Form AR 140

The Hong Kong Polytechnic University

Subject Description Form

Subject Code	CMS6004
Subject Title	Research Methods and Ethics for AI
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject aims to equip doctoral students with advanced knowledge and skills in research methodologies and ethical frameworks specifically tailored to artificial intelligence (AI). Students will develop a deep understanding of the philosophical foundations, methodological approaches, and ethical challenges unique to AI research. The subject will foster critical thinking, responsible research practices, and the ability to address complex ethical dilemmas arising from the development and deployment of AI systems in society.
Intended Learning Outcomes	Upon completion of this subject, students will be able to: a. Demonstrate a comprehensive understanding of research philosophies and methodologies relevant to AI. b. Formulate and critically evaluate research questions, hypotheses, and objectives, and select appropriate methods for AI research projects. c. Identify, analyse, and address ethical issues in AI research, including data privacy, algorithmic bias, transparency, accountability, and societal impact. d. Apply relevant codes of conduct, regulatory frameworks, and professional standards to AI research and development. e. Communicate research findings and ethical considerations effectively through academic writing and presentations. f. Reflect on the broader social, cultural, and philosophical implications of AI technologies and their integration into society.
Subject Synopsis/ Indicative Syllabus	**Research Philosophy, Design, and Methodologies for AI** • Overview of research paradigms • Formulating research questions and hypotheses in AI • The role of theory and hypothesis in AI research • Qualitative, quantitative, and mixed methods approaches • Experimental design, data collection, and sampling in AI research • System modelling, simulation, and computational experiments • Literature review and synthesis in AI **Data Ethics and Responsible AI** • Data privacy, security, and informed consent in AI research • Algorithmic bias, fairness, and transparency • Accountability and explainability in AI systems

- Ethical challenges in the use of large language models and generative AI

Codes of Conduct, Regulatory Frameworks, and Professional Standards

- International and local regulations governing AI research (e.g., GDPR, IEEE, ACM)
- Professional codes of ethics for AI practitioners and researchers
- Procedures for obtaining ethical approval for AI research projects

Societal Implications of AI

- AI and social justice: impacts on employment, inequality, and discrimination
- AI in decision-making: law, healthcare, education, and public policy
- Surveillance, autonomy, and human rights in the age of AI

Academic Writing, Communication, and Presentation

- Effective communication of research findings and ethical considerations. Writing research proposals, papers, presentation, and theses in AI

Teaching/Learning Methodology

This subject will be delivered through a combination of interactive seminars, lectures, case studies, and group discussions. Students will engage in critical analysis of published research, participate in hands-on exercises involving AI research design and ethical evaluation, and collaborate on group projects addressing real-world AI challenges. Emphasis will be placed on connecting theoretical concepts with practical applications and students' own research interests.

Active participation is encouraged, with opportunities for peer feedback and consultation with the instructor throughout the course. Guidance will be provided in academic writing and presentation skills, with formative feedback offered on research proposals and ethical analyses.

Assessment Methods in Alignment with Intended Learning Outcomes
(Note 4)

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
		a	b	c	d	e	f
1. Seminar Participation and Discussion	40%	√		√		√	√
2. Case Study Analysis	20%			√	√	√	
3. Research proposal / Mini-project	40%	√	√				√
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

<u>Seminar Participation and Discussion</u>
Understanding of research philosophies, methodologies, and ethical issues; ability to reflect on societal implications of AI.

<table>
<tr><td></td><td colspan="2">Case Study Analysis
Ability to identify, analyse, and address ethical issues in AI research; application of codes of conduct and regulatory frameworks; effective communication of findings.

Research proposal / Mini-project
Formulation and critical evaluation of research questions, hypotheses, and methods; collaborative problem-solving and integration of research philosophies.</td></tr>
<tr><td rowspan="7">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Seminars / Lectures</td><td>39 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and paper reviews</td><td>20 Hrs.</td></tr>
<tr><td>▪ Case Studies</td><td>30 Hrs.</td></tr>
<tr><td>▪ Research proposal preparation and presentation</td><td>46 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>135 Hrs.</td></tr>
<tr><td>Reading List and References</td><td colspan="2">
Russell, S., & Norvig, P. (2021). Artificial Intelligence: A Modern Approach (4th ed.). Pearson.
Creswell, J. W., & Creswell, J. D. (2018). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.). Sage.
Dignum, V. (2019). Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way. Springer.
Flick, U. (2022). An Introduction to Qualitative Research (7th ed.). Sage.
Jobin, A., Ienca, M., & Vayena, E. (2019). The global landscape of AI ethics guidelines. Nature Machine Intelligence, 1, 389–399.
European Commission. (2021). Ethics Guidelines for Trustworthy AI.
IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems. (2019). Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems (First Edition).
ACM Code of Ethics and Professional Conduct
General Data Protection Regulation (GDPR)
UNESCO. (2021). Recommendation on the Ethics of Artificial Intelligence.
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