ADTA 5560.701
Recurrent Neural Networks for Sequence Data

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Assignment 3

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 famous example. One of the most significant underlying properties of sequence data is persistence, which is closely related to memory. Thanks to its ability to possess a hidden state that can represent memory, the recurrent neural network is a good fit for processing sequence data.

1.2 Simple Recurrent Neural Network (Simple RNN)

Many types of neural networks can be classified as recurrent neural networks. One of the simplest networks is the simple recurrent neural network (Simple RNN).

1.3 Keras: Another Popular AI Framework for Deep Learning

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

- It can run on top of TensorFlow, Microsoft Cognitive Toolkit, and other AI frameworks.
- It is designed to enable fast experimentation with deep neural networks, focusing 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).
- François Chollet, a Google engineer, is its primary author and maintainer. Chollet is also the author of the XCeption deep neural network model.

In 2017, Google's TensorFlow team supported 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

The Google Brain team created TensorFlow, 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: Build, Train, and Test a Simple RNN on Sine Wave Data (70 Points)

Follow the steps discussed in the lectures (PDFs and videos) and redo the lecture project of building, training, and testing a simple recurrent neural network on sine wave data 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.

3. 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.

4. 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 3 – Submission."

Due date & time: 11:00 PM – Wednesday 11/06/2024