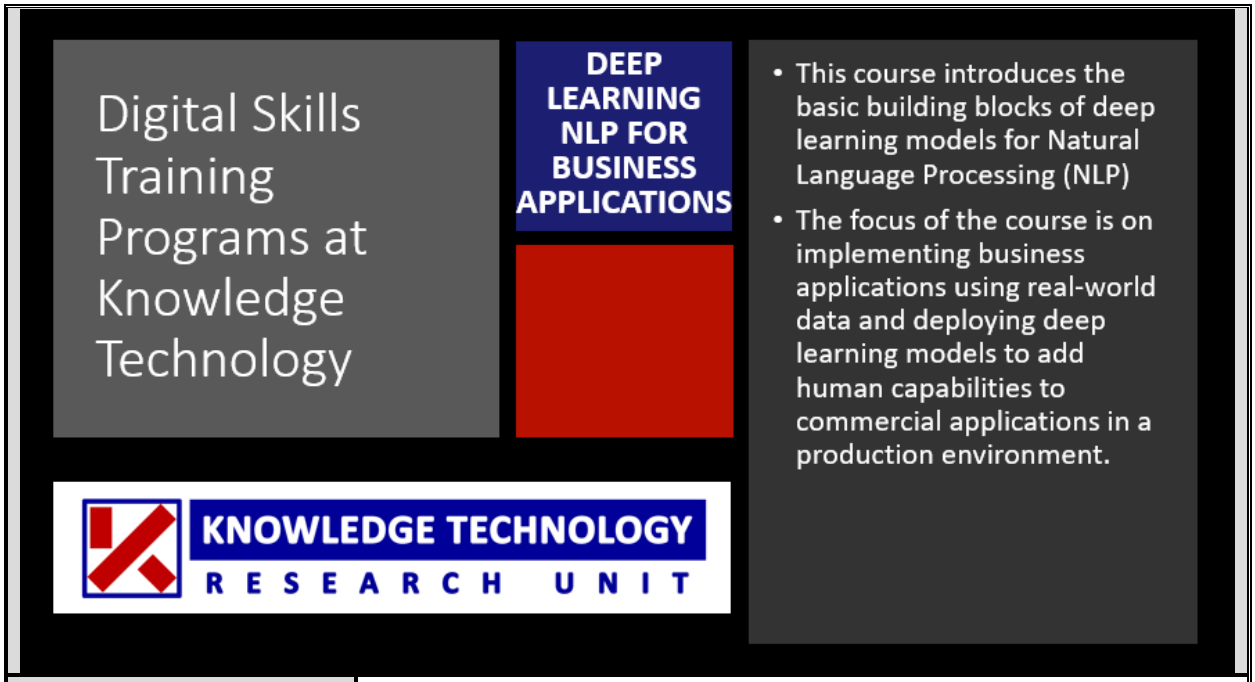

Course Title	Deep Learning NLP for Business Applications
Duration	10 Days
Trainer	Assoc. Prof. Dr. Rayner Alfred
Cost	Email ralfred121@gmail.com or call 013-881-9966 for quotations
Max Participants	25

SYNOPSIS

This course introduces the basic building blocks of deep learning models for Natural Language Processing (NLP) and explores cutting-edge techniques from recent literature. This course will take a problem-based approach, where new models are introduced as solutions to various NLP tasks in business applications. The focus of this course is on providing practical code implementations in Python that can be applied to business use cases to bring human capabilities into business applications.

LEARNING OUTCOMES

The focus of the course is on implementing business applications using real-world data and deploying deep learning models to add human capabilities to commercial applications in a production environment. Participants will

- Learn basic concepts of deep learning to state-of-the-art algorithms and best practices for dealing with natural language.
- Be able to leverage NLP techniques to develop intelligent business applications with rich human-centric interfaces.
- Learn cutting-edge techniques for NLP tasks, such as sentiment detection, conversational systems, language translation, speech-to-text, and much more, using the TensorFlow framework and Python.

JUSTIFICATION TO LEARN DEEP LEARNING NLP FOR BUSINESS APPLICATIONS

Before the advent of deep learning, traditional natural language processing (NLP) approaches had been widely used in tasks such as spam filtering, sentiment classification, and part of speech (POS) tagging. These classic approaches utilized statistical

characteristics of sequences such as word count and co-occurrence, as well as simple linguistic features. However, the main disadvantage of these techniques was that they could not capture complex linguistic characteristics, such as context and intra-word dependencies.

Recent developments in neural networks and deep learning have given us powerful new tools to match human-level performance on NLP tasks and build products that deal with natural language. Deep learning for NLP is centered around the concept of word embeddings or vectors, also known as Word2vec, which encapsulate the meanings of words and phrases as dense vector representations. Word vectors, which can capture semantic information about words better than traditional one-hot representations, allow us to handle the temporal nature of language in an intuitive way when used in combination with a class of neural networks known as recurrent neural networks (RNNs). While RNNs can capture only local word dependencies, recently proposed vector-based operations for attention and alignment over word vector sequences allow neural networks to model global intra-word dependencies, including context. Due to their capability to model the syntax and semantics of language, strong empirical performance, and ability to generalize to new data, neural networks have become the go-to model for building highly sophisticated commercial products, such as search engines, translation services, and dialog systems.

TOPICS LIST

[1] INTRODUCTION TO NATURAL LANGUAGE PROCESSING
[2] TEXT CLASSIFICATION AND POS TAGGING USING NLTK
[3] DEEP LEARNING AND TENSORFLOW
[4] SEMANTIC EMBEDDING USING SHALLOW MODELS
[5] TEXT CLASSIFICATION USING LSTM
[6] SEARCHING AND DEDUPLICATING USING CNNS
[7] NAMED ENTITY RECOGNITION USING CHARACTER LSTM
[8] TEXT GENERATION AND SUMMARIZATION USING GRUS
[9] QUESTION-ANSWERING AND CHATBOTS USING MEMORY NETWORKS
[10] SPEECH RECOGNITION USING DEEP SPEECH
[11] TEXT TO SPEECH USING TACOTRON

COURSE SYLLABUS (7 DAYS)

DAY	TOPICS COVERED	TIME
One	**MODULE 1: INTRODUCTION TO NATURAL LANGUAGE PROCESSING** ➢ This module explores the basic concepts of NLP and the various problems it tries to solve. ➢ We also look at some of the real-world applications to give the participants the feeling of the wide range of applications that leverage NLP.	8am – 5pm
	MODULE 2: TEXT CLASSIFICATION AND POS TAGGING USING NLTK ➢ This module introduces the popular NLTK Python library. We will be using NLTK to describe basic NLP tasks, such as tokenizing, stemming, tagging, and classic text classification. ➢ We also explore POS tagging with NLTK. We provide the participants with the tools and techniques necessary to prepare data for input into deep learning models.	
Two	**MODULE 3: DEEP LEARNING AND TENSORFLOW**	8am – 5pm

	➢ This module introduces the basic concepts of deep learning. It will also help the participants to set up the environment and tools such as TensorFlow. ➢ At the end of the module, participants will get an understanding of basic deep learning concepts, such as CNN, RNN, LSTM, attention-based models, and problems in NLP.	
Three	**MODULE 4: SEMANTIC EMBEDDING USING SHALLOW MODELS** ➢ This module explores how to identify semantic relationships between words in a document, and in the process, we obtain a vector representation for words in a corpus. ➢ The module describes developing word embedding models, such as CBOW using neural networks. It also describes techniques for developing neural network models to obtain document vectors. ➢ At the end of this module, participants will get familiar with training embeddings for word, sentence, and document; and visualize simple networks.	8am – 5pm
Four	**MODULE 5: TEXT CLASSIFICATION USING LSTM** ➢ This module discusses various approaches for classifying text, a specific application of which is to classify sentiments of words or phrases in a document. ➢ The module introduces the problem of text classification. Following this, this module describes techniques for developing deep learning models using CNNs and LSTMs. ➢ The module also explains transfer learning for text classification using pretrained word embeddings. At the end, participants will get familiar with implementing deep learning models for sentiment classification, spam detection, and using pretrained word embeddings for his/her classification task.	8am – 5pm
Five	**MODULE 6: SEARCHING AND DEDUPLICATING USING CNNS** ➢ This module covers the problems of searching, matching and deduplicating documents and approaches used in solving them. ➢ This module describes developing deep learning models for searching text in a corpus. ➢ At the end of this module, participants will learn to implement a CNN-based deep learning model for searching and deduplicating text.	8am – 5pm
Six	**MODULE 7: NAMED ENTITY RECOGNITION USING CHARACTER LSTM** ➢ This module describes methods and approaches to perform Named Entity Recognition (NER), a sub-task of information extraction, to locate and classify entities in text of a document. ➢ The module introduces the problem of NER and the	8am – 5pm

	applications where it can be used. ➢ The module explains the implementation of a deep learning model using character-based LSTM for identifying named entities trained using labeled datasets.	
Seven	**MODULE 8: TEXT GENERATION AND SUMMARIZATION USING GRUS** ➢ This module covers the methods used for the task of generating text, an extension of which can be used to create summaries from text data. ➢ This module then explains the implementation of a deep learning model for generating text. This is followed by a description of implementing GRU-based deep learning models to summarize text. ➢ At the end of this module, participants will learn the techniques of implementing deep learning models for text generation and summarization.	8am – 5pm
Eight	**MODULE 9: QUESTION-ANSWERING AND CHATBOTS USING MEMORY NETWORKS** ➢ This module describes how to train a deep learning model to answer questions and extend it to build a chatbot. ➢ The module introduces the problem of question answering and the approaches used in building an answering engine using deep learning models. ➢ The module then describes how to leverage a question-answering engine to build a chatbot capable of answering questions like a conversation. ➢ At the end of this module, participants will be able to implement an interactive chatbot.	8am – 5pm
Nine	**MODULE 10: SPEECH RECOGNITION USING DEEP SPEECH** ➢ This module describes the problem of converting voice to text, as a beginning of a conversational interface. ➢ The module begins with feature extraction from speech data. This is followed by a brief introduction of the deep speech architecture. ➢ The module then explains the detailed implementation of the Deep Speech architecture to transcribe speech to text. ➢ At the end of this module, participants will be equipped with the knowledge to implement a speech-to-text deep learning model.	8am – 5pm
Ten	**MODULE 11: TEXT TO SPEECH USING TACOTRON** ➢ This module describes the problem of converting text to speech. The module describes the implementation of the Tacotron model to convert text to voice. ➢ At the end, participants will get familiar with the implementation of a text-to-speech model based on the	8am – 5pm

	Tacotron architecture.	

TRAINER'S BIOGRAPHIES

RAYNER ALFRED

ASSOCIATE PROFESSOR OF COMPUTER SCIENCE

Certified IBM DB2 Academic Associate, Certified Tester Foundation Level (CTFL)

AREAS OF SPECILIZATION: Advanced Machine Intelligence, Data Analytics, Data Mining, Information Retrieval, Artificial Intelligence, Machine Learning, Knowledge Discovery

ADDRESS: Knowledge Technology Research Group, Faculty of Computing and Informatics, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah.

CONTACT: Mobile: 6013-881-9966, eMail: ralfred@ums.edu.my

Rayner Alfred is an Associate Professor of Computer Science at the Faculty of Computing and Informatics, Universiti Malaysia Sabah in Malaysia that focuses on Data Science and Software Engineering programmes. He leads and defines projects around knowledge discovery, information retrieval and machine learning that focuses on building smarter mechanism that enables knowledge discovery in structured and unstructured data. His work addresses the challenges related to big data problem: How can we create and apply smarter collaborative knowledge discovery and machine learning technologies that bridge the structured and unstructured data mining and cope with the big data problem.

Rayner completed his PhD in 2008 looking at intelligent techniques using machine learning to model and optimize the dynamic and distributed processes of knowledge discovery for structured and unstructured data. He holds a PhD degree in Computer Science from York University (United Kingdom), a master's degree in computer science from Western Michigan University, Kalamazoo (USA) and a Computer Science degree from Polytechnic University of Brooklyn, New York (USA) where he was the recipient of the *Myron M. Rosenthal Academic Achievement Award* for the outstanding academic achievement in Computer Science in 1994. He has authored and co-authored more than 100 journals/book chapters and conference papers, editorials, and served on the program and organizing committees of numerous national and international conferences and workshops.

Rayner is currently a member of IEEE, a Certified Software Tester (CTFL) from the International Software Testing Qualifications Board (*ISTQB*), and a certified IBM DB2 Academic Associate (IBM DB2 AA). He leads the Advanced Machine Intelligence (AMI) research group in UMS and he has led several projects related to knowledge discovery and machine learning on Big Data. Rayner is also the recipient of the Research Fellow at Japan Advanced Institute of Science and Technology (JAIST), Japan. He is also the recipient of multiple GOLD awards at national and international research exhibitions in Data Mining and Machine Learning based solutions (Face Recognition and Knowledge Discovery), that include International Trade Fair Ideas in Nuremberg, Germany (iNEA2018) International Invention Innovation Competition in Toronto, Canada (iCAN 2018), Seoul International Invention Exhibition in Seoul, Korea (SIIF 2010). He has secured RM6,931.433.00 worth of project grants. Some of his project researches include biometric authentication using face recognition, building security based on plate number recognition using deep learning, sentiment analysis for Malay and English in measuring public opinion, news-news correlation trending, machine learning algorithm-based solution for predicting diseases in health care, smart monitoring using an ensemble based face recognition system and smart information management and retrieval to name a few. Some of the completed projects include Semantic Multi-Agent For Knowledge Sharing, developing an Evolutionary-Based Ensemble Classifier Framework for Learning Big Relational Data, developing a genetic-based hierarchical agglomerative clustering technique for parallel clustering of bilingual corpora based on reduced terms, enhancing document Clustering By Integrating Semantic Background Knowledge and Syntactic

Features Into the BOW Representation and the fundamental Study on an Evolutionary Based Features Construction Methods for Data Summarization Approach to Predict Survival Factors of Coral Reefs in Malaysia, to name a few and also infrared face recognition based on ensemble approach.