MODULE REPORT

This semester is affected by a public health crisis. Colleagues are given the option not to submit this report for performance appraisal, MTAR, and P&T

Module	CS2040S - DATA STRUCTURES AND ALGORITHMS
Academic Year/Sem	2019/2020 - Sem 2
Department	COMPUTER SCIENCE
Faculty	SCHOOL OF COMPUTING

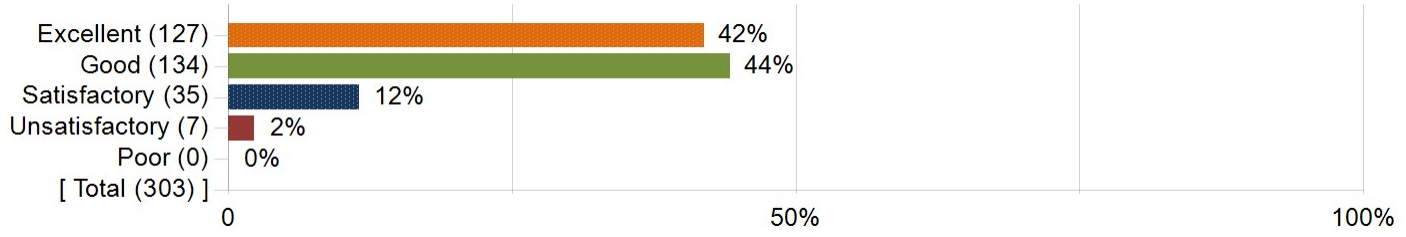
Note: Class Size = Invited; Response Size = Responded; Response Rate = Response Ratio

Raters	Student
Responded	305
Invited	439
Response Ratio	69%

1. Overall opinion of the module

Distribution of Responses

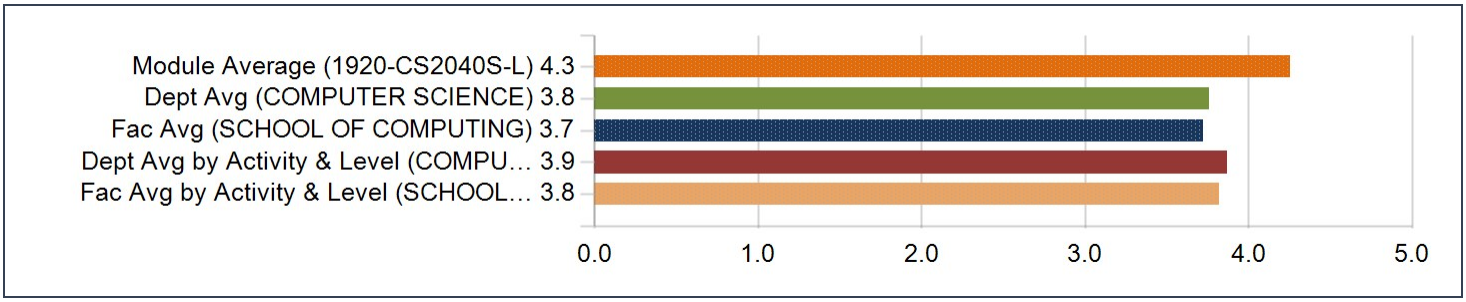
What is your overall opinion of the module?



Statistics	Value
Response Count	303
Mean	4.3
Standard Deviation	0.8

Rating Scores

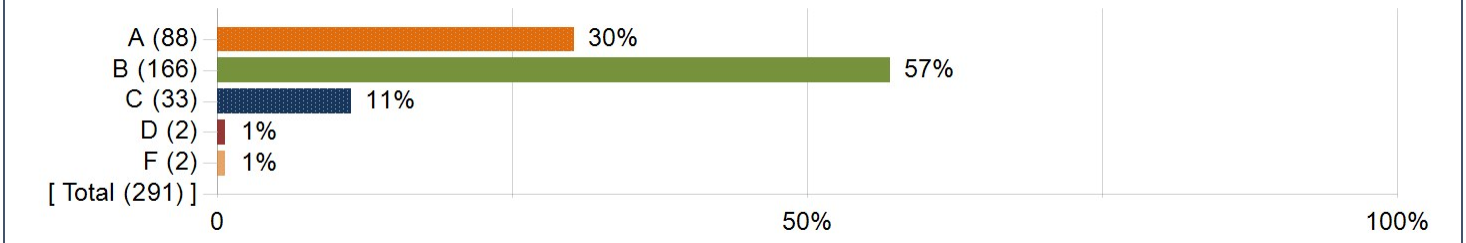
Question	Module Average (1920-CS2040S-L)		Dept Avg (COMPUTER SCIENCE)		Fac Avg (SCHOOL OF COMPUTING)		Dept Avg by Activity & Level (COMPUTER SCIENCE-LECTURE (Level 2000))		Fac Avg by Activity & Level (SCHOOL OF COMPUTING-LECTURE (Level 2000))	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
What is your overall opinion of the module?	4.3	0.8	3.8	1.0	3.7	1.0	3.9	0.9	3.8	0.9



2. Expected Grade

Distribution of Responses

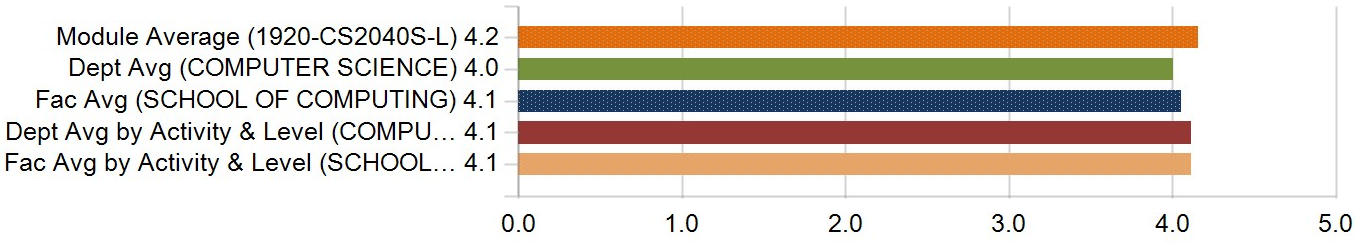
The grade that I am most likely to get in the module is:



Statistics	Value
Response Count	291
Mean	4.2
Standard Deviation	0.7

Rating Scores

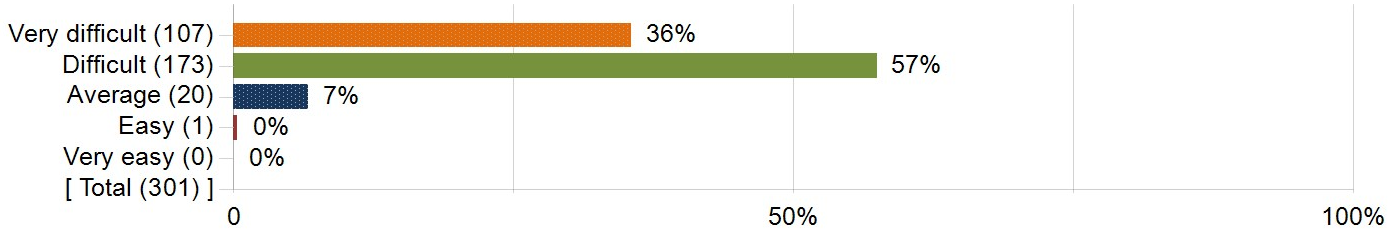
Question	Module Average (1920-CS2040S-L)		Dept Avg (COMPUTER SCIENCE)		Fac Avg (SCHOOL OF COMPUTING)		Dept Avg by Activity & Level (COMPUTER SCIENCE-LECTURE (Level 2000))		Fac Avg by Activity & Level (SCHOOL OF COMPUTING-LECTURE (Level 2000))	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
The grade that I am most likely to get in the module is:	4.2	0.7	4.0	0.8	4.1	0.8	4.1	0.7	4.1	0.7



3. Difficulty Level of the module

Distribution of Responses

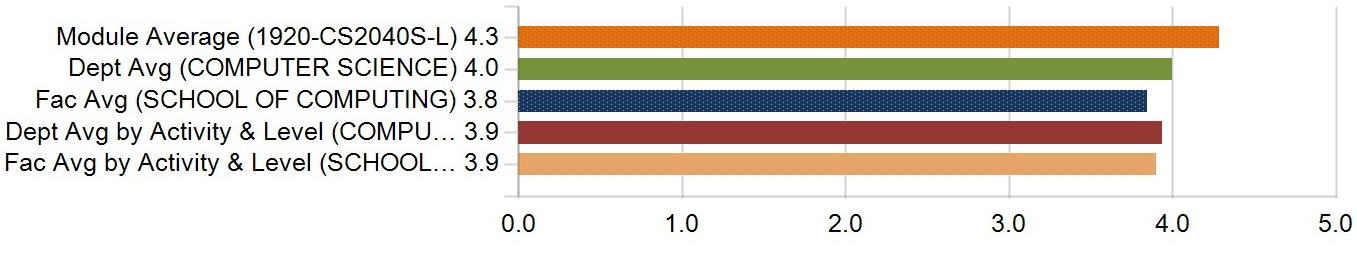
I rate this module as:



Statistics	Value
Response Count	301
Mean	4.3
Standard Deviation	0.6

Rating Scores

Question	Module Average (1920-CS2040S-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:	4.3	0.6	4.0	0.8	3.8	0.8	3.9	0.7	3.9	0.7



WHAT I LIKE / DISLIKE ABOUT THE MODULE

What I liked about the module:

Comments
I have learnt many different types of algorithms and data structures.
Algorithms are always fun.
It is interesting, incorporating what we have learnt into real–life problems. The professor is enthusiastic and passionate about what he is teaching.
Funny moments, lots of computing trivia.
The module encourages problem solving skills and teaches the steps to achieve this.
Challenging
Teaches very useful concepts that will definitely aid us in our future Computer Science endeavors.
The style of teaching is quite engaging.
Very interesting topics and algorithms. I love them so much I want to eat them everyday for my 3 meals.
Challenging but very interesting (no doubt due at least in part to the teaching)
Lectures are easy to follow and understand.
Psets were interesting. I looked forward to this module's lectures/psets/tutorials.
Very engaging! and really fun, exposed us to loads of concepts that i never seen before
Interesting and important content, fun discussions for PSes and when prepping for tutorials.
Challenged my thinking and revisited topics in previous modules. Some tasks also guided students step by step which gave students more confidence.
Interesting subjects and topics. Clearly a core module that will be extremely useful in the real world.
Teaches really useful and interesting stuff. The module is well planned and allow students to learn progressively.
There is this other TA named Christian James who was super gracious in sharing his slides which were very helpful. I look through 90% of his slides and 90% of my doubts after each lesson were answered from them. He was also a great TA outside his class who helped me a lot even though I am not from his class. I would like to thank him and also nominate him for the teaching award if possible. I am really super appreciative of his help and his slides.
Stimulating
The content taught is very relevant and it was made interesting by the lecturers.
Problem sets really force me to think and understand the material
I liked that it introduced different kinds of methods and data structures to solve different problems.
I was helped by another TA named Christian James Welly who guided me along the track so that I am not lost. O can finally appreciate the beauty of this module after being helped with him because I can finally ask a lot of questions that confuses me because he puts a lot of time and effort for his tutorial and slides.
The module trained our problem–solving skill, which is equally important (if not more) as coding skill. I like the different problems that have very elegant solutions. More importantly, many of these problems are closely related to real–life situations.
I am learning a lot with this module
problem sets, but quite time consuming
Taught me a lot of new things about algorithms
It is interesting on how to optimize our code.
–Challenging
Algos
Interesting content!
Challenging problems sets and data structures that I never knew existed before.
Ample practice through the frequent release of problem sets that breaks up the wholely theoretical side of the module and lets students apply what they've learnt to reinforce their concepts.
The problem sets were interesting
Coding segments. Easy to use forums, especially useful during the pandemic.
The algorithms, problem sets are fun and enjoyable.
problem–solving
NIL, I think i just dislike data structure and algorithms in general. Does not spark my interest. Probably just a field of CS that i'm not

Comments
interested in.
Elearning was handled well
We Learn plentiful of stuff
taught good problem solving skills
Learning about problem solving strategies
It is interesting.
requires a lot of brainstorming
Exposure to many different data structures
Interesting
Very interesting computer science theory
Helped me to improve my problem solving skills
Good lectures
– It taught me about algorithms which are very fundamental for computer science. – So many interesting stuff that I have explored while taking this module.
I feel like I really learnt a lot.
It has a heavy emphasis on problem solving and the solutions are often interesting applications of what we have learnt in class.
The recitation and tutorial questions were very interesting and relevant to the recent events, such as using pubg map for graphs shortest path problem, using graph to do contact–tracing for covid–19, etc. The contents covered in this module did pique my interest in many new fields, I have learnt many new ideas and gain a deeper understanding of data structure. There were many instances in this module that made me have "mind–blowing" moments!!!
The fun, challenging and relevant problem set given to us every week.
learnt about data structures and how to apply them
Everything
It's a good overview of data structures and algo. Definitely useful for future modules / internships.
Decently challenging and introduced a lot of new ideas that I was previously unfamiliar with.
Good intro to all the algorithms and data structures
learning depth, algorithims
The problem sets were really fun and made me feel accomplished. It allowed me to properly explore the concepts that were taught during lectures as well and understand how programming and DS/Algos come hand in hand.
I can see the relevance of what I'm learning in the real world. The problems given in class were really interesting and tough at times, but I guess it helped me see how the lecture content applies to real world (simplified) problems too.
It's a very interesting module. 10/10 must recommend for CS kids
It was challenging but very rewarding.
It really pushes me to become a better programmer in terms of finding more efficient solutions to work problems.
I would like to take the opportunity to thank the co–lecturer Prof Ben Leong for his commendable efforts in taking charge of all the admin matters in this module and giving us re–assurance during this hard times.
The practicality of the topics taught and the practice given.
Although I think the content and algorithm are difficult, it is really interesting to think about the algorithm by ourselves. It is like a design to make things fast and efficient. Once, I can write codes about the algorithm and make it run fast, it is really a great sense of achievement.
the content of the module was interesting and i learned a lot about different ways to solve problems. i also liked that we got a break from the problem sets on midterm week!
The ideas we learned
Enhanced my understanding of A LOT of different data structures and how to utilize them effectively.
The abstractness.
Useful algorithm module for future algo design
helps us think out of the box
The pace of the module and workload are acceptable.

Comments
It was eye–opening and extremely interesting.
I think this module is very interesting and it teaches students some important ideas and concepts in data structure and algorithm.
I like how the module let us apply the algorithms or the data structures learnt using actual java codes
Very applicable to real–life optimisation problems
Required a lot of thinking to solve questions in the module
Very interesting problem solving module, love to solve problems.
It is challenging and develops one's critical thinking
very interesting
It is a really important module in computer science and I feel that it was very well–taught. Looking forward to applying what I have learnt in future modules
–
Interesting subject
problem solving is fun
This module is a stepping–stone for my next modules. I really enjoyed this module.
This module showed me that I am unintelligent
Nil
I think the module is very interesting and the content when compared to other CS modules seems very reasonable.
The content! I thought learning about all the algorithms was really cool :)
Problems solving aspect
Well the students are motivated and a lot of them participated in the forum discussion which must have helped all of us learn a lot.
Lecturer is amazing, problem sets are fun, recitations and tutorials are good.
problem sets and contests
It provided us with many problems to try and solve. Although it is challenging, it was fun and interesting. It helped made learning the data structures and algorithms easier as well.
It is interesting seeing how certain concepts apply.
The problem sets are quite challenging, but I like the fact that ample time was provided to do them, if we do not start too late. Most of the time, the lecture slides builds on the lecture topics as well. It is quite fun and there is a sense of accomplishment when we are able to complete the problem sets.
open my eyes to the computing world
Problem sets, more pls :D
Problem sets are designed to be fun with enough time given for students to do. The use of coursemology allows student to make use of the forum fully.
explore the main topic and its variance.
Topics are covered to just the right depth
I enjoyed the homework and the capacity to focus on the learning objective rather than focusing on the grade. The concepts taught went beyond the concepts expected of any other generic algorithms and data structures module. Prof Seth also shown the wider perspective behind learning the fundamentals of an algorithms and data structures module, and shown both the applied and theoretical fields that convince of the relevance of the module.
Ideal introduction to data structure and algorithm. Difficult in a good way. Challenging and fun.
The problem sets are challenging
A lot of things related to real world problems
very interesting content

What I did not like about the module:

Comments
Some problem sets are very time consuming.
Pace was a bit too fast
It is simply quite difficult, which is not the fault of the module teachers.

Comments
The module went at a relatively fast pace. It was hard to keep up with the pace while having masses of knowledge to be digested every week. Some of the lectures could not be comprehended despite rewatching the webcasts for a few times. Certain concepts could be taught in a simpler way because the level of mathematics used is far more difficult than what most of us know, such as the calculation of the runtime analysis. The fact that some problem sets have harder and easier sections discourage students who are already facing difficulties in doing the easier sections, spending more than three full days on just the 'easier' questions. Easier and harder sections could have been made to have equal weightage and those who are better abled to solve the harder sections can attempt the harder section at their own pace. My understandings are that problem sets are there to help students learn and not to penalize the weaker ones. More help could be provided to the weaker students, such as walking through the solutions and the thinking process.
Too much content.
very tough
A small handful of the questions asked during the midterms were implementation specific. I think it would be better if the implementations that are actually used in practice (like say, the default implementations in most programming languages), which differ in slight but important ways from the ones taught in the lectures, are taught and tested on.
There is too much of content overload, I would prefer it if the syllabus was slightly reduced so we could focus on individual concepts for a longer period of time and absorb them better. I would also prefer having been given more practice questions with solutions to work on regularly.
Can get super hard at times. Spent few days just doing one problem set. :((((OH and I don't like how recitations and tutorials are only released 12 hours before my timeslots. it sucks. I hope theywere released earlier.
Great leap in difficulty from lecture materials to tutorials, problem sets and recitation – hard to keep up! Problem sets are too difficult, especially the later ones.
I don't think recitations in this module are that useful or effective. I have attended Jin Zhe's, Zhaomin's and Prof Ben's recitations and only Jin Zhe's recitations are easy/manageable to follow. While coursemology is alright, I think its forum misses a lot of piazza like features that could have helped many students in this module. 1) anonymous questions 2) better search features to check if e.g. a question about lectures have already been asked. Please do consider piazza next time. I think this module could do a little more in helping students communicate algo ideas better. Prof Ben once said something like the point of recitations was to discuss and communicate ideas, but I don't think I've developed that skill much in the module.
The problem sets are weekly with quite heavy workload, and towards finals week it gets really difficult because of workload
Kept changing the rules for finals. Very frustrating and stressful while trying to prepare for finals because we keep getting bombarded with exam announcements. Not to mention unmuted zoom meetings are not conductive, having to hear the background noise of 20+ other students. I understand that the profs are trying to ensure that cheating does not occur and it is very difficult to invigilate online exams, but these measures are rather overboard.
The module isn't encouraging to those who fall behind. It pushes students who are doing well in a engaging way, but it neglects those further behind as well. IMO, it's the type of module that would make students lagging behind consider dropping CS as a course. Overall I found it challenging in a good way, but I have friends who were struggling with it much more than I was.
Some problem sets were quite difficult and were beyond what was taught in class i.e. PS8 could have been easier after learning about dynamic programming.
COURSEMOLOGY IS IN DESPERATE NEED OF IMPROVEMENT. Being forced to use a platform that does not specify what exactly was the reason our code failed has caused much distress among students.
Problem Sets are often too challenging and does not contribute much the content learnt in lectures. PS sometimes are too targeted in terms of what is taught. Also, recitation is way way more useful than tutorial. Will appreciate if rect is longer and tutorial is cut short (might be bias because my TA does not contribute much to my learning and Jin for recitation is just way too good).
Stressful, too fast paced
Midterm results are still not out. Hard to review mistakes and learn from them
I am too dumb for this module.
The problem sets sometimes take too much time..
The problem sets are quite difficult, and the grading does not actually reflect one's effort put into solving them. For instance, I have spent over half a week doing problem set 5, however, because of errors I could not see in private cases, I couldn't fully debug my programme and in the end did not get a good grade for that problem set. On the other hand, I know of friends who discuss with those who are very good at Java and algorithm and solved the problem set very quickly and got better grade than me. Therefore, maybe more guides or hints can be given along the way so that we do not waste too much time trying solutions that are inherently wrong.

Comments
Tutorials are very tough and most of the time I find them very hard to finish.
The recitation was always in a rush, but I feel recitation is when we actually can learn most. The module didn't really teach me how to calculate the run time for the most part.
–too challenging
This mod had too much info overload. Other equivalent mods like CS2040 or CS2040C teach much less content and have easier labs that are actually understandable and applicable while I feel like I'm too busy reading essays for my problem sets, sometimes I don't even understand what the question is asking for until I see test cases. Likewise for questions in exams. I'm not sure which prof sets the questions but the questions are debatable as to what they are asking for. On top of that, I do not like how they do not reveal to us where we stand nor give us back our exam papers. How will I know whether I have enough knowledge and to check which topic I'm doing badly in when I don't even get back my papers and the problem sets don't even test what we learn in lectures??? The problem sets, I feel don't suit this module at all. It's something we should be doing after we finish taking this module; after we know all the data structures and algorithms so we can think about which one most suits each question...etc On top of all of this, the marking of Problem Sets is really really unfair. Some TAs are just stricter than others. I know passing all testcases doesn't mean my code is correct, but to not even get half the marks for each Problem Set just because my TA felt that I could have done better is a very pathetic excuse. Only some problems ask for "most efficient" so what's wrong with giving a solution with time complexity of n^3 when the most efficient is n^2logn? I still think n^3 is fine because the question never talked about efficiency. I know this whole module emphasises a lot about efficiency but it's just unfair when only my tutorialmates are affected while the rest are walking away with full marks. The profs keep going on and on about how grades aren't important. Yes, I'm planning to SU this mod anyways, but I don't want my juniors to suffer like me when they won't even be able to SU this mod. As much as grades aren't important, it's a fact that we will be deemed unsuitable for many of the NUS special programmes and some special mods just because of our CAP. So what's so wrong about wanting to get a good grade so I can participate in these programmes which will help me grow? As much as grades aren't so important, they are deemed important while we are in NUS and having a bad CAP can exclude us from participating in a lot of meaningful programmes. I really hope there will be a curriculum revamp for this module and change the problem sets. Even TAs find this module difficult and they have taken CS3230 somemore.
How long it took to mark my midterms
For the problem set, sometimes the gap between the content taught and the problem set given is very big, so I was very lost. The amount of content can be overwhelming at times.
Some of the problem sets are really difficult
The pace is too overwhelming, sometimes students are haplessly swamped with too much new content. There was one particular 1 hour lecture where both Newton's Method and Gradient Descent were taught and it left many students confused and drained. Unlike the other algorithms students have not quite come across a practical scenario that needs it and hence were struggling to conceptualise both of them. Perhaps it may be better to teach them in separate lectures in more detail instead of cramming them into a 45 min lecture. Perhaps for certain algorithms and data structures, if they are taught in another module later down the line, they could be dropped from this module to give students a bit more of a breather.
The workload is a bit high
Content heavy and weekly problem sets were very time consuming.
Sometimes unclear lecture slides. Not easy to develop my notes during pandemic
Sometimes the module structure was a bit messy.
GRAPHS WAS CANCER. Trim down the number of problem sets. Travelling Salesman problem got in the way of finals preparation.
Somewhat high workload, with 1 Recitation, 1 Tutorial, 3 hours of Lecture and one assignment due every week.
It may be too difficult for students who are didn't have any programming background
module is tough
You will never know why you failed Coursemology test cases.
nil
It should have covered more topic
I think recitations are hard to follow and can be explained clearer
Some of the problem sets had quite short deadlines especially, I wish we would be given 2 weeks to finish every problem set
Brain Wrecker

Comments
I'm stupid
Some material (like proofs) were very difficult to grasp.
There is a lot of content and some concepts are not easy to grasp and apply.
The contents are rather heavy and more in–depth for this module as compared to its counterparts (preclusion mods: cs2040 and cs2040c). Firstly, the contents covered within the limited amount of time (13 weeks) is overwhelming. Most of the time, I felt that I had to further read up on many important things which I believe the teaching team assumes the vast majority of us have knowledge on but in reality, only a few know. Although I know that it is important for us as students to do our own extra readings aside from relying on lectures alone, I found that the amount of extra readings I have to do is too extensive, and the content of the lectures do not do much in aiding me to complete the problem sets that were done every week in a short amount of time. For example, for the hashing problem set, where we should ideally override the hashcode for arrays in order to efficiency do autocomplete, I took many days to google and read up in order to understand how java hash function works and be able to implement the most efficient way to solve the problem set questions. Given the time limit of only a week to do this on top of all the other modules I take, in addition to the fact that this was not covered in the lectures, I found it extremely difficult to do, and I believe most of my batch mates, who do not have this prior knowledge on hashcode, found it difficult as well. Secondly, lectures and recitation classes are too closely spaced in the week. Our weekly 2 hour lectures are on Mondays 4 to 6 pm, and of course, I know that we should attend lectures in person, listen and jot down the crucial points we learnt from it, but in reality, many of us would not only miss or overlook certain points (since human are not perfect creatures) but also need time to digest and understand the entire 2 hours of content. On top of that, the combination of the time it takes for lectures to be uploaded as a webcast and the delay of releasing lecture slides after the lecture was conducted due to the teaching team way of thinking (where students could better follow the pace of the lecturer during lectures and not be lost in flipping their slides), this combination made it very difficult for me to consolidate and review my notes before trying out the recitation worksheet on Monday evenings (recitations are on Tuesdays). This is a weekly recurring problem for me and many times, I go for recitations completely lost. This defeats the purpose of recitations, which is to revisit the materials went through in lectures, which is a pity as it not only stresses students out but also makes the efforts of TAs futile. Overall, I feel that this module is not friendly for students who are new to computer science and seems to be catered more for those who have prior basic experience. This could potentially demoralise a student, raise academic pressure and some may even lose their passion in this field. Even though we all know that ultimately, grades are not everything it is the learning that matters, but many times, we are aware that there are certain programmes offered by the university and internships do use grades as one of its criteria for a student to be chosen no matter how significant or insignificant it is, therefore we still cannot run away from the grading culture. Given that this module is mostly taken by year 1 computer science student, I believe many of us are beginners in this field with very limited prior knowledge (since computing is a completely new field for many who came from JC). I would like to suggest that the teaching team could understand where I am coming from and hope that the team could review on how they can better their teaching pace and materials so that it would be more friendly to the future incoming students, keeping in mind that there would be many who have limited knowledge on computer science.
Nothing its great
some problems sets are taking too much time and they do not show the output of the tests which causes me to debug days just for one line
Felt recitations could have been part of tutorial
It is way too much content for a beginner module. Possible to split into different modules?
The grading was really delayed and we did not know the mark distribution. Though these are understandable.
Very demanding, feels like a 6MC module
too fast paced, no idea whats the format for exams
It was a real mad rush for me and I couldn't cope that well with the pace of new information given. This made me attend tutorials without even attempting them and other lapses that greatly affect my learning for the mod. But these are issues on my part though.
I still have not received my midterm :(
Sometimes the question are too long for the duration.
Not much chances for us to practice programming skills, but each problem set's difficulty had killed me, either I get stuck not understanding how to start or the private test cases destroyed me.
One or two of the topics (gradient descent for example) felt out of place and did not feel integrated into this module.
Obviously the content is difficult, but this is also where the sense of achievement come. By conquering great difficulties, I feel myself getting stronger. However, I seriously think examination can no longer be a true reflection of our ability in this module. Various

Comments
factors make us stressful, especially during this period. Hence, I think what I do not like is the exam–driven nature of this module.
the problem sets were difficult and took a lot of time to complete.
nil
2fast2furious ggez
The abstractness.
Difficult and requires alot of time to process and comprehend
Midterms not returned to us even up to Week 13. The difficulty of problem sets which translates to how much time we have to spend on them could be more consistent given that the time given to complete them is generally the same. If there is a need for a much more difficult PS (eg. PS8), more time could be given to complete that particular PS. More transparency could be given on the grading of this module. I understand the perspective that we should focus more on the learning instead of solely on grades. However, I believe some of us, including myself, are more driven and motivated by specific and tangible goals, hence more transparency in terms of the grading would definitely compel me to work harder.
There's a lot of content for this module, so the learning curve is pretty steep. Also, please give us more instructions on how to operate IntelliJ.
Maybe sometimes the pace is a bit fast.
Very few information about the private cases when they are failed, and it is very difficult and time–consuming to debug without any feedback.
Difficulty
some concepts are hard to grasp
Pretty much pseudocodes were given and I find it difficult to translate into actual Java codes. Maybe sample java codes could be given but these sample codes should be modified and applied in Problem Sets (and not directly copied).
it might be a little too challenging
nil
–
Very hard
This module showed me that I am unintelligent
Nil
Could be more transparent in terms of the marks breakdown. The breakdown was not announced to students.
I think the problem sets can be quite complicated sometimes and gives me additional anxiety because it is graded.
The instruction for Problem set can be confusing at time, especially since the phrasing of the questions are usually very long and they have very few test cases to look through
I hate Java (though I can see why it's a necessary evil for this class, OOP makes data structures easier to get)
Graphs
It is very difficult and very fast. I'm very overwhelmed although I have spent a lot of time studying for this module.
At the start, I was not given any map about the entirety of the module. So every week is always a fresh new concept. But not necessarily a bad thing.
Honestly the way many topics in this module were covered was overly lengthy and made it much, much harder to understand compared to just google the topic and read
This mod should be more transparent about the grading scheme(i.e. what are the grades made up of and their percentage) rather than providing vague information and using "You should focus on the learning rather than concerning too much about the grades" as an excuse. I do think learning is the most important thing but I also believe that knowing how much time should be spent on each components of this mod is essential too.
Difficult, because it needs a lot of abstract thinking for it sometimes only focus on algorithms but I have difficulty writeing the algo into decdent code
I honestly enjoyed the module other than the fact that it was quite time consuming
At the start of the module, more guide and help can be given to those who are just starting out Java, and are still unsure of how things work. Similarly to the usage of IntelliJ. Perhaps more time can be given to do the recitations. Often they are released too late and there is not enough time to do it and we end up going to the recitation just to listen to the answers before looking through. Also not sure if is just me but tutorial questions are often hard to digest and difficult to answer.

Comments
the last problem set being cancelled
Midterm was quite writing–heavy for an algorithms module.
heavy content
Policies are sometimes too opaque
Nil.
To hard to understand
Some problem sets (eg regex) were very tedious and did not provide much learning compared to the time spent Exam was badly written. Tested a lot on knowing actual implementation, and was tedious and vulnerable to careless mistakes, rather than questions testing concepts.