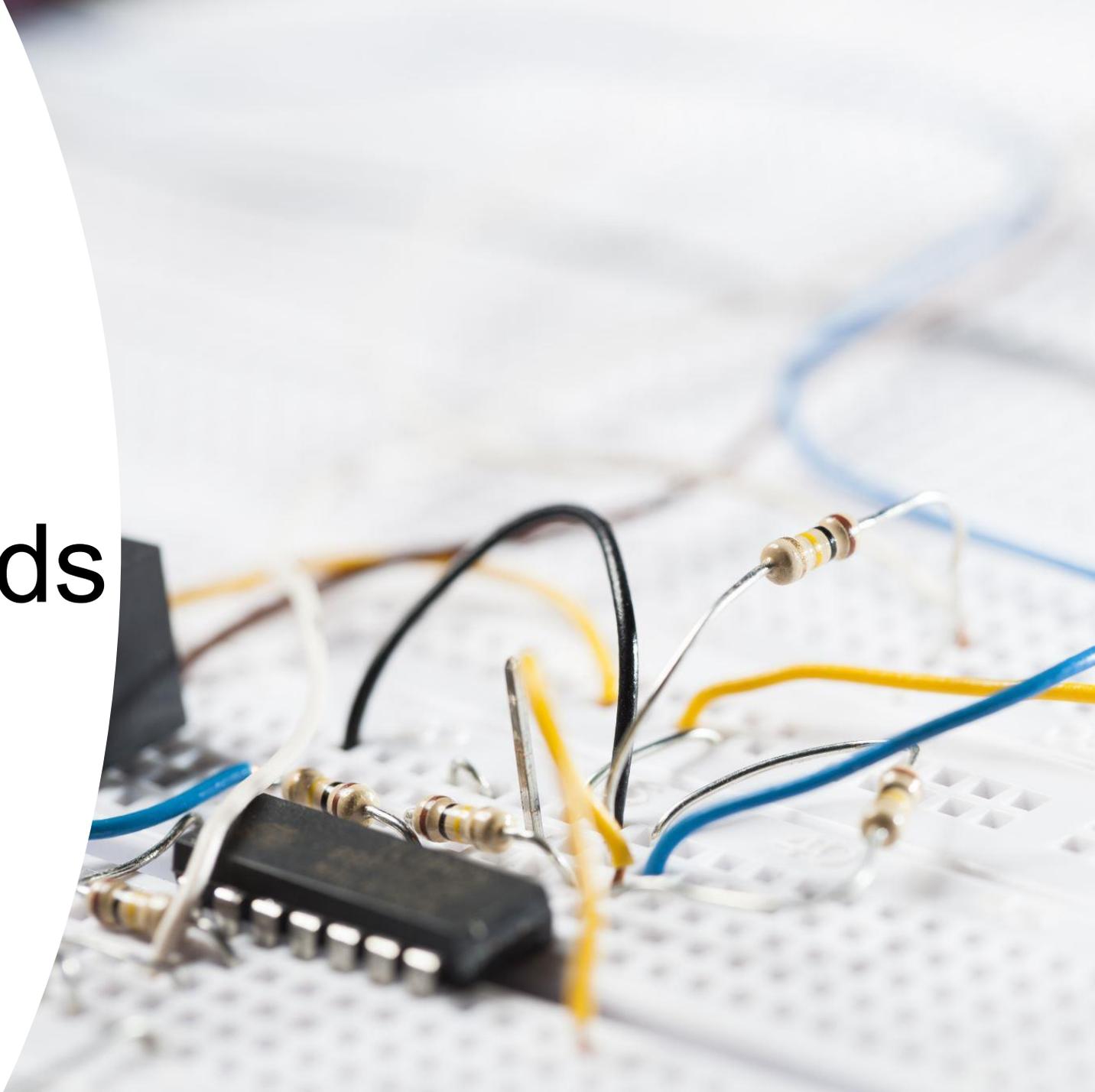


Technology Research Methods

Dr. Mingshan Jia

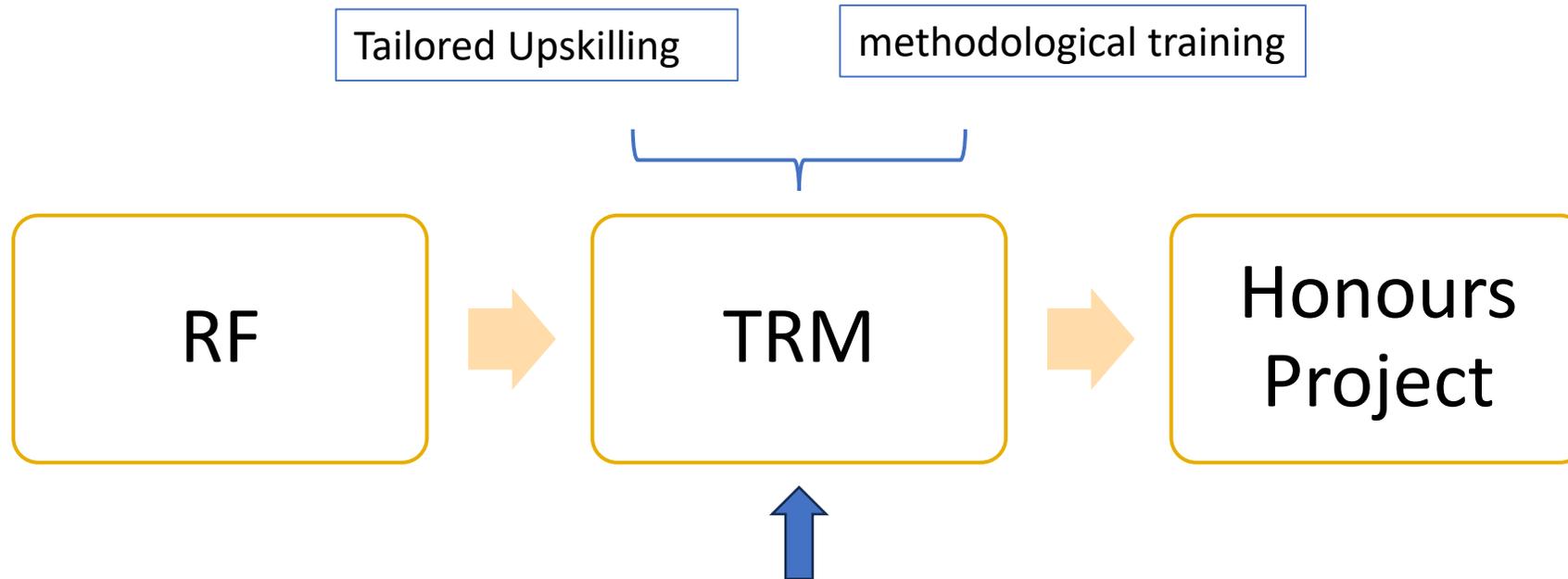




Agenda

- What is this course about?
- Compulsory module outline
- Requirements for Assignments
 - Assignment 1A, 1B
 - Assignment 2

TRM Introduction



Compulsory Module: Applied Research Method (1cp)

- Week 2: Basics of Research
- Week 3: Research methodologies
- Week 4: Formulating Research Questions
- Week 5: Experiment Design
- Week 6: Data Interpretation
- Week 7: Research Validity & Reliability
- Week 8: Writing Introduction
- Week 9: Writing Methodology
- Week 10: Research Ethics
- Week 11: Presenting & Publishing Research
- Week 12: Conclusion

Assignments

Assessment Task 1 (60%): Learning Plan and Reflection

- *Task 1A Individual Learning Plan (20%)*: Together with your supervisor, prepare a learning plan for your research project.
- Due on August 15th
- *Task 1B Learning Reflection (40%)*: Critically reflect on how effectively you executed the learning plan, providing an in-depth discussion on what you learned in each module.
- Due on October 26th

Assessment Task 2 (40%): Draft of Introduction and Methodology Chapters.

- Introduction Chapter: Establish research context, significance, aims, objectives/questions.
- Methodology Chapter: Introduce and justify your research methods, as well as discuss intended datasets, planned experiments and analyses, etc.
- Due on October 26th

Assignment 1A: Learning Plan

Rule of thumb:

- **Course/Module Relevance:** The upskilling activity should directly support your research.
- **Collaborative Planning:** Create the plan together with your supervisor.
- Courses/modules you want to pursue need to be **FREE**.
- **Credit requirement:** You need to complete **at least 6 cps**
 - 10–12 hours of learning = 1 cp
 - Compulsory Module = 1cp

Learning Plan: Prior Learning

Prior Learning

- Completed Courses/modules in the **last three months**
- Need to be approved by your supervisor as well
- These still need to be included in Assessment 1A and 1B

Learning Plan: Suggested Modules

External learning platforms for ML/AI/DS related projects:

- [Coursera](#) (free auditing)
- [edX](#) (free auditing)
- [Hugging Face Course](#) (free)
- [Fast.ai](#) (free)
- [Google Machine Learning Crash Course](#) (free)
- [Kaggle Micro-Courses](#) (free)

Internal Learning Modules

- [RESHUB courses](#)
- [Library workshops and training](#)

Learning Plan Example 1

Project title: Controllable image-to-video synthesis for cartoon character animation

- Knowledge & Skill Required

- Deep Learning & Neural Networks
- Diffusion Models & Image Generation
- Motion Synthesis & Temporal Consistency

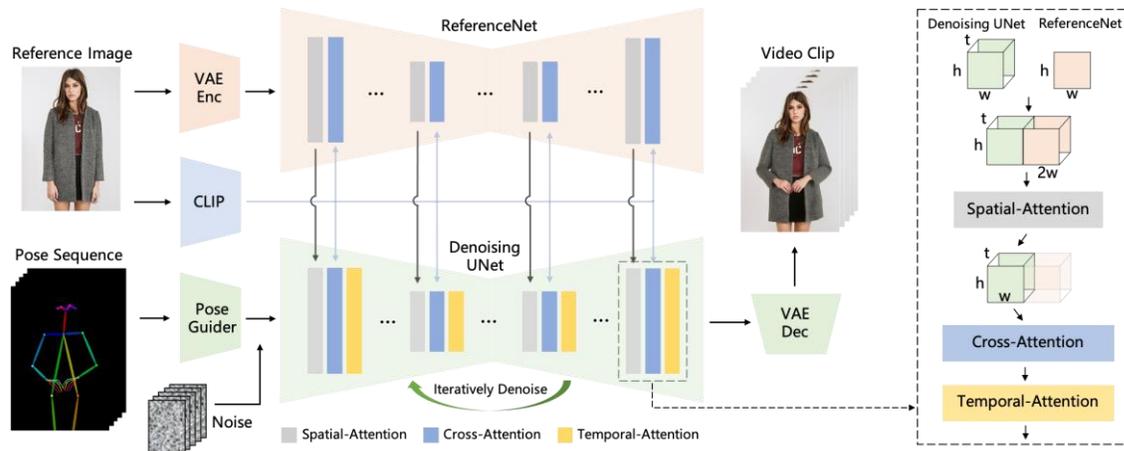


Coursera: Deep Learning & Neural Networks
Fast.ai: From Deep Learning Foundations to Stable Diffusion
Research Paper: "Animate Anyone"

- Project Management & Paper Writing



Coursera: Git & GitHub
UTS Library Workshop: CoPilot for Academic Writing



Learning Plan Example 1 (6. 1cps)

Module	Source	Description	Expected Learning Outcomes	Credit Points
TRM Compulsory Module	UTS	Provides a grounding in applied research— from fundamentals and methodology through question formulation, experimental design, data interpretation, validity/reliability, ethics, to academic writing	Design and justify a sound study, interpret results responsibly, write clear introduction/method sections, and present with ethical integrity.	1.0
Online Course: Deep Learning and Neural Networks	Coursera	Covers fundamentals of deep learning, neural networks, and optimization techniques.	Develop a foundational understanding of deep learning, activation functions, loss functions, and backpropagation.	2.5
Online Course: From Deep Learning Foundations to Stable Diffusion	Fast.ai	Explores the underlying mathematics and implementations behind diffusion models, including Stable Diffusion.	Gain insights into how diffusion models work, implement key techniques, and train models for image generation.	2.0
Online Course: Git & GitHub	Online Course	Covers best practices for using Git and GitHub in ML workflows, including collaboration and version control.	Learn version control, repository management, and collaboration for ML research projects.	0.5
Workshop: <u>Let's Learn: CoPilot for Academic Writing, Research and Data Analysis</u>	UTS Library	A workshop on using AI-powered tools like CoPilot for academic writing, research, and data analysis.	Learn how to leverage AI-driven tools to enhance academic writing, streamline research workflows, and improve data analysis.	0.1
Research Paper: 'Animate Anyone: Consistent and Controllable Image-to-Video Synthesis for Character Animation'	ArXiv	In-depth study of a state-of-the-art approach to image-to-video synthesis, with emphasis on consistency and controllability.	Understand advanced techniques in motion synthesis and diffusion models, reproduce key results, and critically analyze methodology.	

Learning Plan Example 2

Project title: Fine-Tuning LLMs for Child-Centric Learning

- Knowledge & Skill Required
 - NLP & LLM Fundamentals
 - Fine-Tuning & Prompt Engineering
 - Domain-Specific Adaptation

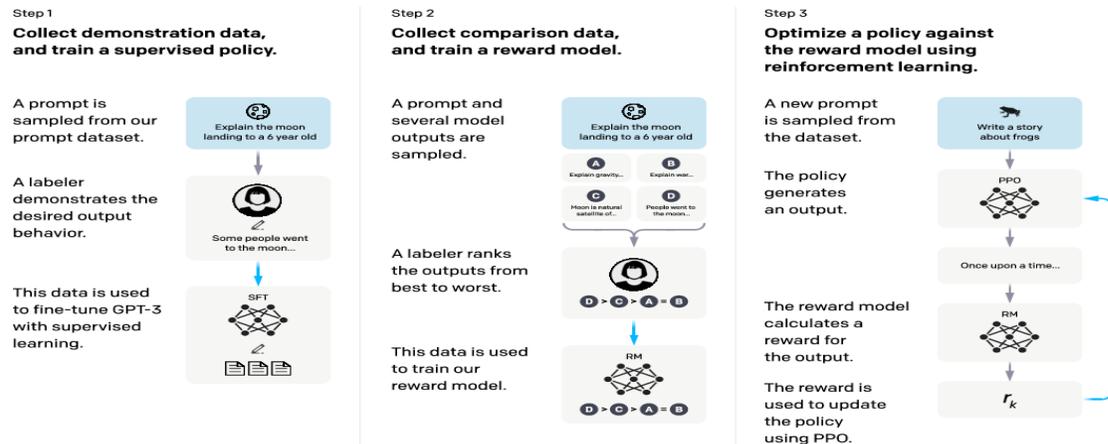


Fast.ai: Practical Deep Learning (selected modules)
Hugging Face: NLP Course (selected modules)
Coursera: Generative AI with Large Language Models
Paper: Training language models to follow instructions with human feedback

- Project Management & Paper Writing



Coursera: Write Smarter with Overleaf and LaTeX

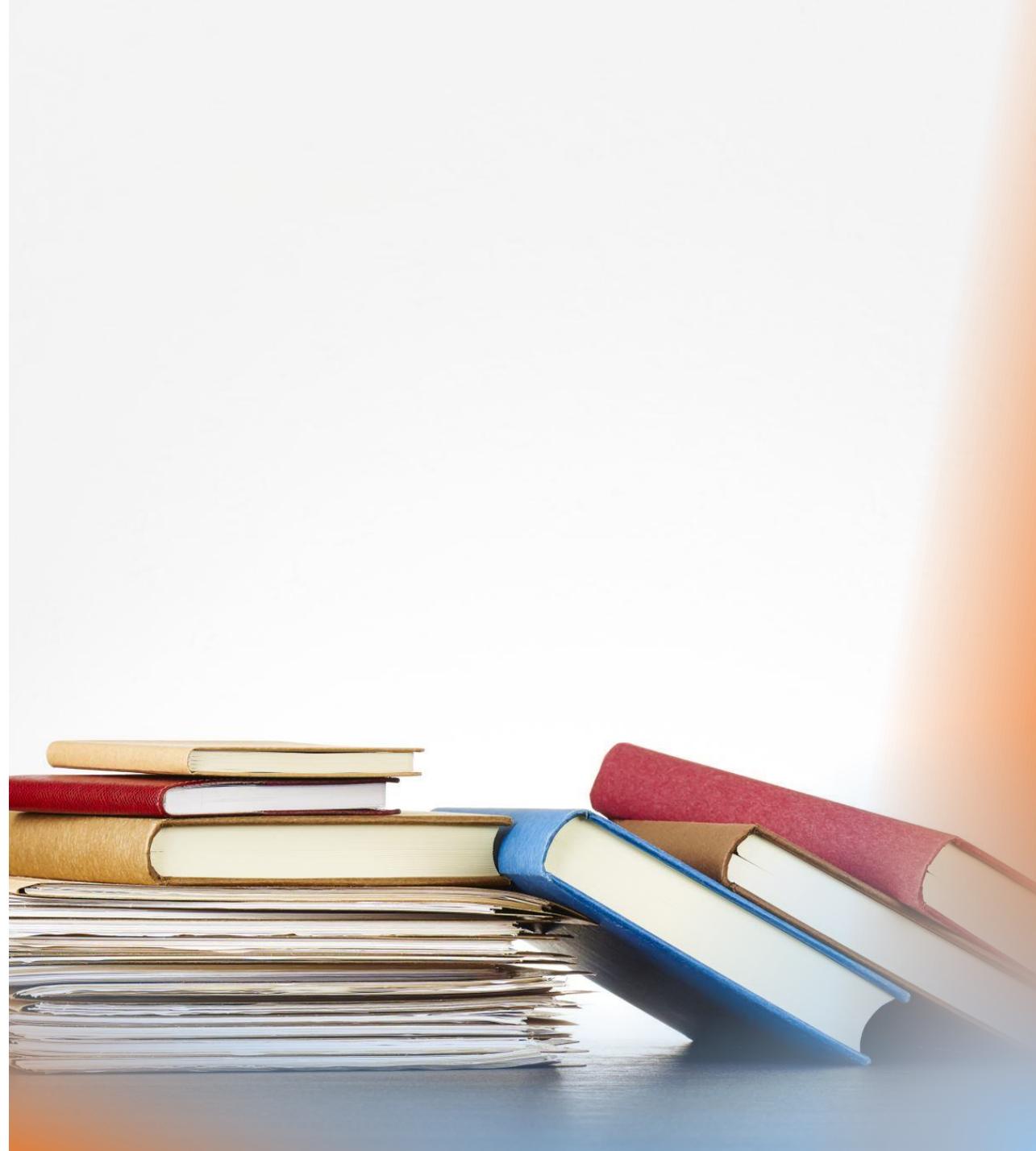


Learning Plan Example 2 (6.5 cps)

Module	Source	Description	Expected Learning Outcomes	Credit Points
TRM Compulsory Module	UTS	Provides a grounding in applied research—from fundamentals and methodology through question formulation, experimental design, data interpretation, validity/reliability, ethics, to academic writing	Design and justify a sound study, interpret results responsibly, write clear introduction/method sections, and present with ethical integrity.	1.0
Fast.ai: Practical Deep Learning (selected modules)	Fast.ai	Covers practical deep learning applications with a focus on selected modules relevant to NLP and LLMs.	Gain hands-on experience in training deep learning models and applying them to NLP tasks.	1.5
Hugging Face: NLP Course (selected modules)	Hugging Face	Explores key NLP concepts, including tokenization, fine-tuning, and deployment of large language models.	Develop an understanding of transformer-based NLP models, training techniques, and dataset preparation.	2.5
Coursera: Generative AI with Large Language Models	Coursera	Covers how generative AI models work, prompt engineering, and fine-tuning techniques.	Learn techniques to customize and optimize large language models for specific applications.	1.0
Coursera: Write Smarter with Overleaf and LaTeX	Coursera	Covers best practices for using LaTeX and Overleaf for academic writing, citations, and document preparation.	Improve academic writing using Overleaf and LaTeX for research paper preparation.	0.5
Paper: Training language models to follow instructions with human feedback	ArXiv	Discusses reinforcement learning from human feedback (RLHF) to align LLM behavior with user intent.	Understand how RLHF improves LLM responses and enhances human-aligned language model training.	

Credits that are not accepted

- Watching standalone videos
- Reading papers
- Reading books



Learning Plan: Expectation

Once you have all the courses/modules you are going to complete, you can write your Learning Plan – Assessment Task 1A ([Due on August 15th](#))

- No need to seek course coordinator's approval for your selected learning modules/activities.
- If you intend to claim cps from prior learning, ensure it is approved by your supervisor and clearly mentioned in your plan.

General Suggestions for Learning Plan

- Combine theoretical learning with hands-on exercises and mini-projects.
- Choose courses and modules from different platforms.
- Use AI Tools to facilitate your learning.
- (Read research papers.)

Learning Plan: Suggested Format

- A brief introduction to your research project that outlines the required knowledge and techniques.
- A specific learning plan containing course/modules equivalent to 6 (or slightly more) credit points, along with a timeline for each activity.
- Scheduled meeting times with your supervisor.
- Direct Links to the selected online learning courses/modules.

Assignment 1B: Learning Reflection

- NOT a generic summary of course content
- The reflection should be personal, analytical, and focused on your growth and application of knowledge.
- Discuss how your learning has benefited/will benefit your research.

Learning Reflection: Suggested Format

Any format and structure can be used as long as:

- Sections are clearly organised per module/activity.
- Reflection is deep and analytical.
- Artefacts demonstrate learning progress.

Learning Reflection: Suggested Format

Example (For one module):

- Introduction (initial plan, goals, and expectations)
- A detailed discussion of the learning process with supporting artefacts
 - What was actually completed (activities, dates, credit points);
 - Key concepts/theories/techniques;
 - Challenges faced and how they were overcome;
 - Application of new techniques in exercises, mini-projects, and your research project
 - ...
- A reflective conclusion (how the learning has benefited your research)

Learning Reflection: Learning Evidence

- Notes & Annotated documents (kept in word documents, slides, or other note-taking software)
- Code/Results from exercises, assignments, mini-project, or your research project (Jupyter Notebook, GitHub repository)
- Screenshots of quizzes, exercises, assignments, and/or experiment results
- Certificates, badges, completion percentages

Assessment Task 2

In Assignment 2 you will complete a draft of the introduction and methodology chapters as preparation for your Honours Project.

- **Draft Introduction Chapter:** This chapter should lay the groundwork for the study by establishing its context, importance, and central objectives, reflecting on how your research project contributes to generating deeper knowledge in the field
- **Draft Methodology Chapter:** This chapter should justify your chosen research methods and demonstrate their alignment with your objectives.

[More details & Rubric are available on Canvas](#)

Assessment: AI Use Policy

- Assistive use of AI tools is permitted.
- [UTS Use of AI in Research Guidelines](#)
- Students must include an [AI Use Statement](#) listing tools/versions, representative prompts, where and how outputs were used/edited, and how outputs were verified. Full transcripts are not required but may be requested for audit.

Acknowledging

Previous designs of this course by

- Dr. Camille Dickson-Deane
- Dr. Barry Jay
- Prof. David McGloin
- Prof. Oliveria Marjanovic
- The Craft of Research

[Booth, W. C., Colomb, G. G., & Williams, J. M. \(2003\). *The craft of research*. University of Chicago press.](#)



Questions?