SUMMARY OF COURSERA COURSE

SEQUENCES, TIME SERIES AND PREDICTIONS

RATINGS: /5

WEEK 1 – SEQUENCES AND PREDICTIONS

UNIT 1: Introduction, a conversation with Andrew Ng

- Focusing on time series data like Stock market data, climate condition
- The “trends”, “seasonality”, “the residual noise”
- We will try to model the sun spot activity

UNIT 2: Time series examples

- Time series data are every where
- Time Series: an ordered sequence of values usually equally spaced over time
- Univariate TS: single value at each time step
- Multivariate TS: multiple values at each time step

UNIT 3: Machine Learning applied to time series

- About anything that has a “time factor” in it can be analysed
- “Forecasting”, “Project to the past (imputation)”, “Detect Anomalies”

UNIT 4: Common patterns in time series

- Common patterns: “Trends”, “Seasonality”, “Combination of trends and seasonality”, “white noise (you can do almost nothing with it)”, “Autocorrelated Time Series: it correlates with a delayed copy of itself (lag)”
- Time series usually have a bit of “trend” + “seasonality” + “autocorrelation” + “noise”
- Stationary and Non-Stationary Time Series

UNIT 5: Introduction to time series

- Synthetic time series data

UNIT 6: Introduction to time series notebook

- Ran and Downloaded “S+P_Week_1_Lesson_2.ipynb”

UNIT 7: Train, validation and test sets

- Techniques for forecasting time series
- Split the time series into training, validation and test periods
- “Fixed Partitioning”, “Roll-Forward Partitioning”
- We will focus on Fixed Partitioning in this course

UNIT 8: Metrics for evaluating performance

- Metrics: “errors”, “mse”, “rmse”, “mae”, “mape”

UNIT 9: Moving average and differencing

- Moving Average is a common and very simple forecasting method
- Its best to use Moving average on the “difference time series” and then add back the series removed
- “simple approaches may work quite while”

UNIT 10: Trailing versus centered windows

- “Trailing and Centered Windows”

UNIT 11: Forecasting

- “For errors lower is better”

UNIT 12: Forecasting notebook

- Ran and downloaded “S+P_Week_1_Lesson_3_Notebook.ipynb”
- Quite confusing will get it eventually

UNIT 13: Quiz

UNIT 14: Week 1 Wrap Up

UNIT 15: Exercise 1 – create and predict synthetic data

WEEK 2 – DEEP NEURAL METWORKS FOR TIME SERIES

UNIT 1: A conversation with Andrew Ng

- Applying NN to the sequences

UNIT 2: Preparing features and labels

- Some machine learning techniques for forecasting on Time series data
- We have divide data into features and labels, we use a “window size” as feature and then use the next value as a label
- “window(5, shift =, drop_remainder =)”

UNIT 3: Preparing features and labels

- Prepare a Time series for ML by windowing the data
- TF likes its data in “Numpy” format
- Shuffling data helps to prevent “sequence bias”

UNIT 4: Preparing features and labels notebook

- Ran and Downloaded “S+P_Week_2_Lesson_1.ipynb”

UNIT 5: Sequence Bias

- Sequence bias is when the order of things can impact the selection of things

UNIT 6: Feeding windowed dataset into NN

- Created a function for windowing our Time series data

UNIT 7: Single Layer NN

- We used a single layer NN with one Dense layer

UNIT 8: Machine Learning on time windows

- X0 is pointing to the value are time, t = 0

UNIT 9: Prediction

- The result was quite good

UNIT 10: More on single layer neural network

- Running and making predictions

UNIT 11: Single Layer NN Notebook

- Ran and Downloaded “S+P_Week_2_Lesson_2.ipynb”

UNIT 12: Deep NN training, tuning and prediction

- “LearningRateScheduler()”, to help get the optimal learning rate with the help of “callbacks”
- In Time series sequence of value can play a vital role

UNIT 13: Deep NN

- Screencast of the notebook for the DNN and callbacks for “LearningRateScheduler”

UNIT 14: Deep NN Notebook

- Ran and Downloaded “S+P_Week_2_Lesson_3.ipynb”

UNIT 15: Quiz

UNIT 16: Week 2 Wrap Up

- Next week we will explore using RNNs for time series data

UNIT 17: Exercise 2 – Predict with a DNN

WEEK 3 – RECURRENT NEURAL NETWORK FOR TIME SERIES

UNIT 1: Week 3 – A conversation with Andrew Ng

- Apply RNNs and LSTM to the time sequence data
- Lawrence loves LSTMs
- "Lambda Layers"???, allow us to write a code and implement it as a layer in the NN

UNIT 2: Conceptual Overview

- RNNs are flexible they can be used to predict different type of sequence data
- Input shape for RNNs is 3-dimensionals (batch size, # time steps, # dims)

UNIT 3: Shape of the inputs to the RNN

- (4, 30, 1): batch size of 4, 30 time steps, 1 (univariate)
- "return_sequence = True", if we want to return a sequence instead of a single value

UNIT 4: Outputting a sequence

UNIT 5: Lambda Layers

- "keras.layers.Lambda(lambda function)"

UNIT 6: Adjusting the learning rate dynamically

- "sequence to sequence" and "sequence to vector" predictions
- "Huber" a loss function that handles outliers well

UNIT 7: More Info on Huber Loss

- https://en.wikipedia.org/wiki/Huber_loss

UNIT 8: RNN

- Screen cast of DNN with "Simple RNN"

UNIT 9: RNN Notebook

- Ran and Downloaded "S+P_Week_3_Lesson_2_RNN.ipynb"

UNIT 10: LSTM

- LSTM: works by adding a "cell state" to a typical RNN which helps to carry context

UNIT 11: Link to the LSTM Lesson

- Deep Specialization video on LSTMs

UNIT 12: Coding LSTMs

- Code for LSTM, an improvement over “SimpleRNN”

UNIT 13: More on LSTM

- Screencast of LSTM code

UNIT 14: LSTM Notebook

- Ran and Downloaded “S+P_Week_3_Lesson_4_LSTM.ipynb”

UNIT 15: Quiz

UNIT 16: Week 3 Wrap Up

- We will try to CNNs in the next week

UNIT 17: Exercise 3 – Mean Absolute Error

WEEK 4 – REAL WORLD TIME SERIES DATA

UNIT 1: Week 4 – A conversation with Andrew Ng

- Hurray it is the final week
- We will work with real world data
- Learn to assembly the pieces you learn (build projects)

UNIT 2: Convolutions

- Combining Convolutions with LSTMs

UNIT 3: Convolutional NN Course

- Reference to Andrew Ng videos on CNNs

UNIT 4: Bi-directional LSTMs

- We expand the dimensions on the “windowed_dataset” helper function
- Experiment with different “batch_sizes” to fine tune model

UNIT 5: More on batch sizing

- Reference to Andrew Ng videos on Mini Batch Gradient Descent

UNIT 6: LSTM

- Screen cast of Notebook

UNIT 7: LSTM Notebook

- Ran and Downloaded “S+P_Week_4_Lesson_1.ipynb”

UNIT 8: Real Data – Sunspots

- Move synthetic data to real world data
- Sunspot data from KAGGLE
- Put data into a List (easy to append on) > then cast to a Numpy array

UNIT 9: Train and tune the model

- Fine tuning the parameters for optimal results

UNIT 10: Prediction

- Your result may vary due to some randomness

UNIT 11: Sunspots

- Screen cast of Notebook

UNIT 12: Sunspots Notebook

- Ran and Downloaded "S+P_Week_4_Lesson_5.ipynb"

UNIT 13: Combining our tools for analysis

- Experimenting with hyper parameters is a great way to learn the ins and outs of Machine Learning

UNIT 14: Quiz

UNIT 15: Exercise 4 – Sunspots

- A github repo of datasets https://github.com/jbrownlee/Datasets

UNIT 16: Wrap Up

- Looking forward to what I will build next

UNIT 17: Congratulations

- Well equipped to dive deeper into time series predictions

UNIT 18: Specialization Wrap Up

- You have taken a big step in a long journey