

Course Outline

Course Code : DBA4714
Course Title : Deep Learning & Generative AI in Business
Class Date : From 15/1/2024 To 19/4/2024
Semester : Semester 2, Academic Year 2023/2024
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Overview

This course introduces deep learning and generative AI for application to business analytics. It preferably requires basic knowledge of Python programming and elementary statistics, and places a strong emphasis on applying AI models on real world datasets to tackle practical business problems. Deep learning is an interdisciplinary field that combines domain knowledge of the business problem, effective and creative programming skills, as well as rigour in mathematics and statistics. As generative AI models becomes larger, more powerful and more widely available, there is a need for humans to understand its inner workings, apply it effectively and safely, and be aware of its shortcomings. In this course, the foundational knowledge of deep learning models is taught. We then focus on Large Language Models and their applications, such as ChatGPT, to tackle various business problems. After having acquired the technical and application knowledge, we discuss application issues of AI models, such as ethics and limitations. The main topics are:

- Review on Python programming and relevant Python packages
- Review on linear and logistic regression models
- Introducing the deep learning revolution and deep learning models
- Understanding the types of neural networks and their compositions
- Understanding training and validation of neural networks
- Introducing Large Language Models such as ChatGPT, Google Bart and Facebook Llama
- Text generation by Large Language Models
- Creating effective prompts to extract informative results from Large Language Models
- Understanding ethical issues and limitations of AI
- Practical application of Large Language Models on real world datasets to derive business insights
- The application focuses on assisted data analysis with synthesis of the supporting Python code, and synthesis of text that presents the business data analysis and reports the project. Other project topics may also be considered subjected to the instructor's approval.
- Reviewing, correcting and improving the results from Large Language Models, and then concluding with valuable business conclusions and recommendations

Course Objectives

Through this course, students will sharpen their skills in the following ways:

1. Understand neural networks
 1. Types and compositions of neural networks
 2. Training and validation of neural networks
2. Apply statistical and optimization concepts to neural networks
3. Understand text generation in Large Language Models
4. Understand prompt components and apply prompt engineering to interact with Large Language Models effectively
5. Understand the ethical issues, limitations, risks and misuses of AI models
6. Exploit generative AI models and work collaboratively with them
 1. Brainstorm ideas and formulate business problems from the data with the assistance of Large Language Models
 2. Advance from basic Python programming to reviewing and improving Python code outputs from Large Language Models such as ChatGPT, Google Bart or Facebook Llama. This

- includes using Large Language Models to read datasets and perform data analysis with synthesis of the supporting Python code.
3. Review and run the synthesized Python code to verify the processing of data and creation of data visualizations
 4. Synthesize text that presents the business data analysis and reports the project
 5. Review, correct and improve the synthesized Python code and text
7. Expand their business analytics toolkit with generative AI: After completing this course, students are expected to have the skill to apply Large Language Models on real world datasets to tackle business problems and derive business insights. They then review, correct and improve the results, and conclude with valuable business conclusions and recommendations.

Assessments

Class Participation (25%)

- Participation in seminars

Assignments (25%; 10% assignment 1 + 15% assignment 2)

- Qualitative and quantitative questions
- To be done in Jupyter Notebook (includes text responses and Python coding)

Group Project (50%; 15% individual presentation + 35% group report)

- Practical application of Large Language Models (ChatGPT, Google Bart or Facebook Llama) on a real world dataset to tackle a business problem and derive business insights, via
 - Assisted business data analysis with synthesis of the supporting Python code
 - Assisted text synthesis that presents the business data analysis and reports the project
- Reviewing the synthesized Python code and running the synthesized code in Jupyter Notebook to verify the processing of data and creation of data visualizations
- Reviewing, correcting and improving the synthesized Python code and text, and then concluding with valuable business conclusions and recommendations

Schedule and Outline

Week	Date	Topics
Week 1	Wed 17 Jan	Course Overview Review on Python Programming, Jupyter Notebook and the Python Packages Pandas, NumPy and Matplotlib
Week 2	Wed 24 Jan	Introducing Deep Learning
Week 3	Wed 31 Jan	Types of Neural Networks
Week 4	Wed 7 Feb	Compositions of Neural Networks
Week 5	Wed 14 Feb	Review on Linear Regression and Logistic Regression as Predictive Models
Week 6	Wed 21 Feb	Training of Neural Networks
Recess	-	No Seminar (Recess Week)
Week 7	Wed 6 Mar	Validation of Neural Networks Large Language Models
Week 8	Wed 13 Mar	Decoding Methods for Text Generation
Week 9	Wed 20 Mar	Prompt Engineering

		Ethical Issues and Limitations of AI
Week 10	Wed 27 Mar	Risks and Misuses of AI Project Presentations
Week 11	Wed 3 Apr	Project Presentations
Week 12	Wed 10 Apr	No Seminar (Public Holiday)
Week 13	Wed 17 Apr	Project Presentations

Software:

The Anaconda software provides the Jupyter Notebook together with some other data science tools.

Anaconda: <https://www.anaconda.com/products/distribution#Downloads>

General Guide & Reading

OpenAI and ChatGPT:

- <https://openai.com>
- <https://openai.com/blog>

Google Bard:

- <https://bard.google.com>

Facebook Llama:

- <https://www.llama2.ai/>

Basic Python programming:

- Python data science handbook, Jake VanderPlas

Machine Learning:

- An Introduction to Statistical Learning, Gareth James et al.
- Pattern Recognition and Machine Learning, Christopher M. Bishop

Academic Honesty & Plagiarism

Academic integrity and honesty is essential for the pursuit and acquisition of knowledge. The University and School expect every student to uphold academic integrity & honesty at all times. Academic dishonesty is any misrepresentation with the intent to deceive, or failure to acknowledge the source, or falsification of information, or inaccuracy of statements, or cheating at examinations/tests, or inappropriate use of resources.

Plagiarism is 'the practice of taking someone else's work or ideas and passing them off as one's own' (The New Oxford Dictionary of English). The University and School will not condone plagiarism. Students should adopt this rule - You have the obligation to make clear to the assessor which is your own work, and which is the work of others. Otherwise, your assessor is entitled to assume that everything being presented for assessment is being presented as entirely your own work. This is a minimum standard. In case of any doubts, you should consult your instructor.

Additional guidance is available at:

- [Administrative Policies](#)
- <http://www.nus.edu.sg/registrar/administrative-policies-procedures/acceptance-record#NUSCodeofStudentConduct>
- <http://nus.edu.sg/osa/resources/code-of-student-conduct>