**МИНОБРНАУКИ РОССИИ**

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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

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-а:

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):

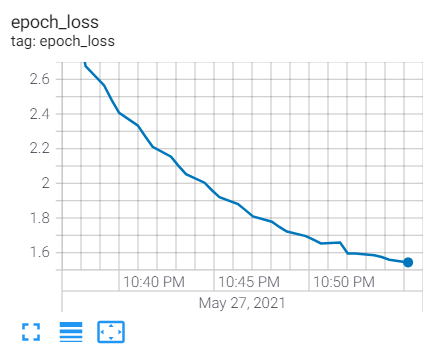
## super(GeneratorCallback, self).\_\_init\_\_()

## 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:



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.