Course Overview

Course Code : DBA4714
Course Title : Deep Learning and Generative AI in Business
Class Date : From 12/1/2026 to 9/5/2026
Semester : Semester 2, Academic Year AY2025/2026
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Overview

This course introduces deep learning and generative AI for application to business analytics. It places a strong emphasis on applying AI models on real world datasets to tackle practical business problems, and preferably requires knowledge of elementary statistics and basic Python programming. It is not required to have advanced Python programming or advanced statistical knowledge.

Deep learning is an interdisciplinary field that combines domain knowledge of the business problem, 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 the application issues of AI models, such as ethics and limitations. The main topics are:

- Review on relevant Python packages and regression models
- The deep learning revolution and deep learning models
- Types of neural networks and their compositions
- Training and validation of neural networks
- Introducing Large Language Models such as ChatGPT, Google Gemini, Microsoft Copilot and Facebook Llama
- Text generation by Large Language Models
- Creating effective prompts to extract informative results from Large Language Models
- Ethical issues and limitations of AI
- Practical application of Large Language Models on real world datasets to derive business insights
- Reviewing, assessing and improving the results from Large Language Models

Course Objectives

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

1. Understand the architectures of artificial neural networks
2. Apply statistical and optimization concepts to neural networks
3. Apply text generation techniques to Large Language Models
4. Understand prompt components and apply prompt engineering to effectively interact with Large Language Models
5. Understand the ethical issues, limitations, risks and misuses of AI models
6. Benefit from using generative AI models and work collaboratively with them:

i. Brainstorm ideas and formulate business problems from the data with the assistance of Large Language Models
ii. Progress from being a basic Python programmer to being competent in reviewing and improving Python code outputs from Large Language Models
iii. Progress from being an individual analyst to being competent in assessing and value-adding to data analytics outputs from Large Language Models
iv. Verify the processing of data and creation of data visualizations by running Python code outputs from Large Language Models
v. Use Large Language Models to synthesize text that presents the business case, the data analysis and the project report

7. Expand analytics toolkit with generative AI: Acquire the skill of applying Large Language Models on real world datasets to tackle business problems and derive business insights. They then review, assess and improve the results, and finally make valuable business conclusions and recommendations.

Assessment

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 basic Python coding)

Group Project (50%: 15% individual presentation + 35% group report)
- Practical application of Large Language Models (ChatGPT, Google Gemini, Microsoft Copilot 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 case, data analysis and project report
- Reviewing the synthesized Python code and running the synthesized code in Jupyter Notebook to verify the processing of data and creation of data visualizations
- Assessing and improving the synthesized Python code and text, and then making valuable business conclusions and recommendations

Schedule and Outline

Week	Date	Topics
1	14/1/26	Course Overview Review on Jupyter Notebook and Python Packages Pandas, NumPy and Matplotlib
2	21/1/26	Introducing Deep Learning
3	28/1/26	Types of Neural Networks
4	4/2/26	Composition of Neural Networks (5/2/26 Assignment 1 release)
5	11/2/26	(10/2/26 Assignment 1 deadline) Review on Linear Regression and Logistic Regression as Predictive Models (20/2/26 Project group and name deadline)
6	-	Public Holiday (No Seminar)
-	-	Recess Week (No Seminar)
7	4/3/26	Training of Neural Networks

		Regularization (5/3/26 Assignment 2 release)
8	11/3/26	(10/3/26 Assignment 2 deadline) Validation of Neural Networks Large Language Models
9	18/3/26	Text Generation Prompt Engineering
10	25/3/26	Prompt Engineering cont'd Prompt Engineering Techniques
11	1/4/26	Ethical Issues and Limitations of AI Project Presentations
12	8/4/26	Project Presentations
13	15/4/26	Project Presentations (17/4/26 Project submission deadline)

Jupyter Notebook Software

The free Anaconda software provides the Jupyter Notebook together with some other data science tools. It can be downloaded at https://www.anaconda.com/products/distribution#Downloads

Large Language Models

OpenAI and ChatGPT
- https://openai.com
- https://openai.com/blog

Google Gemini
- https://gemini.google.com
- https://www.gemini.com/blog

Microsoft Copilot
- https://copilot.microsoft.com
- https://www.microsoft.com/en-us/microsoft-copilot/blog

Facebook Llama
- https://www.llama2.ai
- https://ai.meta.com/blog

Reference Books and Resources

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

Basic Python programming:
- Python data science handbook, Jake VanderPlas

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