

University of Michigan

Winter 2022 Instructor Report With Comments

NAVARCH 568 881 - EECS 568 881 - ROB 530 881

Maani Ghaffari Jadidi

48 out of 50 students responded to this evaluation.

Responses to University-wide questions about the course:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
This course advanced my understanding of the subject matter. (Q1631)	27	16	1	0	0	1	4.7	4.6	4.5
My interest in the subject has increased because of this course. (Q1632)	25	16	5	0	0	1	4.6	4.2	4.3
I knew what was expected of me in this course.(Q1633)	16	23	7	0	0	1	4.2	4.6	4.3
I had a strong desire to take this course.(Q4)	21	17	7	1	0	1	4.4	4.1	4.3
As compared with other courses of equal credit, the workload for this course was (SA=Much Lighter, A=Lighter, N=Typical, D=Heavier, SD=Much Heavier). (Q891)	2	1	20	15	8	1	2.5	3.0	2.6

Responses to University-wide questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median	Univ-wide Median	School/College Median
Maani Ghaffari Jadidi seemed well prepared for class meetings.(Q230)	28	15	3	0	0	1	4.7	4.8	4.6
Maani Ghaffari Jadidi explained material clearly.(Q199)	19	14	12	1	0	1	4.2	4.7	4.3
Maani Ghaffari Jadidi treated students with respect. (Q217)	34	10	2	0	0	1	4.8	4.8	4.7

Responses to questions about the course:

	SA	A	N	D	SD	N/A	Your Median
Overall, this was an excellent course. (Q1)	20	19	6	1	0	1	4.3
This course increased my desire to learn more about this subject in the future. (Q32)	28	14	3	1	0	1	4.7
Students felt comfortable asking questions. (Q892)	28	14	4	0	0	1	4.7

Responses to questions about the instructor:

	SA	A	N	D	SD	N/A	Your Median
Overall, Maani Ghaffari Jadidi was an excellent teacher. (Q2)	23	18	4	1	0	1	4.5
Maani Ghaffari Jadidi taught near the class level. (Q212)	21	13	9	2	0	1	4.4
Maani Ghaffari Jadidi acknowledged all questions insofar as possible. (Q216)	28	16	2	0	0	1	4.7

The medians are calculated from Winter 2022 data. University-wide medians are based on all UM classes in which an item was used. The school/college medians in this report are based on classes that are graduate level with enrollment of 75 or greater in College of Engineering.

Written Comments

How would you change this course? (Q907)

Comments
I think it would be nice if the recitation could become an actual part of the course. The recitations I went to were very helpful but I couldn't go to many since I had another class scheduled during both options. There could also be a little bit more of a slow introduction to some of the higher level mathematical concepts (Lie algebra, and probability theory in particular) for students who aren't as familiar
Maybe touch upon some of the robotics set-up stuff as well. I understand the goal is to understand papers but hands-on with ROS, Gazebo, rviz etc should not be assumed and one or two lectures can be dedicated to it.
Provide faster turn-around time for getting graded homework back to the students
I am personally a reader, I like to read books, papers and I feel happy when I get space to think about the subject deeply. It doesn't interest me much when I'm doing something only for the sake of assignments which on contrary, I have found in other students who without having much understanding can still perform good in assignments/projects. If the courses are inclusive of reasoning abilities that help build the "logical intuitive skills" in students, then for future it will help them grow their problem-solving skills, debugging and analyzing skills for much more challenging problems because their fundamentals and grassroot learning is very strong.
The slide for this course could be more clear and the canvas for slides and notes could be organized more systematically.
It is good as it is.
Ros, as powerful of a tool as it is, is extremely difficult to figure out if not used to using different operating system environments. The GSIs did a pretty good job of helping, but the hassle of trying to learn the software tool took too much time before actually making progress on the homework. Same for GTSAM.
I would change the HW structures. Don't get me wrong, the subjects of the HWs are very good, it is just the instructions and templates are a little hard to follow
Change some handwriting equations to latex. Have detailed documentation of how to install ROS.
If possible, I'd like to form the final project team myself, rather than randomly having teammates.
One thing – NON-RANDOM GROUPS!! The problem with random groups is that you end up with people with very different objectives/interests, and it's hard to find a project which will help everyone learn what they want to learn.
The assignments were not great. Oftentimes the ability to complete an assignment hinged on whether one saw a particular reply to a post on Piazza. The homework templates were sometimes misleading. They might include a section labeled as "your code here" but require modifications elsewhere in order to run correctly.
The homework makes a pretty large leap from "here are concepts lets talk about them" to "implement the entire filter". It feels like there needs to be questions in the middle where you're implementing a small part of the filter, or doing some Lie Algebra math where there's a way to validate the results. Also, for 501 the recitations were sessions where we would do worksheets and complete questions similar to the homework. I think this class could really use something like that. The recitations were fine, but they could have been a much large part of the class and helped to get through the lie algebra portions of the course.
Change the course title from "mobile robotics" to "robotics perception and localization".
Expectations/prereqs for the course would have been valuable. I didn't know going in how much experience in probability and programming would be required which made it really difficult.
Homework workload is too heavy, especially for assignment 5 and 6.
make it a bit slower paced
To provide more visual presenstations
The notes that were being output at the beginning of the semester were nice. Very helpful! Just hoped that notes would continue to be published as the course went on. I understand that sometimes notes are difficult to transcribe. However, the structure in which they explain material sometimes felt more "linear" compared to slides.
Na

Which aspects of this course were most valuable? (Q908)

Comments
I have a really solid understanding of the fundamentals of probabilistic state estimation and perception which I think is really valuable
The assignments were the most valuable things/
The quick piazza responses and the recorded lectures/ability to attend online.
Not having exams, is according to me a good approach. Writing exams is a rote-learning technique where people having the most memorizing skills shine. For our future in academics, industry, research or wherever I don't think we are any longer required to do exams, then what's the benefit of having quizzes or exams. Rather, the focus should be on, "how do you implement certain concept for certain application" or "how can you enhance certain theory to output improved results". So, I liked the course structure not involving exams.
The project is great for students to implement the knowledge we learned from book to practice. Also, the gsis are so responsible and patient. They offered us a lot of help.
1. The parts about different Filtering algorithms 2. The introduction of SLAM
The new information, and the most updated SLAM
I appreciated that homework and example code was in multiple languages, making it more accessible to people that are less confident in computer science. The homework, project, and class use cases were interesting and concrete, which helped understand the material.
Writing codes to implement the algorithm.
Lectures and homeworks were both great!
Everything for me is new and valuable.
Having the recordings to go back through my notes and expand on them when the information was going too quickly.
I found Maani's commentary to be among the most useful aspects of the course. He would discuss historical aspects of the development of the theory and provide insight into why certain techniques won out over others. I also generally found the sample code extremely helpful and have already used variants of it in my own work.
The implementation of the filters and algorithms were the most useful part, even if it took a long time to do it.
The course taught Kalman filters and Lie algebra clearly and usefully.
The instructor team is very active and helpful answering questions on piazza.
The assignments
The implementation and experiment
The project and the in-depth homework assignments.
I really like the recommendations related to the course, such as books, online courses and youtube videos. Those helped me a lot for understanding course materials.

Which aspects of this course were least valuable? (Q909)

Comments
I thought the invariant EKF part of the course was a little too theoretical for me. I really enjoyed it and a very interested in it, but the math was more abstract than I am used to and the skills were sort of hard to apply. I think this part of the course was valuable because I got to learn a lot about something I knew very little about, but I felt this material strayed from the essence of the course.
Advance level filters which I might never implement in the industry.
I really think that all parts of this course are valuable. You may be able to strip out a guest lecture, but they offer examples of applying theory in the real world.
It was a good course, I have always been interested in this field for many years now, so I honestly don't have anything against. I might be a bit biased because of my love for this subject. But overall, not focusing on the nitty-gritties, everything was valuable.
The slides and explanations from instructor can be improved to let students better understand it
Handwritten those equations.
Honestly the project – I ended up on a project I wasn't very interested in.
The group project was a huge time sink with minimal reward. The requirements favor a strong mathematical background and students who lack that background find it difficult to make meaningful contributions. On the other end of the spectrum, students who already have that background find themselves doing the bulk of the heavy lifting with regards to writing code and the manuscript. I understand the motivation for wanting to include a group project, but I found it to be actively detrimental to my learning in this course.
The final project really didn't provide anything for me personally. We worked on an InEKF for months and never got it working, and the class hadn't taught me enough on what I was doing wrong to attempt to fix it. I struggled to even come up with the questions we needed to ask the professor to get information that would fix it. I understand that projects are useful for learning, but with how new the field is it seems like advancements are difficult to come by. Also, looking back our proposal made zero sense (we asked about using ORBSLAM with InEKF which ORBSLAM doesn't have a KF), and the instructional team didn't make any effort to stop us. We were able to pivot later but we wasted a lot of time working on something that couldn't be done for a class project.
The final project. A big project like such may require students do parts of work that are totally unrelated to the course material.
NA
The whole course was very useful in general
Sometimes the lecture felt too "mathy" or theoretical whereas the homework assignments were very practical. Making that jump was sometimes difficult.
na

How can Maani Ghaffari Jadidi improve the teaching of this course? (Q901)

Comments
Sometimes the lectures went a little bit fast and it was a little hard to follow. He paused and asked if there were any questions, but most of the time I didn't have specific questions about the material, rather I just needed a minute to let the concepts sink in.
He's awesome already !
I would continue to be flexible with the schedule. It really helped me balance my work–school–life balance and get the most out of the assignments instead of rushing to get everything in by the due date. I think it may also be beneficial to have a lecture devoted to a case study of how a robot such as Cassie works/applies the theories we learned in class.
Professor is excellent, he is connected to the students which is a very good trait because learning is never one way. Students and teachers can learn and grow together from each others' experience.
Explain more about the mathematical derivations. Prepare more about probability background.
I think he is doing an awesome job, it is understandable how hard to cover all those tough materials
More detailed lecture notes! The supplemental notes were much clearer and more succinct than the textbooks.
It would be nice to see more numerical examples of each filter.
Spend less time writing down equations, and spend more time explaining the meaning behind them.
Non–random groups.
(1) More consistent notation. Particularly early on on the course, when students are not as familiar with the notation, consistent labels for the various quantities involved can help maintain a better mental model and establish connections between the various filter types.
(2) Better templates. Work towards making the templates more "dummy" proof with consistent notation that matches the lectures. The Python templates in particular look as though they were written by a MATLAB user (column–major ordering for arrays, classes as structs, etc) and used non–idiomatic constructs which makes it harder to focus on the mathematics.
(3) Make the group project an individual project with reduced scope.
It's very obvious that Professor Ghaffari is extremely smart and a great researcher, but he really feels like he struggles as a teacher. The lecture slides he produces are extremely dense and difficult to parse through, and since he's moving through them so quickly it's difficult to take notes at a fast enough pace for them to be useful. While covering Lie Algebra specifically, I constantly felt like I didn't understand what was going on, and I'm still not confident I could explain to someone else what it actually means. For specific improvements:
1. Redo the lecture slides to be more comprehensible. I personally succeeded in 501 because Ozay wrote during class instead of presenting slides. I doubt this is viable for this class, but I did feel like I learned better when you wrote instead of presented slides. In cases where this isn't possible, more English on the slides explaining what is happening at any given point would be useful.
2. Make sure variables are consistent. I spent hours trying to relate the homework to the slides to the textbooks, because all 3 had different variable names for the same thing. This made it brutally difficult to solidify my understand of a topic since I never could figure out what a specific variable meant.
The course taught some great methods like InEKF, but it would be better to taught more of its development history, philosophy, and its shortcomings.
Prof. Maani Ghaffari may consider giving more time for project.
Professor Maani has done a great job at the course instruction. Kudos to the GSIs.
Prof. Ghaffari cares greatly about his students. He adapts the curriculum and deadlines to the student's needs and provides all the help we need to thoroughly understand the matter.
Personally, I had difficulties following the lectures. Too little visual examples and the direct entry into the hardcore underlying theory made it difficult to understand. I found myself watching other lectures (Cyrill Stachniss) too often! It discouraged me from attending lectures and engaging in the matter. Particularly the InEKF and lie algebra. The second half of the course for SLAM was better!
This course is easily one of the most important classes in the Robotics Program. Prof. Ghaffari is a very experienced teacher who supports his students in every way possible. If the lectures would be a bit easier to follow, I would give this class a 5/5
My biggest ask would be notes. Everything else about the course was pretty spectacular. The slides were good without the notes, but the notes sometimes just told the story more completely.
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