

ADTA 5560.701

Recurrent Neural Networks for Sequence Data

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Assignment 4

1. Overview

1.1 Sequence Data and Recurrent Neural Network (RNN)

Sequence data are ubiquitous in the real world, and sine wave data is one popular example. One of the most significant underlying properties of sequence data is persistence that is closely related to memory. Thanks to its nature of possessing a hidden state representing memory, the recurrent neural network is a good fit for processing sequence data.

1.2 Long Short-Term Neural Network (LSTM)

There are many types of neural networks that can be classified as recurrent neural networks (RNNs). One of the most popular and powerful RNNs is the Long Short-Term Memory (LSTM) neural networks.

1.3 Keras: Another Popular AI Framework for Deep Learning

Keras is an open-source neural network library written in Python.

- It is capable of running on top of TensorFlow, Microsoft Cognitive Toolkit, and other AI framework.
- It is designed to enable fast experimentation with deep neural networks; it focuses on being user-friendly, modular, and extensible.
- It was developed as part of the research effort of project ONEIROS (Open-ended Neuro-Electronic Intelligent Robot Operating System).
- Its primary author and maintainer is François Chollet, a Google engineer. Chollet also is the author of the Xception deep neural network model.

In 2017, Google's TensorFlow team decided to support Keras in TensorFlow's core library. Chollet explained that Keras was conceived to be an interface rather than a standalone machine-learning framework. It offers a higher-level, more intuitive set of abstractions that make it easy to develop deep learning models regardless of the computational backend used.

1.4 TensorFlow

Created by the Google Brain team, TensorFlow is an open-source library for numerical computation and large-scale artificial intelligence (AI) machine learning and deep learning projects. TensorFlow bundles together a broad spectrum of machine learning and deep learning models. It uses Python to provide a convenient front-end API for building applications with the framework while executing those applications in high-performance C++.

2. PART I: Request GCP Free Credit Coupon and Redeem It (20 Points)

It is assumed that the student has a GCP account after completing HW 1.

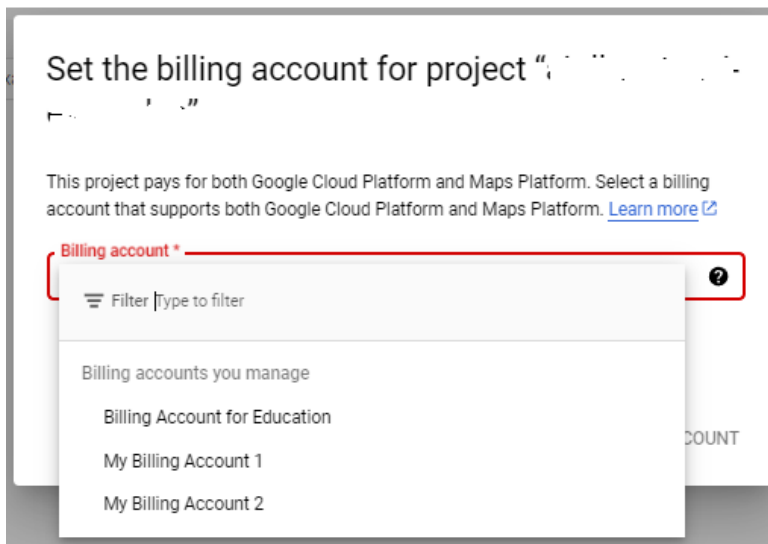
As discussed, from the instructor's request, Google Cloud Platform (GCP) offers a \$50.00 free credit coupon to each student who can redeem and use the credit for classwork.

TO-DO

- Access the link provided in the instructor's announcement email to request a free credit coupon.
- Redeem the free credit coupon following the instructions in GCP's email.
- Capture the screenshot that shows "Billing Account for Education."

SUBMISSION REQUIREMENT PART I:

- Submit the screenshot that shows "Billing Account for Education" like this:



IMPORTANT NOTES:

--> As discussed, by redeeming the coupon, not only does students have the credit to use for GCP services, but they also **helps that GCP will continue providing free credit coupons** to students in the following semesters.

3. PART II: Build, Train, and Test an LSTM with Time Series Data (50 Points)

Follow the steps discussed in the lectures (PDFs and videos), redo the lecture project of building, training, and testing an LSTM neural network, and then perform the forecasting using TensorFlow (backend) and Keras.

SUBMISSION REQUIREMENT #1

--> Submit a Jupyter Notebook document (**in its native format**, **not** PDF) that shows coding all the steps and the results of each step while redoing the project.

IMPORTANT NOTES:

--> The time-series dataset used in the lecture videos was downloaded from the financial website Yahoo! Finance. The student should access the website and download the historical data of the stock as discussed in the videos.

--> After downloading and saving the data file, the student should upload the dataset to the remote server and save it into the same folder where the Jupyter Notebook document is saved.

--> If the student wants to know in detail the steps of downloading historical data of stocks from Yahoo! Finance, he/she can open this link: <https://finance.zacks.com/download-stock-prices-yahoo-6966.html>

4. PART II: Write the Project Report (30 Points)

--> Write a report on the results of the project.

SUBMISSION REQUIREMENT #2:

--> Submit the report in an MS Word document.

5. HOWTO Submit

The student is required to submit the Microsoft Word document and the Jupyter Notebook document by sending them to the instructor (Thuan.Nguyen@unt.edu) as attachments to a UNT email.

The subject of the email must be: “**ADTA 5560: Assignment 4 – Submission.**”

Due date & time: 11:00 PM – Wednesday 11/20/2024