Title (Units): **COMP4135 Personalized AI and Recommender Systems (3,2,1)**

Course Aims: In an era defined by information overload, personalized AI and recommender systems are essential for delivering tailored content and driving decision-making. This course explores the core concepts and advanced methodologies of recommendation, from collaborative filtering to modern AI-driven approaches like deep learning and generative models. Students will examine evaluation frameworks, user experience design, and the ethical implications of personalization across real-world domains such as e-commerce, economic activities, social media, and streaming platforms.

Prerequisite: COMP3057 Introduction to AI and ML OR
COMP3117 Applied Artificial Intelligence

Course Intended Learning Outcomes (CILOs):
Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	Knowledge
1	Describe the basic concepts behind personalized AI and recommender systems
2	Explain a variety of approaches for building recommender systems
3	Describe system evaluation methods from both algorithmic and users' perspectives
4	Describe applications of recommender systems in various domains
	Professional Skill
5	Reproduce recommender algorithms using an open source toolkit
6	Conduct experimental evaluations on implemented algorithms

Calendar Description: The topics of this course mainly include 1) basic concepts such as user profile and preference prediction; 2) a variety of typical recommendation approaches including collaborative filtering, content-based filtering, matrix factorization, deep-learning-based methods, and generative models; 3) system evaluation design and metrics; 4) popular applications across real-world domains such as e-commerce, social media, and streaming platforms.

Teaching and Learning Activities (TLAs):

CILOs	Type of TLA
1 - 4	Students will learn major concepts of and techniques for building and evaluating recommender systems.
5 - 6	Students will gain practical experiences via laboratory sessions, individual assignments, and group projects.

Assessment:

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Continuous Assignments	50%	2-6	Continuous assignments are designed to measure how well students have learned the fundamentals of recommender system implementation and evaluation. Lab exercises, individual assignments, group projects, and in-class quizzes are designed to evaluate students' knowledge and skills.
2	Examination	50%	1 - 4	Final examination questions are designed to identify how far students have achieved the intended learning outcomes. Questions will primarily assess students' knowledge of recommender systems.

Assessment Rubrics:

	• Achieve the seven CILOs, demonstrating a mastery of fundamentals of recommender system implementation and evaluation
Excellent (A)	• Have a thorough understanding of concepts and technologies involved, and be able to explain and highlight the key points of these concepts and technologies • Able to reproduce recommender algorithms and conduct experiments
	• Achieve the seven CILOs, demonstrating a good understanding of fundamentals of recommender system implementation and evaluation
Good (B)	• Have a good understanding of concepts and technologies involved, and be able to explain and highlight the key points of these concepts and technologies • Able to reproduce recommender algorithms and conduct experiments for familiar cases
	• Achieve most of CILOs, demonstrating a basic level of understanding of fundamentals of recommender system implementation and evaluation
Satisfactory (C)	• Have a basic understanding of concepts and technologies involved • Able to reproduce recommender algorithms and conduct experiments for simple cases
	• Achieve less than three of CILOs, having little understanding of fundamentals of recommender system implementation and evaluation
Fail (F)	• Have little understanding of concepts and technologies involved, and unable to explain and highlight the key points of these concepts and technologies • Unable to reproduce recommender algorithms and conduct experiments for simple cases

Course Content and CILOs Mapping:

Content		**CILO No.**
I	Basic concepts of personalized AI and recommender systems	1
II	Recommendation algorithms	2,5
III	Algorithm evaluation and metrics	3,6
IV	Industrial pipeline	4,6
V	Applications	4

References:

• Lantao Hu, Yueting Li, Guangfan Cui, and Kexin Yi. Industrial Recommender System: Principles, Technologies and Enterprise Applications. Springer Nature, 2024.
• Francesco Ricci, Lior Rokach, and Bracha Shapira, eds. Recommender Systems Handbook, 3rd edition. Spring US, 2022.
• Dietmar Jannach, Markus Zanker, Alexander Felfernig, and Gerhard Friedrich. Recommender Systems: An Introduction (1st ed.), Cambridge University Press, 2010.
• Michael D. Ekstrand, John T. Riedl, and Joseph A. Konstan. Collaborative Filtering Recommender Systems, Now Publishers Inc, 2011.
• Charu C. Aggarwal, Recommender Systems: The Textbook. Springer Cham, 2016.

Course Content:

Topic

I. Basic concepts of personalized AI and recommender systems
   A. User profile and preference elicitation
   B. Non-personalized vs. Personalized systems Taxonomy of recommender systems

II. Recommendation algorithms
   A. Collaborative filtering
   B. Content-based filtering
   C. Deep-learning-based methods
   D. Sequential recommendation
   E. Generative models and others

III. Algorithm evaluation and metrics

A. Experiment design
B. Prediction accuracy metrics
C. Rank-aware top-N metrics
D. User-centric evaluation methods

IV. Industrial pipeline
A. Industrial recommender system architecture
B. Industrial pipeline and strategies

V. Applications
A. E-commerce websites
B. Social media
C. Streaming platforms and others