ADTA 5560.701
Recurrent Neural Networks for Sequence Data

Thuan L Nguyen, PhD

Assignment 5

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: RNN: LSTM: Core Concepts: Cell (C) State (50 Points)

SUBMISSION REQUIREMENT #1

--) Discuss the Cell (C) state of the LSTM neural network from two different points of views:

- A flow in a channel
- A snapshot of the cell state

3. PART II: RNN: LSTM: Core Concepts: Gates (50 Points)

SUBMISSION REQUIREMENT #2

--) Discuss why each gate in the LSTM neural network can be viewed as a neural network.

4. HOWTO Submit

The student is required to submit the Microsoft Word 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 5 – Submission."

Due date & time: 11:00 PM – Wednesday 12/04/2024