COMP64803:
Introduction to Responsible & Reproducible AI

Mingfei Sun

CDT on Decision-Making for Complex Systems
Department of Computer Science
The University of Manchester

CDT Course Overview

Strands	Area	Year 1: Foundation year with the cohort based in Manchester.			Years 2-4: PhD years with the students located in Manchester and/or Cambridge		
		TB1 (Oct-Jan)	TB2 (Feb-May)	TB3 (Jun-Sep)	Year 2	Year 3	Year 4
Core Foundation Strand	Machine Learning Foundations	Reasoning and Learning under Uncertainty (UoM, 15cr)	Reinforcement Learning (UoM, 15cr)	Mini research project (30cr)	PhD Project at Manchester and/or Cambridge	PhD Project at Manchester and/or Cambridge	PhD Project at Manchester and/or Cambridge
	Data-Driven Decision Making	Machine Learning and the Physical World (UoC, 15cr)					
Systems and Applications Strand	Domain Units Real-World Complex Systems	Introductory Domain Topics (UoM, 15cr)	Advanced Domain Topics (UoM, 15cr)		Summer or Winter School (one/year)		
	Team Projects	Team Project 1 (5cr)	Team Project 2 (5cr)	CDT conference	Journal Club (throughout the years)		
					CDT Conference (one/year)		
Enhanced training and EDI Strand	Responsible AI	Responsible AI Courses from The Alan Turing Institute Workshops (5cr)			Responsible Research and Innovation training		
	Research Techniques & Methods	'Starting Your Postgraduate Research' , 'Academic writing', 'Writing your Data Management Plan', 'Preparing Papers and Presentations', 'Preparing for your Final Year',					
	Skills Development and EDI training	'Media Training', 'Public Engagement', 'Policy Engagement', 'AI for increasing Business Productivity', 'Entrepreneurship training'					

Figure 1. Overview of CDT Students Training. TB stands for Teaching Block.

General Information

Title	Introduction to Responsible and Reproducible AI
Unit code	
Credit rating	15
Level	7
Contact hours	Lectures: 6hrs
Other Scheduled teaching and learning activities*	Computer Laboratories: 30hrs
Pre-requisite units	
Co-requisite units	
School responsible	Engineering
Member of staff responsible	Mingfei Sun
ECTS**	7.5
Notional hours of Learning***	150

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- **Team Coding Hackathons**: to bring students together to create, innovate and hack on ideas that inspire them. The students should brainstorm a project idea under a given thematic topic and present their idea through coding demonstrations. It provides students with necessary trainings of basic programming skills, including the use of Git, Docker, efficient Python programming, and the use of Jax/Pytorch framework

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- **Paper Reproducibility Challenge**: to investigate reproducibility of papers accepted for publication at top conferences, and verify the empirical results and claims in the paper by reproducing the computational experiments, either via a new implementation or using code/data or other information provided by the authors. The students should submit their results in the form of blogposts.

Intended Learning Outcomes

On the successful completion of the course, students will be able to:

- Explain the concept of ethics and ethical theory in relation to transparency and fairness;
- Apply the algorithmic tools and technologies to accommodate fairness and transparency;
- Implement research ideas with basic programming tools;
- Reproduce the main results from a technical paper and explain it in a short and understandable way.

Teaching Plan

- Fall Term:
  - Two lectures (6 Oct & 10 Nov): 2 hours each
  - Computer Lab Sessions (SEM1 Week 8 & 9): 3 hours each
- Spring Term:
  - One Hackathon (W/c 2 Feb): 3 days
  - One lecture (9 Mar): 2 hours
  - Computer Lab Sessions (SEM2 Week 6, 7 & 8): 3 hours each

Month/YEAR	Week Name	S+ Wk No.	M	T	W	T	F	S	S
Sept 2025	SVAC 14	52	8	9	10	11	12	13	14
	SVAC 15	53	15	16	17	18	19	20	21
	WW 2025	1	22	23	24	25	26	27	28
	SEM1W01	2	29	30					
Oct 2025	SEM1W01	2			1	2	3	4	5
	SEM1W02	3	6	7	8	9	10	11	12
	SEM1W03	4	13	14	15	16	17	18	19
	SEM1W04	5	20	21	22	23	24	25	26
	SEM1W05	6	27	28	29	30	31		
Nov 2025	SEM1W05	6						1	2
	SEM1W06	7	3	4	5	6	7	8	9
	SEM1W07	8	10	11	12	13	14	15	16
	SEM1W08	9	17	18	19	20	21	22	23
	SEM1W09	10	24	25	26	27	28	29	30
Dec 2025	SEM1W10	11	1	2	3	4	5	6	7
	SEM1W11	12	8	9	10	11	12	13	14
	SEM1W12	13	15	16	17	18	19	20	21
	CVAC 01	14	22	23	24	25	26	27	28
	CVAC 02	15	29	30	31				
Jan 2026	CVAC 02	15				1	2	3	4

Month/YEAR	Week Name	S+ Wk No.	M	T	W	T	F	S	S
Feb 2026	SEM2W01	20	2	3	4	5	6	7	8
	SEM2W02	21	9	10	11	12	13	14	15
	SEM2W03	22	16	17	18	19	20	21	22
	SEM2W04	23	23	24	25	26	27	28	
Mar 2026	SEM2W04	23							1
	SEM2W05	24	2	3	4	5	6	7	8
	SEM2W06	25	9	10	11	12	13	14	15
	SEM2W07	26	16	17	18	19	20	21	22
	SEM2W08	27	23	24	25	26	27	28	29
	EVAC 01	28	30	31					
Apr 2026	EVAC 01	28			1	2	3	4	5
	EVAC 02	29	6	7	8	9	10	11	12
	EVAC 03	30	13	14	15	16	17	18	19
	SEM2W09	31	20	21	22	23	24	25	26
	SEM2W10	32	27	28	29	30			
May 2026	SEM2W10	32					1	2	3
	SEM2W11	33	4	5	6	7	8	9	10
	SEM2W12	34	11	12	13	14	15	16	17
	Ex SEM2W13	35	18	19	20	21	22	23	24
	Ex SEM2W14	36	25	26	27	28	29	30	31

Assessment

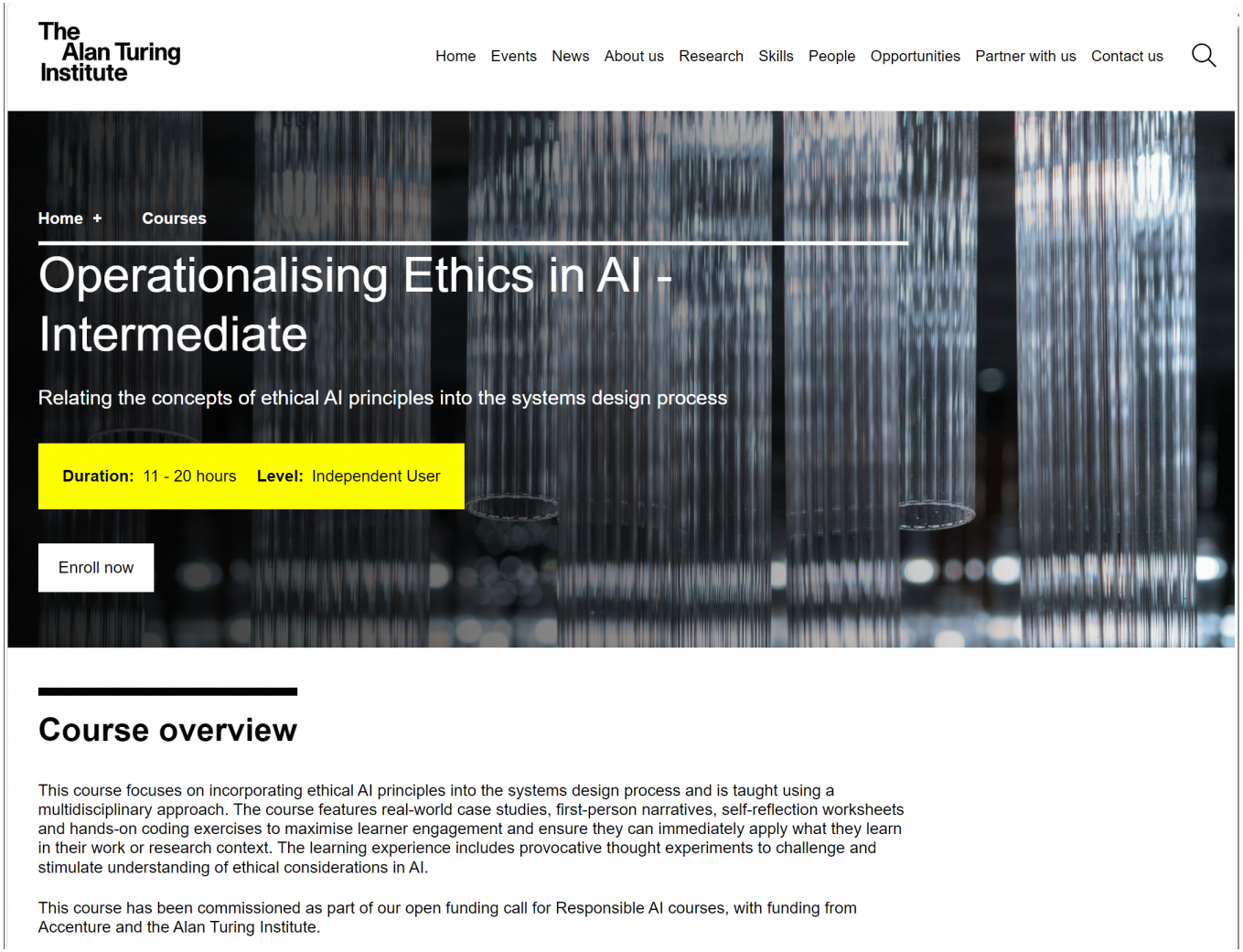
This unit is assessed as pass/fail only. All elements of assessment must be passed to pass the unit.

Assessment task	Length	How and when feedback is provided	Weighting within unit (if relevant)
Coding assignment	15 hrs	Coding submissions will be assessed with marks on different rubrics and comments/suggestions will be given on what coding skills to improve upon.	0.5
Presentation	12 hrs	Feedback will be given in peer reviews and marks on different rubrics.	0.2
Blogpost report	40 hrs	Reports will be marked on: results coverage, technical clarity, and blogpost understandability.	0.3
Operationalising Ethics in AI Online Course	8 hrs	Online course run and automatically marked by Alan Turing Institute. Upon completion, students must obtain a certificate to demonstrate that they have passed this element.	Pass/Fail*

In This Lecture (1)

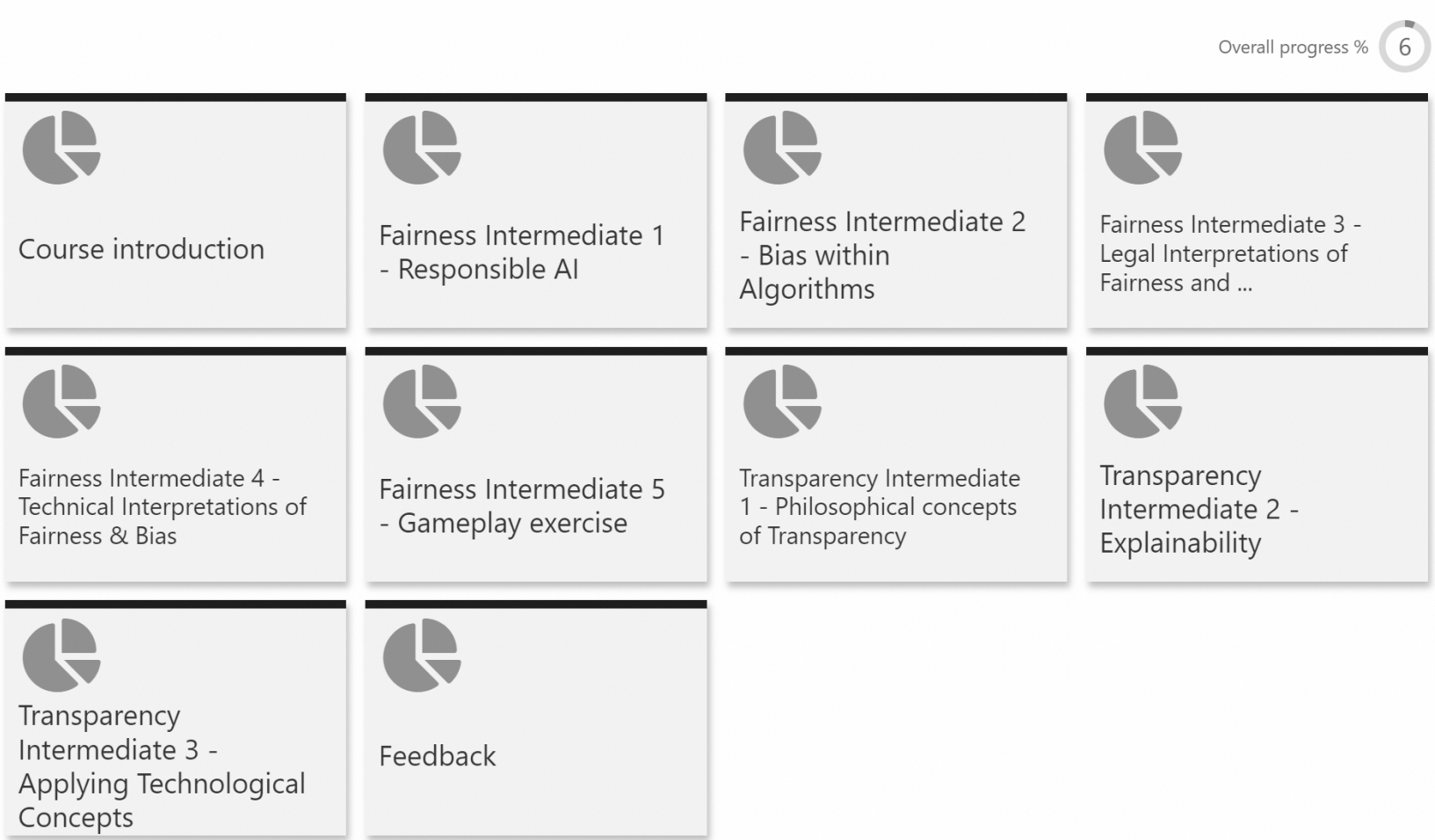
Let's first understand Ethics in AI: to enrol the online course

- Operationalising Ethics in AI - Intermediate



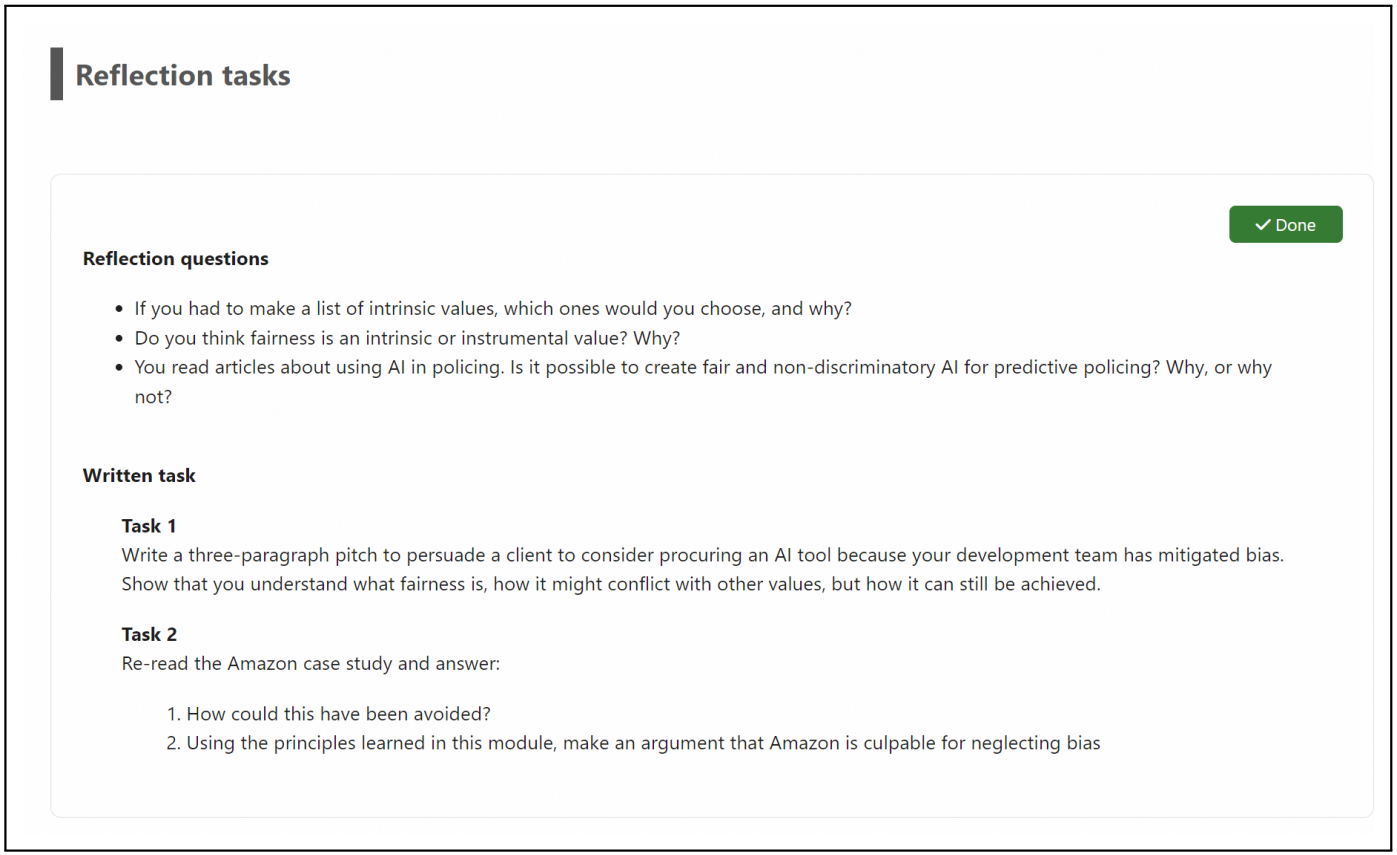
`https://www.turing.ac.uk/courses/operationalising-ethics-ai-intermediate`

Operationalising Ethics in AI - Intermediate



Operationalising Ethics in AI - Intermediate

You can skip Reflection Tasks:



Reflection tasks

✓ Done

Reflection questions

- If you had to make a list of intrinsic values, which ones would you choose, and why?
- Do you think fairness is an intrinsic or instrumental value? Why?
- You read articles about using AI in policing. Is it possible to create fair and non-discriminatory AI for predictive policing? Why, or why not?

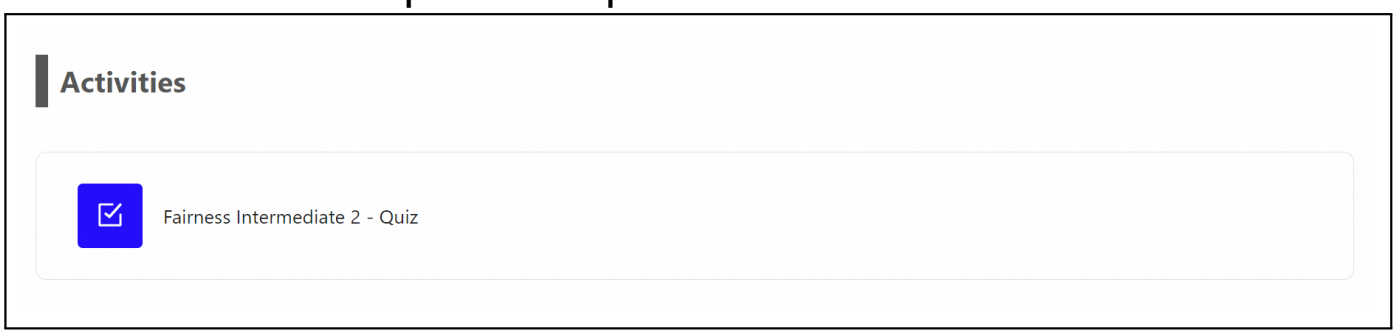
Written task

Task 1
Write a three-paragraph pitch to persuade a client to consider procuring an AI tool because your development team has mitigated bias. Show that you understand what fairness is, how it might conflict with other values, but how it can still be achieved.

Task 2
Re-read the Amazon case study and answer:

1. How could this have been avoided?
2. Using the principles learned in this module, make an argument that Amazon is culpable for neglecting bias

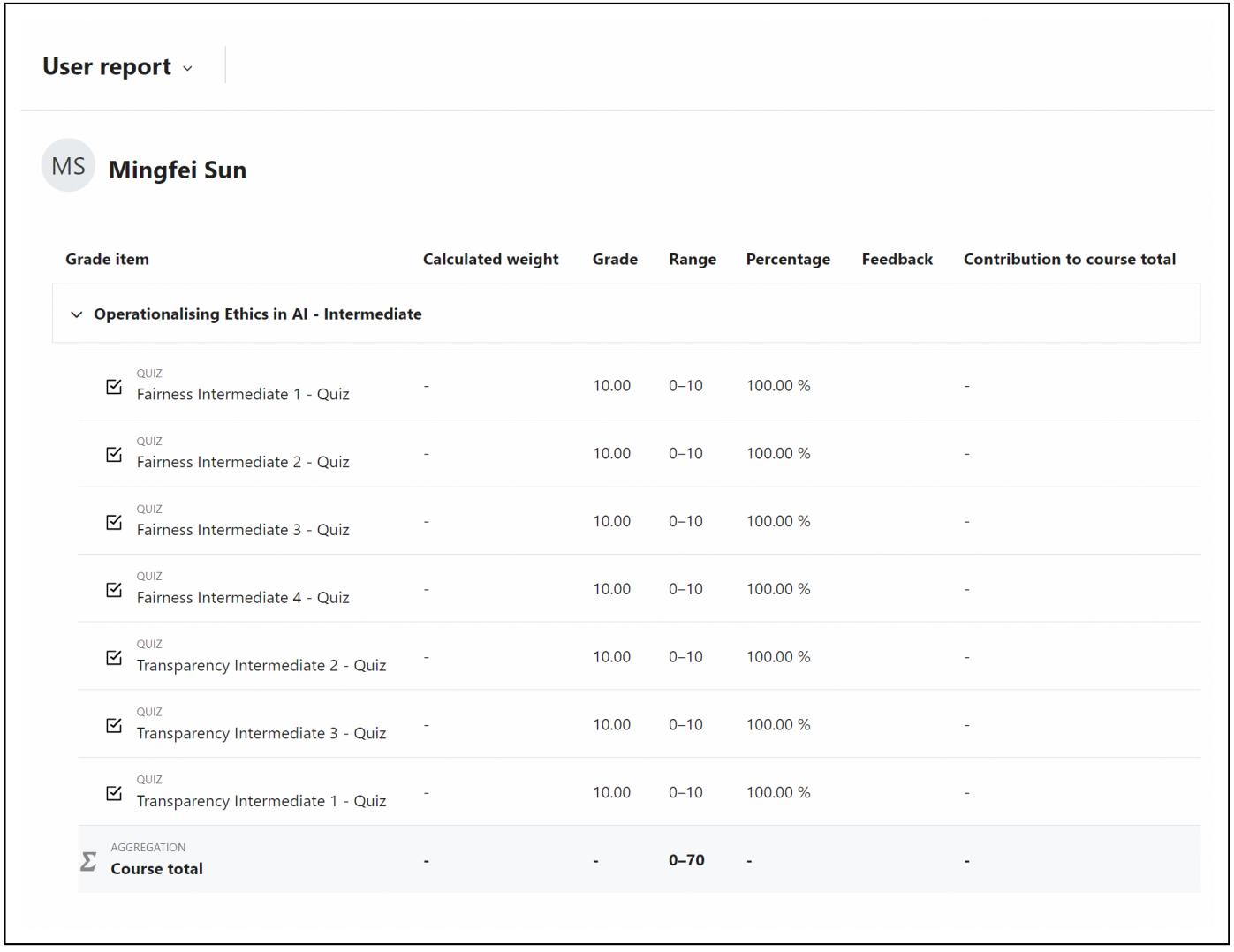
You'll need to complete all quiz:



Activities

Fairness Intermediate 2 - Quiz

Operationalising Ethics in AI - Intermediate



User report

MS **Mingfei Sun**

Grade item	Calculated weight	Grade	Range	Percentage	Feedback	Contribution to course total
Operationalising Ethics in AI - Intermediate						
QUIZ Fairness Intermediate 1 - Quiz	-	10.00	0–10	100.00 %		-
QUIZ Fairness Intermediate 2 - Quiz	-	10.00	0–10	100.00 %		-
QUIZ Fairness Intermediate 3 - Quiz	-	10.00	0–10	100.00 %		-
QUIZ Fairness Intermediate 4 - Quiz	-	10.00	0–10	100.00 %		-
QUIZ Transparency Intermediate 2 - Quiz	-	10.00	0–10	100.00 %		-
QUIZ Transparency Intermediate 3 - Quiz	-	10.00	0–10	100.00 %		-
QUIZ Transparency Intermediate 1 - Quiz	-	10.00	0–10	100.00 %		-
AGGREGATION **Course total**	-	-	**0–70**	-		-

Submit your grades to me by 15th Dec (passing grades: 75% each)

In This Lecture (2)

How can we be responsible for our codes?

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How can we be responsible for our codes?

- Version controls: Git
- Reproducible development environments: Docker
- Good coding practice: Effctive Python
- More ...

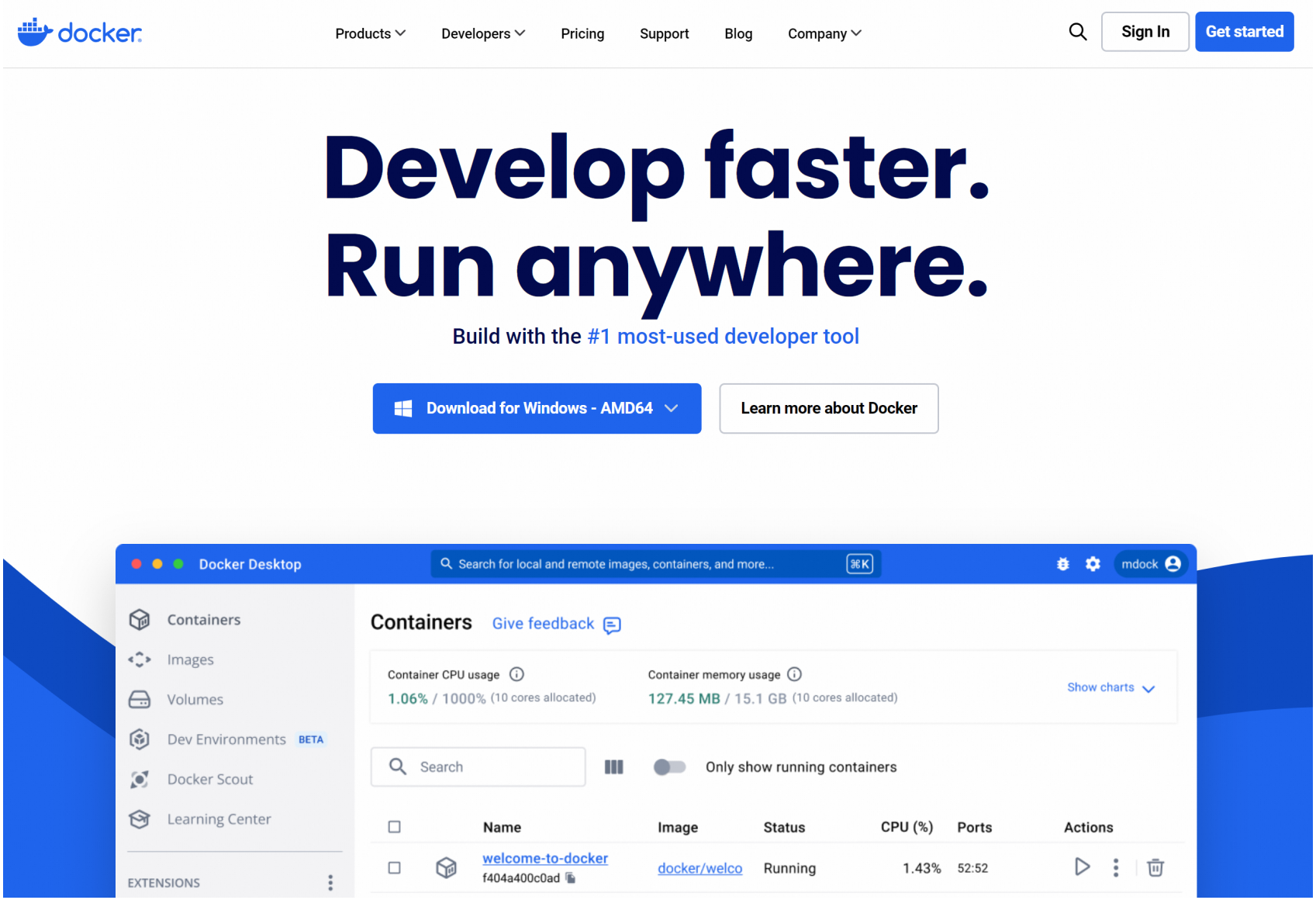
What is Version Control?

What is Git?

Git Hands-on Exercise

- Create a GitHub account (if you don't have one)
- Fork the repository from `https://github.com/mingfeisun/COMP64803-Responsible-Reproducible-AI`
- Clone locally the repo from your own forked version
- Add your readme markdown file to cohort-2025
- Git add and commit your changes
- Git push your changes and make a pull request

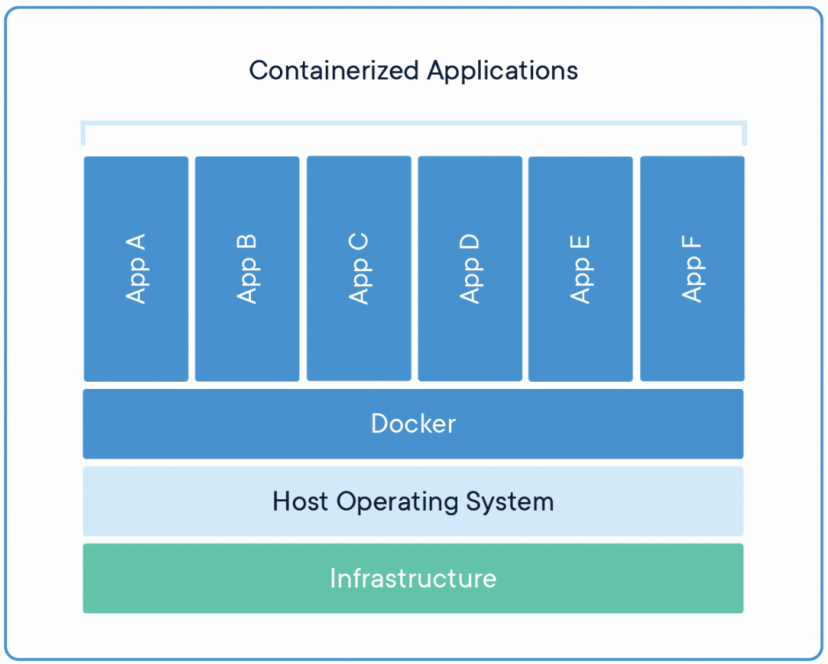
Docker: Most-Used Development Tool

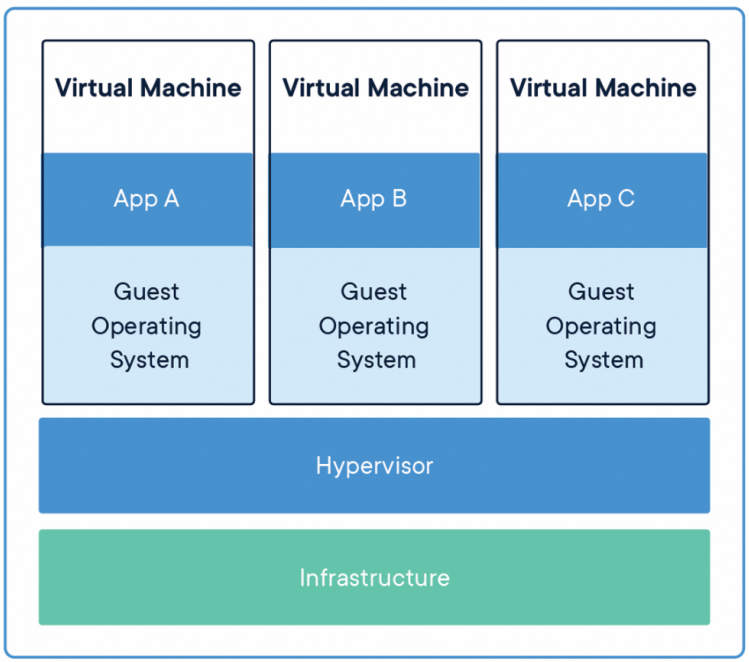


Docker: containers vs virtual machines

Comparing Containers and Virtual Machines

Containers and virtual machines have similar resource isolation and allocation benefits, but function differently because containers virtualize the operating system instead of hardware. Containers are more portable and efficient.





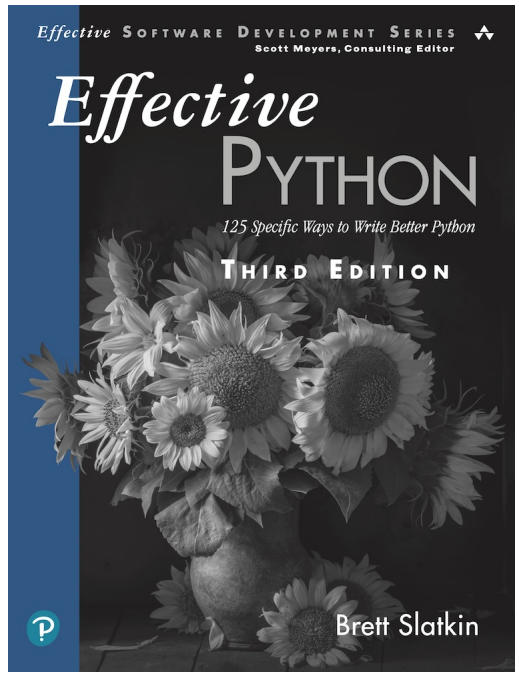
Docker: What Is Docker?

Docker Hands-on Tutorial

Go to `https://github.com/mingfeisun/COMP64803-Responsible-Reproducible-AI/wiki/Docker-tutorial` and follow the instructions

Effective Python

Pythonic Thinking: The Python community has come to use the adjective Pythonic to describe code that follows a particular style. The idioms of Python have emerged over time through experience using the language and working with others.



- "Know Which Version of Python You're Using"
- Unit tests: "You should always test your code, regardless of what language it's written in"
  - pytest: `https://docs.pytest.org/en/stable/`
- Try to read and understand source codes as much as possible

For Next Lecture

You are supposed to:

- Pick **5 specific ways** to write better Python (discuss with your supervisor to determine which ones can be crucial to know for your future research)
- Prepare a **10-min talk** on your selected effective Python ways
- Give a **live demo or executable code snippets** in a docker environment
- **Git push your codes** to our course unit repository via pull request (before the lecture)

END LECTURE