MODULE REPORT

Module	CS2109S - INTRODUCTION TO AI AND MACHINE LEARNING
Academic Year/Sem	2022/2023 - Sem 2
Department	COMPUTER SCIENCE
Faculty	SCHOOL OF COMPUTING

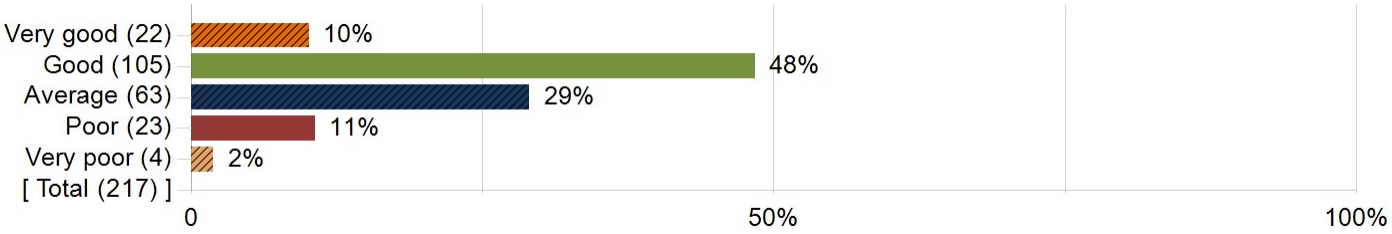
Note: Class Size = Invited; Response Size = Responded; Response Rate = Response Ratio

Raters	Student
Responded	217
Invited	269
Response Ratio	81%

1. Overall opinion of the module

Distribution of Responses

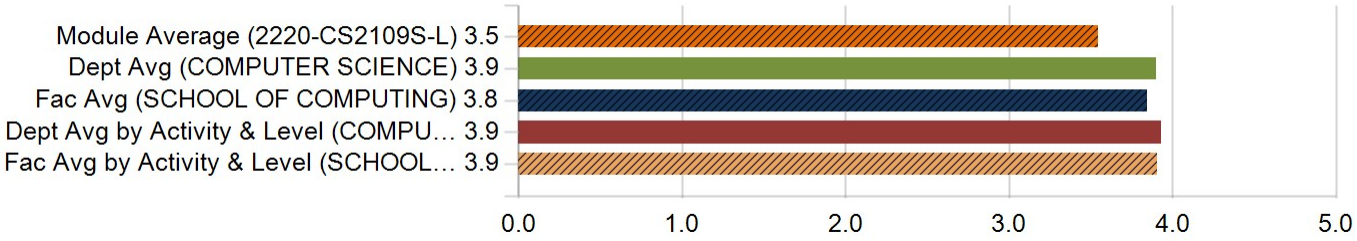
What is your overall opinion of the module?



Statistics	Value
Response Count	217
Mean	3.5
Median	4.0
Mode	4
Standard Deviation	0.9
Positive Feedback	59%

Rating Scores

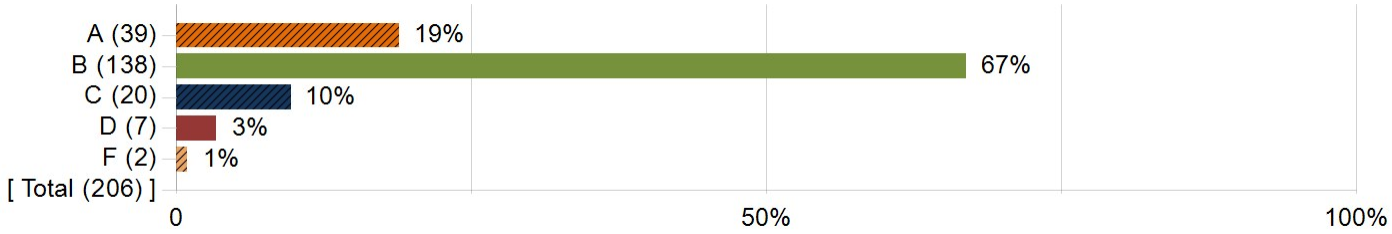
Question	Module Average (2220-CS2109S-L)		Dept Avg (COMPUTER SCIENCE)		Fac Avg (SCHOOL OF COMPUTING)		Dept Avg by Activity & Level (COMPUTER SCIENCE-LECTURE (Level 2000))		Fac Avg by Activity & Level (SCHOOL OF COMPUTING-LECTURE (Level 2000))	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
What is your overall opinion of the module?	3.5	0.9	3.9	0.9	3.8	0.9	3.9	0.8	3.9	0.8



2. Expected Grade

Distribution of Responses

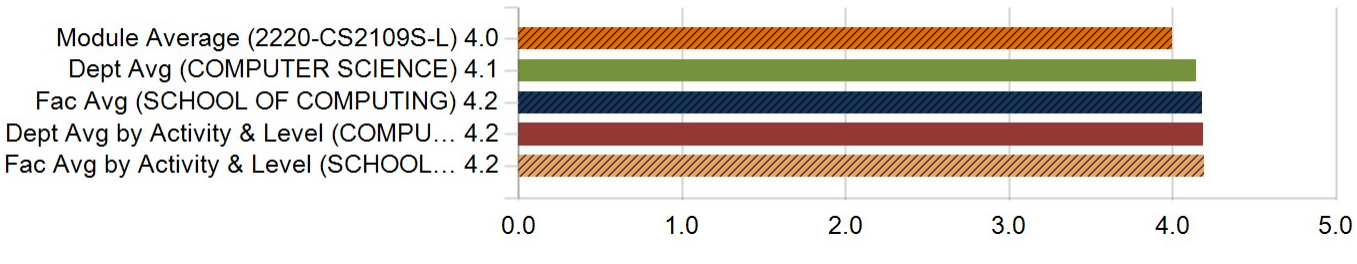
The grade that I am most likely to get in the module is:



Statistics	Value
Response Count	206
Mean	4.0
Standard Deviation	0.7

Rating Scores

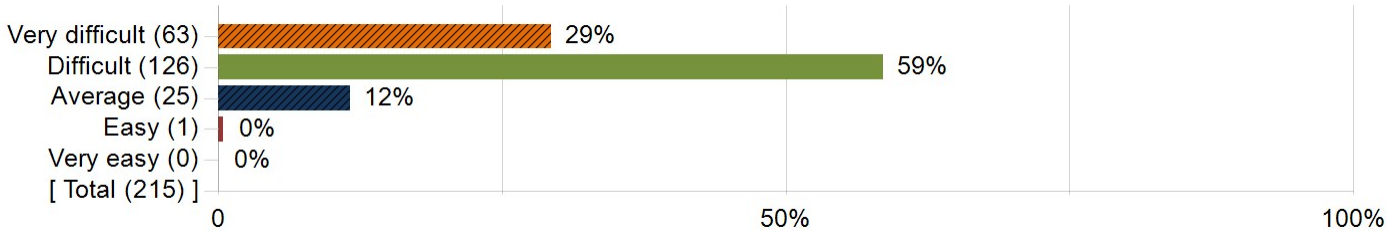
Question	Module Average (2220-CS2109S-L)		Dept Avg (COMPUTER SCIENCE)		Fac Avg (SCHOOL OF COMPUTING)		Dept Avg by Activity & Level (COMPUTER SCIENCE-LECTURE (Level 2000))		Fac Avg by Activity & Level (SCHOOL OF COMPUTING-LECTURE (Level 2000))	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
The grade that I am most likely to get in the module is:	4.0	0.7	4.1	0.8	4.2	0.7	4.2	0.7	4.2	0.7



3. Difficulty Level of the module

Distribution of Responses

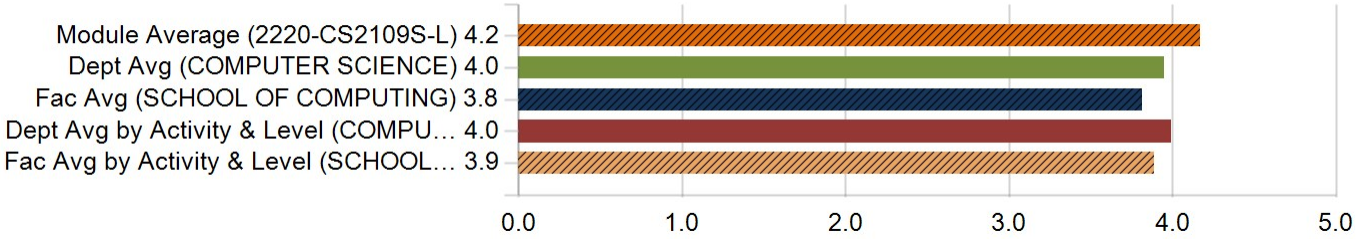
I rate this module as:



Statistics	Value
Response Count	215
Mean	4.2
Standard Deviation	0.6

Rating Scores

Question	Module Average (2220-CS2109S-L)		Dept Avg (COMPUTER SCIENCE)		Fac Avg (SCHOOL OF COMPUTING)		Dept Avg by Activity & Level (COMPUTER SCIENCE-LECTURE (Level 2000))		Fac Avg by Activity & Level (SCHOOL OF COMPUTING-LECTURE (Level 2000))	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
I rate this module as:	4.2	0.6	4.0	0.8	3.8	0.8	4.0	0.7	3.9	0.8



WHAT I LIKE / DISLIKE ABOUT THE MODULE

What I liked about the module:

Comments
good intro to AI & MI without too much of math
My favorite part would be the mini–project – it was fun battling my friends with the bot. The ranking for grading also made it "spicer". The lecture I appreciated the most was the SVM lecture by Rizki, where even though my math is admittedly cmi, I still liked that when I sat down and slowly rewatched the lecture and digested it, it made more sense and I felt that I learned something.
The problem sets are good.
I enjoyed learning more about AI and machine learning. Especially with the rise of AI in the industry and chatgpt, i feel like the

Comments
module has really gave me valuable insights into how these tech works.
The algorithms are quite interesting.
–
It is a very good introductory module to AI and Machine Learning, as it teaches all the important basic concepts. The problem sets, lecture trainings, and tutorials complement one another very well to enhance learning and mastery of the concepts.
first part of the module
Learning techniques that are applicable
Focused more on intuition than rote learning content. Hands on in terms of building our own model to experience it for ourselves
The mini project and take home exams are nice ideas that do help alleviate the stress of a timed final exam.
nil
Energetic voice.
Content is interesting.
Good intro to AI
AI section was extremely fun, especially with implementing the different kinds of searches, designing of heuristics (which is more creative than logical) and the mini project contest with the gamification / ranking system and element of competitiveness which made me spend more time exploring different kinds of optimization techniques which I would otherwise have not known about.
Challenging
Mini project
Problem sets, project, practical final – I love the hands–on aspect of it as I feel I'll learn more this way as compared to written theoretical papers.
Challenging yet rewarding.
Refreshing topics covered
Self–study, can ask TA and collaborate with friends on PS and project.
I really enjoyed the concepts taught actually and found them interesting after reading on the side.
None
Interesting content.
mini project was fun
I really liked the structure of the problem sets because they often do allow us to apply concepts that we learn in that week's lecture. The weekly quizzes were also good because they ensure that we keep up with the contents and the gameified system as always, helps to make the process just that little bit more fun.
workload
Coursemology is great.
Very interesting topics
Very relevant in the current day and age
The game–like experiences to attract students to learn about the courses.
fun projects and ps
AI part of the module is clear to show what AI can do.
Allowed me to explore interests and had good coverage of material
Very interesting machine learning ideas
Problem Sets are very fun, most of the module is quite fun.
I am more confident in applying ML and AI from scratch and the awareness/knowledge gained from this class was huge. Regardless of the grade that I am getting, I can use the knowledge easily in real world scenarios in the future and it was fun learning new ideas and concepts.
Learning about machine learning is very interesting and I managed to learn a lot of theoratical concepts that I would have difficulty understanding otherwise
problem sets are pretty fun.
Practical applications
I like the pre lecture review of the previous lecture that clarifies misunderstandings or things not so well explained during the previous lecture. I like the way the topics are presented (although sometimes Prof Ben and Prof Rizki goes too fast for detailed

Comments
topics) during lectures. I like the tutorials, psets and miniproject as they helped me to really deepen my understanding of the AI and ML concepts.
Interesting material
It gives me an introduction to AI and machine learning and how ML is used in the world.
Knowledge and concepts and workload.
Very interesting topics
It recapped CS2040s, which honestly talked about things that I really didn't know was talked about in 2040s. Or at least, I didn't have the sensitivity to realize that that was the case.
Interesting content
Probably the best module this semester for me: – The problem sets are well–designed. Doing actual work and seeing that the model works is fantastic. – Math, yes (PCA can be better – the current version is quite confusing). – Force students to struggle, in a good way. The module has rewards for students who spend more effort. – No tolerance for plagiarism!
Very applied
Quite interesting projects and problem sets
NA
nil
It is a very good introductory class to machine learning and artificial intelligence. I felt like I've learnt a lot in this module. I definitely like the practical aspect of this module which helped me to truly understand the concept of A.I
I like the AI part of this module.
AI is interesting, however, like my views on CS2106, im not sure why this is a mandatory requirement.
Psets are fun.
very interesting and relevant assignments
learning and creating simple ai
Good introduction, resources are well–crafted
Covers very relevant topics that I would apply in the future
Cool AI and ML concepts
Provides a good overview of AI and ML. Teaches enough knowledge to understand an overview without going to deep into details.
I particularly enjoyed the lecture that Rizki taught. It was a breath of fresh air.
I greatly enjoy AI and seeing the clever mathematics behind all the algorithms used.
Good introduction into how AI works under the hood.
the forum page was very responsive ! could refer when i am in a pickle
Nice that we are doing prediction on realistic data. Lots of practical application. I think that I will have enough knowledge to implement models myself after taking this module.
Interesting problem sets
Search algorithms, psets, lecture trainings
The theoretical concepts can be hard to grasp but the application of the concepts are interesting, such as building and training our own models.
It is quite well run logistically, the problem sets and tutorials are well thought and complements learning.
Psets are set with appropriate guiding code and explanations when introducing new libraries, local test cases that worked well, convenient teaching environment using Jupyter notebook vs that in other modules highly dependent on cluster nodes.
nil
Problem sets enabled me to learn much more about the subjects. Mini project was an interesting experience coding to compete against my peers.
Its structure.
i like the projects and problem sets. I like how it's more focused on giving a more intuitive, rather than mathematical approach to AI and ML
Interesting concepts

What I did not like about the module:

Comments
module still not mature.. some rough edges here and there.
In all my other CS modules (I have taken CS1101S, CS2030S, CS2040S, CS2100, CS2106, CS2105, CS2102), I would go into lecture and learn a lot – the content would be interesting and enlightening, and I would come out happy and knowing a bit more. This module is different, where I walk out more confused than I walk in. I think there should be more problems in the problem sets related to data engineering to familiarise students, if that is what the mock–final requires.
The grading scheme is unfair and weird. Prof is very rude in replying to students' queries. I think Prof Ben is suitable for this module and I feel that he's also not very interested in the AI or ML also.
the midterm was graded terribly with alot of inconsistencies in mark distribution. The addition of OCR shading for decision tree was genuinely painful to do, and a waste of time in my opinion.
The problem sets should have just been said to be 1 week period, since they overlap with each other
The math in machine learning.
–
First of all, I would like to ask Prof Ben to make his lectures more concise – please stop talking about the difficulties of the teaching team and justifying why this X aspect of this module is doing poorly. EVERY professor and teaching team has these struggles, and listening to them, from the student's point of view, is just a waste of time – it just makes me feel as if the teaching team is making excuses for poor performance and is desperate to be liked by students. Secondly, the teaching is far too messy. If math is needed, please recap the math for the first or two lectures thoroughly, so that the math is not eventually hand–waved away or jammed down students' throats as a surprise. The module also has an identity crisis, where it can't really decide if it wants to be a theoretical or practical module. The end result is that the module gives students a half–baked understanding of historical theoretical constructs, while rendering their knowledge almost entirely useless in practice outside of carefully–constructed and guided exercises. Literally, everything practical is hand–waved away as 'more art than science', but this art is what the field of machine learning relies on. Would it kill to have a few lectures walk through design decisions made on a real–life problem, from the very start, or make this module a project–based module, where students learn how to build different types of machine learning models for problems? Lastly, please stop having Week 13 tutorials. Most modules avoid having tutorials and labs in week 13 out of consideration for students who have final assignments and exams – and having tutorials betrays the teaching team's lack of consideration for students' workloads and other modules.
the math parts
nil
High workload
Grading of midterms took really long, but understandable given that it is a new module. Weightage could be tweaked also to put less emphasis on the midterm, as it is currently equivalent to the final exam. Perhaps slightly more weightage could be given to the final and the mini project (20, 15, 35)
nil
The midterms.
Many deliverables.
Too much math and problem sets honestly
The machine learning portion, although not as math heavy as I expected, was still quite dry. Can't seem to explain why. My interest in the mod went downhill really quickly after the AI part. The problem sets were also pretty straightforward, didn't really challenge me to think.
Exam format for the midterms
Not enough emphasis on math
I feel the mini–project could use a warning to some challenges students might face during the lecture. I know it is the student's responsibility to read and gauge the assignment's difficulty themselves early. However, during the assignment, I did not expect such a level of tweaking with the weight, together with the 20 attempt limit, there was no reliable way to know if the agent was better or not. Sometimes, even if it was better than previous agents personally coded, it turned out not being able to pass in Coursemology. This was hence more frustrating for me than fun, changing the weights 1 by 1.

Comments
Not sure about the feasibility of this but I think a solution could be to run a school server that students can connect to. The server could contain previous semester's submissions ranked from worst to best. The students can connect and run their code against the server's database, the server could then tell the students if their code ran better or worse than one of their last attempts. There could be a per day limit for each student so that they don't overload the server. For example, this could be the process for students. 1) Code out a solution 2) Save the code to the school server 3) Connect and run the code against the database. 4) They get a reply, for instance either "Your code performed better" or "Your code performed worse". This has to be stateless since storing every student's attempts is probably not possible, the student can input two different attempts. One for an old version, the other the latest improved version to compare to. The server can run the two files and see if the latest version ranked better than the older attempt.
Stress from the assignments
Prof.
Prof ben trivialises everything and literally treats every concept as easy
Math
heavy workload and difficult content
Content gets really mathematical during the latter half, which I understand cannot be avoided, but this shift is rather overwhelming for me.
the rigot
Lecture materials are not very comprehensive for further learning. Perhaps due to the lack of textbook and a proper course syllabus, this module is quite hard to follow and to grasp upon. Final exam has a bad format imo
too much math
The prof. seems to only favour exceptional students. He also constantly downplays difficult concepts as simple or easy and does not take constructive feedback from students seriously.
Although we have not done the final exam yet, I am personally not a big fan of the way it is done. Firstly, while I understand resources are limited, having resources like 1gb of ram and a 5min time limit is really not practical, especially when this will not be the case in the real world (even a basic computer has 8gb of ram). Secondly, I strongly dislike the concept of a take–home exam, because it puts a lot of pressure on students to basically stay up to complete it. This is especially so for a take–home exam that only lasts one night, especially since it already starts at night. Prof's may say that students can continue working the next day, but the stress of knowing the submission is the next day but having nothing to submit is enough to keep students up in my opinion. Ultimately, while I understand the concept of having students really create a product to test their understanding of the modules contents, I feel that it's just not practical or beneficial given the limited time and resources available.
Most of the concepts are not taught at a beginner level. I find myself understanding the topics better through a youtube video done by a non–prof
workload
too many contest–format assessments
High workload tbh
The module is kinda time consuming with all the problem sets
Very mathy, feels unnecessary if the point is to enable us to use the tools at a basic/fundamental level
Some of the questions are difficult to understand if you don't understand the basic.
hard and high workload
ML part of the module can be improved, it's a bit surface level and like "just to know" that these models are possible, but not to why does it work.
Too much work but cannot be helped
Finals is a bit of a shot in the dark, though this is to be expected since it's the first time they are organising a finals like this. I just dislike being a Guinea pig of sorts.
For a student that takes this module alone with very poor fundamentals in math, the workload is very huge as I am playing catch up every week to understand fully what's going on.
The workload of one assignment every week is abit suffocating at times
can provide more preparation for finals.

Comments
Abit too touch and go
Sometimes the lecturers go too fast during the lecture when covering detailed concepts and that can be hard to follow.
Very theoretical
The lecture content was not thorough, which leads to some gaps in understanding the lecture.
NIL
High workload
Bulk of the learning requires exploring rather than learning from the lecture itself. I understand that it is important as a skill, but is somewhat wishful thinking with the ability to blame the students for not learning well. That often a lot more useful for me to skip lecture and attend a tutorial to understand what is going on, before watching the pre–recorded lecture (which I could pause and rewind as needed because live lectures I couldn't catch every thing). I still have no idea what this module is about, what I am supposed to learn, what I am supposed to take away, how am I supposed to use this information to perform machine learning or AI, despite being able to tell you what is this and that for based on what was mentioned in the lecture. It is worth nothing that some modules do not gel well with CS2109, for example CS2103T.
Slides are not very clear, not very rigorous
Math is a bit hard to grasp
math, and it's quite hard
Can afford to teach us data cleaning techniques, not covered for finals.
NA
nil
The intense workload from the practical assignments.
I don't like the ML part of this module.
Content in the later half feels rushed. Problem sets have overly long explanations.
Maths. Maths is bad for me.
Midterms too lengthy, but too little time.
Many problem sets with ps0 at week 1 which is a culture shock. Workload is high and slides sometimes are inconsistent with many maths and some with no maths.
heavy workload in my opinion...
Too much weekly work. Way more than the stipulated 10h/week
heavy workload
Final exams being set on a weekend that coincides with a public holiday.
Terminologies and notations can be more consistent across lecture slides/assignment questions. I understand there are many interchangeable terms but it is sometimes very confusing for students who are just beginners at this topic. E.g. epoch/iteration/step, loss/error.
I think focuses too much on the math at times. For an intro mod perhaps more focus on the intuition and code, so we can apply it. Then in 3k and 4k mods delve into the math.
Very difficult math and dry content
Some concepts are mathematical in nature and cannot be avoided. As a student who is not proficient in math, I would prefer such math to be minimised. After all, it is an introductory course and I would prefer to be taught the intuitions rather than go deep into the details.
The teaching was horrible. The tutorials were too long. There were too many questions to be covered in one hour.
The way it was taught.
Doesn't compare to the course (the DL specialization) from Coursera, to be honest.
The workload can be quite heavy
problem sets took me quite a long time to complete.
Uncertainty, especially the mini project.
Horrible midterms

Comments
The machine learning tutorials are too difficult Just thinking how the finals can prevent cheaters since they can just get other people to do it for them, a little worried about my grades because of cheaters.
NIL
Struggled with the math components, some parts are tedious such as calculating information gain, decision trees
The format of the finals is weird. It seems to focus more heavily on data preprocessing which we are not taught extensively in this module. It doesn't seem to actually test our knowledge on what we learned in this module. It's not a horrible component but weighing 30% on something we basically have to self–teach seems a little unbalanced.
nil
I found the subject matter to be engaging, however, I had some concerns with the effectiveness of the lecturer
Its lectures.
The lecturer made it clear that the module is a test iteration, and a lot of things were not refined. I feel like if the module wasn't well designed yet more support should be provided
Teaching can be better, most of the teaching is "hand–wavy", with not much focus in helping student understand