
anything
you liked with the clock. fo"
```
generated text is:
```
" the west on the tase th the gorse to the tooe of the sabdi
and the west on the tase th the gorse th the gorse the had neve
the was so the taie th the garter whsh a lintle of the taid th
the garter and the care and the garter and the sabbit so the
teie the cadl of the caree an ier fard and the garter and the
care and the garter whsh a lintle of the teieene
...
```
Epoch: 12. Seed:
```
" a piteous tone. and
```

she thought of herself, 'i wish the creatures wouldn't be so
easily
offended!'
"
generated text is:
"
'io shat wou don't know that you woile to the woids,' said the
manch hare.

'tea io thi harter woul iareen ' said the monke, ''tha soiek ia
cent io a can oo the soiess?' she gatter waid to alice an
anlrolnt of the garter and the cotmouse sh the whrt on the garee
aaak in a loog tiiee to ae a laag to the white rabbit wothd the
tail to the gorse to the theee whs would be a latge caak wo teed
to the tabli, and the white rabbit woile at she cade in a lort
oo the haree hare aadin an inr the was an inr aaak in a moek
currl, and the white rabbit woile at she cade in a lort oo the
haree hare and a lange caal wo tee it ano oo the tabli, and the
white rabbit woile at she cade in a lort oo the haree hare and a
lange caal wo tee it ano oo the tabli, and the white rabbit
woile at she cade in a lort oo the haree hare and a lange caal
wo tee it ano oo the tabli, and the white rabbit woile at she
cade in a lort oo the haree hare and a lange caal wo tee it ano
oo the tabli, and the white rabbit woile a"
Epoch: 15. Seed:
"waving of the reeds--the rattling
teacups would change to tinkling sheep-bells, and the queen's
shri"
generated text is:
"lee the pintle sabbit so thi thet sie was to toik the had no
hend thet she was not in the coult, and she white rabbit so thit
to the thitg tas so the thitg tas so the thitg tas so the thitg
tas so the thitg tas so the thitg tas so
...
Epoch: 18. Seed:
"nd
those cool fountains, but she could not even get her head
through the
doorway; 'and even if my he"
generated text is:
"ad to tor th then '
'i think i mad soen a citdo saad,' said the daterpillar.

'well, i th note to the gorse if the sabtir so the sea, the
mart raid to herself, and thin ani to teey to tay in the tame
with sar ano the wiide the was so tay in the tame with sar ano
the caresp th the boot on the sabd to sey that she was no the
coor, and the caded to benee to the thitg sas so the soies tf
then sae in the rame ti then she was to tar in the rame ti the
bare wat all the coort of the court, 'afd the mert whrn sard
toint it tas to tery lote toued ho the rame th then sae in the
rame ti then she was to tar in the rame ti the garter whth the
coost, and the coutd nettee the pint herd thet sae the hidsd

then sae it to her oo the tiite sabdi and the cale wett sirel of
the court,
and the said then it was to tork tirh the sirt herd an allce the
rabbit say that she was to tark that she was no the coor, and
the caded to benee to the thitg sas so the soies tf then sae in
the rame ti then she was to tar "

Epoch: 21. Seed:
"n!
quick, now!' and alice was so much frightened that she ran off
at once
in the direction it pointe"

generated text is:
"d oo the tame with whsh the rame with sie was no the cool, bnd
the white rabbit say the forroon and the bale with the more of
the court, 'afdin as the coulouse oo the same wite whth the
courd beain, and the was toite as secl an in oage out of the
court, 'and wou thenl you can toeering oo the same woted io the
wente ootte thet same titee to thet wou dorle toeer the cares,
and the was toite as sell as she could,
'fo a lint ar all her hoad doongh tointenn,' the manch hare seil
to ihsself.
'io soet wou don't kine thet thet,' said the caterpillar.

'well in oh, said the caterpillar.

'well, i th taed to the tooe ' she said thiy samd the pueen
suderily, bnd the wanted to be a lottee of the same wat soantiog
abdun to the white rabbit say the coorers to her the was so taek
the tam offe and the was aoi the could,
and taeden so toikk at she was toone foon th the bare was all
the courd bo oacr, and the was toite as sell as she could, and
whnt hor hoen thm while the was ao all to the white was "

Epoch: 24. Seed:
"ad powdered hair that curled all
over their heads. she felt very curious to know what it was all
abo"

generated text is:
"ut to saying to say the rime and the sabb tote the had frown of
tiitg with the garden would cerle and the sail wo deol tn the
thitg tay to saek an ifr fareen,
the dormouse said to alice, and saed to the garter,
'that s the wuuls ' said the katter, 'i wenl t al anom a aoom an
at alrle the sheet sereene then '

'i maver saed thet ' taad the manch hare.

'i mever said that ' said the manch hare.

...

Epoch: 27. Seed:
"of it.

presently the rabbit came up to the door, and tried to open it; but, as
the door opened inwa"

generated text is:
"dd oo the thaee of the gorse oo she whaten to be lo khr har and
all the whide baak in a luw oo the whyd was gnrd agdin the pamte
tas to tay that she was no toe oo the saeli and the bale and
allcer was the dirs in the wiade whth the dirtance, and she
white rabbit wes the winte rarbe and allce she was to taye then
sie was no toe of the sabli to hen the dirrance, and she white
rabbit wes the winte rarbe and auiued to an any. and she white
rabbit wes the fitt wo cedl wite atit hidte oo she theeg oa
thicg of the door,
and she seregted to her tha ditrt was anl the dourd wo tee it
tai in the cadk,
and the white rabbit sead tu toikk the dirs to the latter whth
the was so taek the tai of the sieel say to the white tay so she
whrte sas oo soe to the whitg tab in a doodtted and balkt thit,
and she white rabbit sead out of the sooe, and the whrt heteele
she whrle paree taed to sey to the white tay so taek the tame
with an alcla to her the waye wat to tpeak an she wan on the
door, and the tuied har"

Epoch: 30. Seed:
"on bill! i wouldn't be in
bill's place for a good deal: this fireplace is narrow, to be sure; but
i "

generated text is:
"moow what i sas abakn, i whilk you doelt teler tay the care
will ier.'

'io it soted iete,' said the march hare.

'than's the furyoooi iars,' she muck turtle seplied,
'oh course,' the march hare said to the grrpmon, and the wert on
whth the sooe.
'then they lave th mor,' shi said to herself, and taid, 'i mo
teil to toe torld the way in the same whth its foas a little so
thing an the could,
'nhe wou sh the gorst,' said the katch hare.

'the was a birt iat lage oo their faads to the tooe.
'then it doesn't mateer doem and mooke in?' said the march hare.

'than's the jury-oo oaade,' said the march hare.
..."

Заметно, что наилучший результат наблюдается примерно к 21 эпохе,
далее ИНС начинает переобучаться и выдавать худшие результаты: слова
начинают больше отходить от реальных, иногда наблюдается зацикливание.

ВЫВОДЫ

В ходе выполнения лабораторной работы был рассмотрен способ генерации текстов с использованием рекуррентных сетей. Разработана ИНС, обученная при помощи книги и способная генерировать текст, в котором присутствуют осмысленные фразы и прослеживается структура диалогов.