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Application Summary

Competition Details

Competition Title:	2024 CTL Junior Faculty Teaching Excellence Award
Category:	
Cycle:	
Submission Deadline:	02/9/2024 11:59 PM

Application Information

Application Title:	Ani_Mazumdar_CTL_Junior Faculty Teaching Excellence Award 2024
Application ID:	11744
Submission Date:	02/9/2024 7:40 PM

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Primary School or Department

George W. Woodruff School of Mechanical Engineering

Primary Appointment Title:	Eugene C. Gwaltney, Jr. School Chair and Professor

Application Details

Proposal Title

Ani_Mazumdar_CTL_Junior Faculty Teaching Excellence Award 2024

Date: February 7, 2024

To: 2024 CTL Award Selection Committee

Re: Letter of Support for Dr. Anirban Mazumdar for the 2024 CTL Junior Faculty Teaching Excellence Award

Dear Members of the Awards Selection Committee:

With this letter, I strongly support the nomination of Dr. Anirban Mazumdar for the 2024 Center for Teaching and Learning Junior Faculty Teaching Excellence Award. As Chair of the George W. Woodruff School of Mechanical Engineering, I can attest that Dr. Mazumdar has had significant positive impact on the Woodruff School of Mechanical Engineering as well as the College of Engineering and the Institute through his work and leadership in teaching inside and outside the classroom environment, student mentoring and educational program development.

Dr. Mazumdar joined the Woodruff School of Mechanical Engineering as Assistant Professor in January of 2018 after working as a postdoctoral researcher at Sandia National Lab for five years. Since he joined the Woodruff school, he has taught two undergraduate courses, ME 4451 Robotics and VIP: Low course aerial autonomy, and one graduate course ME 6407 Graduate Robotics. In the six years he has been teaching he taught more than 620 students in the ME 4451 course, about 100 in the VIP course and about 20 in the graduate course. Dr. Mazumdar's teaching expands outside the classroom as he regularly mentors and guides undergraduate students in research, a total of 24 students in the last six years in addition of course to mentoring his own graduate students.

Dr. Mazumdar is an excellent and passionate instructor. His teaching effectiveness scores are typically above 4.8 and 4.9, with 4.0 being the lowest score he received only few times, which are simply outstanding and among the best in the school. He is one of our top instructors and probably the best among assistant professors, who often prioritize research over teaching in the early years of their academic career. Dr Mazumdar also goes the extra mile in ensuring students understand the material and makes himself available encouraging students to seek out help and stop by to meet with him. I can personally testify to this as my office is near Ani's and I often see students waiting outside his office. He enthusiastically explains concepts in robotics and automation and encourages peer learning and collaboration. When it comes to mentoring and teaching his undergraduate researchers, he personally meets

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Ranjan, Devesh - #11744

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with them, trains them and helps them develop the skills they need to be successful researchers often inspiring them to apply to graduate school.

Dr. Mazumdar's passion for education and student learning is unbridled and infectious. He is a sough after instructor, and it is no surprise that his sections always fill up very quickly with students during enrollment. Dr. Mazumdar has developed a vibrant and well-funded research program focusing on robot mobility with the ultimate goal to understand and achieve agile, versatile and efficient robot behavior in unstructured environments. He also has a joined appointment in Sandia National Lab. It's this expertise, knowledge, and excitement he always brings in his class teaching the students on topics he is truly passionate about. This is what makes him such an engaging educator.

Overall, Dr. Mazumdar's teaching and student mentoring activities are simply outstanding. Through his leadership in education, Dr. Mazumdar is bringing lasting, positive change to numerous students of the Woodruff School, the College of Engineering, and the Institute. In my opinion, according to Dr. Mazumdar's teaching accomplishments and performance, he should have received many teaching related awards, however he is either too hamble or focused so much into his teaching that never before did he even consider applying for an award. That is why I am very excited for this nomination.

Again, I strongly support awarding the 2024 CTL junior Faculty Teaching Excellence Award to Dr. Anirban Mazumdar. He is one of our top instructors in all metrics including CIOS scores, comments by students, opinion of colleagues. He is truly deserving of this award.

Please note that by accident, my colleague who provide the reference letter has listed the award as "Outstanding teaching award" when the award Dr. Mazumdar is nominated for is the "Junior faculty teaching excellence award".

Sincerely,

Devesh Ranjan

Devesh Ranjan (he/him/his)
Eugene C. Gwaltney, Jr. School Chair and Professor
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Georgia Institute of Technology, Atlanta, Georgia 30332-0405 U.S.A.
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<div align="center">

Dr. Anirban Mazumdar
Woodruff School of Mechanical Engineering
February 8th, 2024

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Georgia Tech Center for Teaching and Learning Junior Faculty Teaching Excellence Award

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Reflective Statement on Teaching

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Teaching Vision

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"Working problems out together really reinforced all the equations and tidbits to remember and then tying that problem back to why you would ever want to actually remember this made the class great" - ME 4451 student

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This quote from one of my former students highlights my vision for teaching. My goal as a teacher is to help students achieve their future aspirations by providing education, skills, and confidence. While their careers will vary dramatically, I want each of my students to be able to highlight at least one thing they learned from me that positively impacted their career. This can be a technical concept, a key skill, a problem-solving technique. or a way of working as a team.

My teaching and research mentorship focuses on robotics and autonomous systems. Georgia Tech students studying these fields are capable of pursuing a wide range of future paths including industrial robotics, graduate studies, and applied research at government institutions. Many students are also interested in careers in areas that we do not generally associate with robotics such as computer game design, animation, and clean energy. I have not discovered a single concept or equation that will positively impact such a range of future paths. Therefore, I strive to achieve my teaching vision by creating innovative laboratory exercises, formulating new lectures based on my professional experience at a National Laboratory, leading robotics research projects, and improving the accessibility of complex concepts and systems.

I have made a large impact on course-based undergraduate robotics education at Georgia Tech. I currently teach the only mechanical engineering undergraduate robotics course ("Robotics", ME 4451) and a vertically integrated projects (VIP) course titled "Low Cost Aerial Autonomy. Through these two courses, I educate students across a range of levels and majors in topics ranging from robot mechanisms, artificial intelligence, motion planning, and mobile robotics. I have also made an impact on both undergraduate and graduate robotics research at Georgia Tech. I currently mentor 15 graduate students and I have advised 10 graduate students who have graduated. I have also supported a range of undergraduate researchers from around the nation.

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Illustrations of the Candidate's Teaching Excellence and the Impact on Student Learning

Innovation in the Classroom

My educational career has thus far focused on robotics education. I have innovated in the classroom in two core ways: i) introducing more educational opportunities for learning about autonomous vehicles and drones, ii) providing greater opportunities for personalized education.

i) Additional Educational Opportunities in Autonomous Vehicles and Drones

I joined Georgia Tech in 2018, which was when the field of drones and autonomous cars was rapidly growing. I realized that the existing robotics courses were not covering many topics that students were interested in. For example, ME 4451 was using antiquated mobile robots for the labs and did not cover mobile robotics heavily. Therefore, I worked with the school of mechanical engineering to obtain the latest mobile robots. These robots are smaller, feature more sensors, and utilize industry-grade software. I also worked with my teaching assistants to formulate new laboratory exercises that would fully leverage these new robots. For
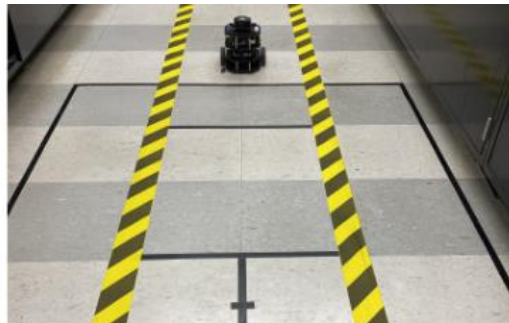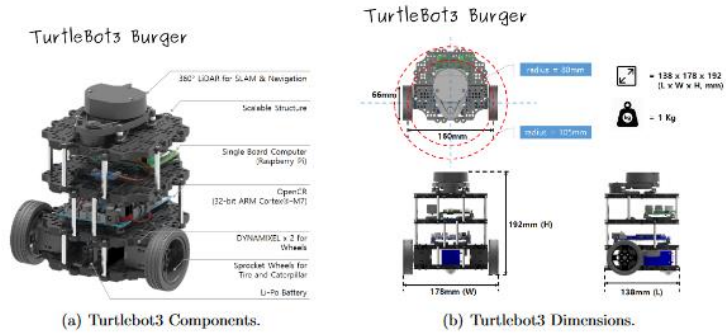

Figure 1: Photos illustrating the revised mobile robot hardware and additional lab exercises.

example, a new lab module examines the use of LIDAR sensing and how to use it to avoid crashing into obstacles. Images of the new TurtleBots and a lab exercise example are shown in Fig. 1. In addition, we recently retrofitted our equipment to include studies of GPS-type sensors. Since the actual GPS signal does not work inside buildings, I worked with our TAs to instrument the laboratory with a beacon system that can emulated GPS performance. We created a new lab that focuses on using this beacon system for robot positioning.

I have also transformed how Georgia Tech students learn about mobile robots. The ME 4451 course originally focused heavily on robot arms. While I have kept core robot-arm content, I have added several new lectures on mobile robot motion, controls, sensors, and navigation. In addition, I created a new VIP Course called Low Cost Aerial Autonomy. This course enables students to have hands-on experience with a wide range of aerial robot/drone topics including mechatronic design, flight mechanics, motion planning, machine learning, and artificial intelligence. I have created several sub-teams focused on each of these areas. This course enables a much broader set of Georgia Tech students learn about drones. This is because VIP is open to a range of grade levels and majors.

ii) Providing Greater Opportunities for Personalized Lab Experiences

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I strive to provide students with more personal interactions with robotics. Specifically, I want to make sure all my students learn from frustration of working with fragile and limited hardware. I also want them to all feel the tangible satisfaction when things work and the robot physically executes the desired action. Balancing this desire with the popularity of the course is challenging. Our lab sections consist of 16 students, but we only have space for 4 lab stations. When I first started the course, the lab sections were divided into groups of 4. However, I discovered that 4 students could not share the same experience when trying to use 1 system. Usually 1-2 students per team were left out and had much more limited interactions with the hardware. Therefore, formulated a new lab architecture where the lab section is broken into 2 subsections. Students are supposed to use half the lab period time to develop their code and then use the other half to put their code on the robots and execute the tasks. This means that we now have teams of 2 students. This has greatly increased the amount of interaction each student gets with the robot.

COVID-19 was very disruptive to my vision of personalized laboratory experiences. My students in Fall 2020 and Spring 2021 were literally spread throughout the world. It was not obvious how we would be able to do any laboratory exercises and we gave some thought to creating simulation environments. I felt strongly that the physical robots were
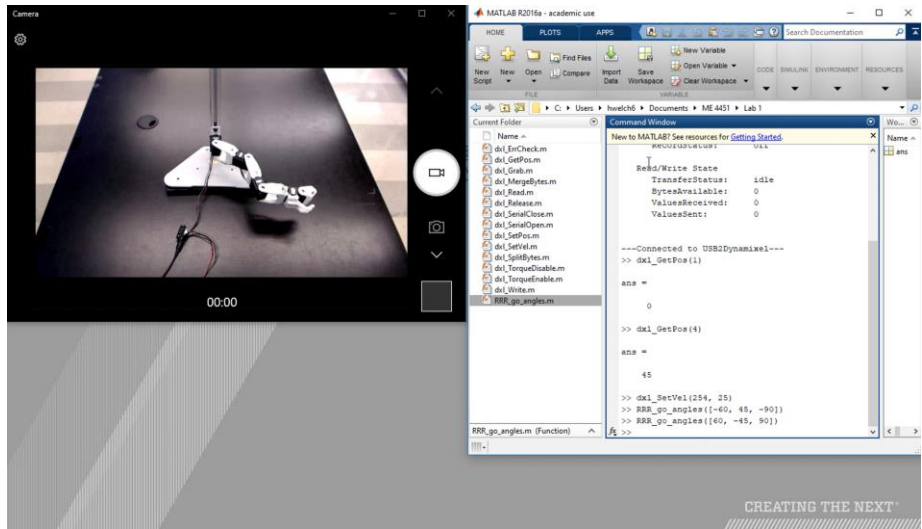

Figure 2: An example image showing a flipped lab experience. This enabled students to perform the lab exercises with hardware while around the world during the COVID-19 pandemic.

one of the most unique parts of the class. Therefore, I worked with the TAs to create the concept of *Flipped Labs.* This meant that the TAs would be physically in lab while the students worked from home. We created infrastructure that enabled the students to remotely connect to the laboratory computers and control the physical robots. We added a set of webcams so that each team could see their robot moving around in the lab. This worked out better than I imagined due to the hard work and innovation of the TAs: Hogan Welch and Raymond Kim. An example of our environment is shown in Fig. 2. The webcam shows the robot and the Matlab can be used to control the robot directly (albeit with some latency). The students were literally controlling Georgia Tech robots from around the world! I think this was one of the most unique teaching approaches for robotics. It also helped lighten the atmosphere through unintentional humor. There were cases where the TAs would scream "make it stop" as the robot behaved erratically and the students frantically tried to stop their script from hundreds of miles away.

Teaching Excellence

I have achieved teaching excellence through both quantitative and qualitative measures. First, I impact a substantial number of robotics students each semester. I teach ~100 ME 4451 students

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per year. This represents a ~3x increase over the 32/year that was the norm before I started at Georgia Tech . Second, I have generally achieved high CIOS scores for overall effectiveness in ME 4451. I have received a 4.8 or higher effectiveness score in 9 out of the 11 semesters I have been evaluated. Third, I have received very profound and satisfying positive feedback on my teaching performance from my ME 4451 students. Some examples from the CIOS feedback are provided below.

Comments on Teaching Effectiveness
- *Dr. Mazumdar's real world experience and his understanding and empathy for students made this course especially effective and engaging.*
- *Dr. Mazumdar was very knowledgeable about the subject and would make connections to real-world problems.*
- *One of the best professors and classes that I have taken at Tech.*
- *Dr. Mazumdar is a young professor that cares about teaching and re-wording or describing in another way as necessary to clarify points instead of just continuing and leave students lost like many older professors.*
- *He really knows what he is talking about - both because of his research here and maybe even to a bigger degree, his interactions with the robotics industry outside of GT. He is very clear about why you are learning what you are in the class and how it's actually applicable to time after tech and not just to get the A. This is something very few instructors intentionally make a point of and it was very helpful and reinforced why we should care and actually learn/retain*
- *I think Dr. Mazumdar did a great job explaining the subject matter as well as the extraneous topics that are needed to function as an actual robotics engineer*
- *Dr. Mazumdar was a great professor! It was evident he cared and spent a lot of time preparing the class. He made it fun and interesting to learn and was always available to help us out!*
- *Amazing course and would take the course over and recommend to other students.*
- *This professor actually cared about the quality of his teaching and was genuinely interested in helping students learn the material. The best professor I've had during my five years at Georgia Tech.*

Accessibility to Students

My view of accessibility is that I want students to be able feel comfortable learning from me, asking questions, and sharing feedback. I try to maximize the impact of my in-class interactions. I attempt to have students "fill in the blanks" during lectures, and I ask them to explain their reasoning rather than simply stating the answer is "right" or "wrong." I stay after lectures to answer questions at the whiteboard and try to schedule follow-on discussions. I also visit the labs especially towards the end of the semester to check on the students and ensure that they are still enjoying the course (despite the mounting end of term pressures). Recently I implemented a new topic for my final lecture. I try to make it an informal end to the semester where the students can ask me any question about the course, the robotics field, research, graduate school, and job opportunities. I close the lecture by asking two pointed questions:
  a) *What was your favorite part of the course?*
  b) *What are your suggestions for improvements?*

The student feedback is both positive and negative. The negative feedback is never fun to hear, but those comments do help me improve the course. Finally, I believe that the material should also feel accessible to the students. Many students are interested in robotics because they found it fun in high school or are excited by popular culture. I want my course to remind the students how fulfilling and enjoyable robotics can be. I try to achieve this by sharing my enthusiasm for the topics and emphasizing to the students the power of what they are learning. I have provided some examples from my CIOS responses describing my accessibility to students and how I leverage my enthusiasm.

- *Very approachable and friendly, also extremely knowledgable in the field of robotics*
- *His approachability and ability to relate the class material to real life examples.*
- *Always kept students engaged and called on us in a way that didnt make us scared to answer and furthered the class discussion*
- *He engaged the students very well in class and lab. He made a point to know our names and in some cases to get to know us beyond that. It is hard to really quantify the difference it makes but it doesn't go without noticing and I highly appreciate it.*
- *Really understands what it is like to be a student and is very considerate. Sets very reasonable expectations and is willing to adapt to students' needs. He is the most respectful professor I have met so far.*
- *Dr. Mazumdar was an awesome professor who understands student needs and makes sure students are challenged and learning. He also understands the difficulty in which students have with stuff on top of school.*
- *Professor Mazumdar was fantastic. Beyond being an effective teacher, he also very much cared about us as students. I'd specifically note that my interactions with Professor Mazumdar at one point even prevented a panic attack. Please let him keep teaching this course.*
- *Dr. Mazumdar always brought a positive energy into lecture and did a really great job of breaking down topics into easy to understand segments. I appreciated that he went over materials that were relevant to different topics even if they were covered in prior courses.*
- *Class was fun and engaging, everyone got a chance to speak and contribute to the conversation. It was great to often be reminded how mathematical concepts could be related to real world application.*
- *Always kept students engaged and called on us in a way that didnt make us scared to answer and furthered the class discussion*
- *The greatest strength of this instructor was his amount of knowledge in the field and his enthusiasm for the course.*
- *Dr. Mazumdar is very empathetic to students and is also a great lecturer. His lecturers are always interesting and made me always want to go to lecture every week.*
- *Dr. Mazumdar had great enthusiasm for the material and communicated with students very effectively. His passion for the subject helped foster interest in myself and others students regarding robotics. He was also always available to answer any questions and made adjustments when appropriate*

Connections Between Research and Learning

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I discovered my love of robotics and automation through an undergraduate research opportunity. Therefore, I have always been passionate about using robotics research to increase student engagement and learning. I integrate research and learning in several ways: i) using examples from research in my undergraduate robotics course (ME 4451), ii) teaching a VIP course that enables students to work on research projects, iii) provide undergraduate research opportunities on campus and in my laboratory.

Leg Mode   Wheel Mode

Figure 3: Image of a robotics research project hat that is highlighted in ME 4451.

i) Incorporating Robotics Research into ME 4451

I use my research to excite students about robotics and illustrate the relevance of the topics. I show videos of my research in lectures and I showcase advancements in the state-of-the-art. I also have my graduate students provide guest lectures and live demonstrations of their robotics projects. Fig. 3 shows a robot that can "change its shoes" to enable more robust locomotion. Videos of this robot often create student excitement and interest. This robot combines an arm and a mobile platform, thereby leveraging much of the content that is taught in ME 4451. Two students from ME 4451 have worked on this robot as undergraduate researchers.

ii) Undergraduate Research through the VIP Program

In 2020 I started a new VIP course called Low Cost Aerial Autonomy. In mechanical engineering, VIP courses do not count towards my teaching load, so this is an "extra" course for me. I teach it because of the positive impact it has on my research group. This course has 15 students per semester and enables students to work on research projects related to aircraft design, motion planning, artificial intelligence, and virtual reality. This course allows students from a range of levels and majors to participate in research projects. Recently three VIP students were co-authors on an AIAA journal publication on combining machine learning and motion planning. This is a truly unique achievement, and was a testament to their graduate mentor. I nominated the mentor, Zachary Goddard, for the outstanding VIP mentor award, which he won in 2023.
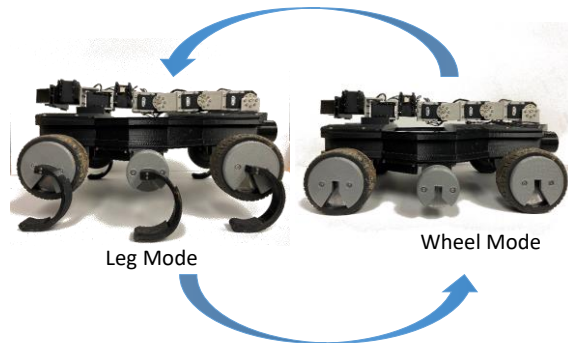
iii) Providing Undergraduate Research Opportunities

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I view undergraduate research as one way to directly connect research and learning. Undergraduate research opportunities not only provide exposure to research, but they often teach skills that are not learned in the classroom. Examples include, electromechanical design, collaborative software development, and use of state-of-the-art algorithms. I encourage my undergraduate robotics students (both ME 4451 and VIP) to join my laboratory as undergraduate researchers. In addition 5 students have gone from taking ME 4451 to joining my laboratory as graduate researchers. My impact on undergraduate research extends beyond Georgia Tech. I became an active participant in the SURE Robotics Research Experience for Undergraduates (REU) program soon after I joined Georgia Tech. I really enjoyed working with students from across the country. When the original PIs of SURE-Robotics left Georgia Tech in 2020, I was asked to become PI. I was told that the program would end early if I did not take on the program. It is unusual for an Assistant Professor to run an entire REU program, and it is particularly challenging for an Assistant Professor to run the program without a Co-PI or dedicated professional staff. However, I took on the program because I had seen and benefitted from its positive impact. Therefore, between 2021 and 2022 I ran all aspects of the SURE-Robotics program at Georgia Tech. This included reviewing applications, arranging housing and meal plans, obtaining buzz cards, and organizing events. In those 2 years we hosted 14 students from across the country at Georgia Tech, introduced them to research, taught them about graduate school, and highlighted professional opportunities. I am proud that 5 REU students

Figure 4: Images of new robotic gripper designs led by REU students in my lab.

from my lab have been co-author or lead-author on publications. Figure 4 shows two robotic gripper designs that were led by REU students (Rianna Jitosho and Esther Lee) in my lab. Each student was lead author on a prestigious IEEE robotics conference paper.
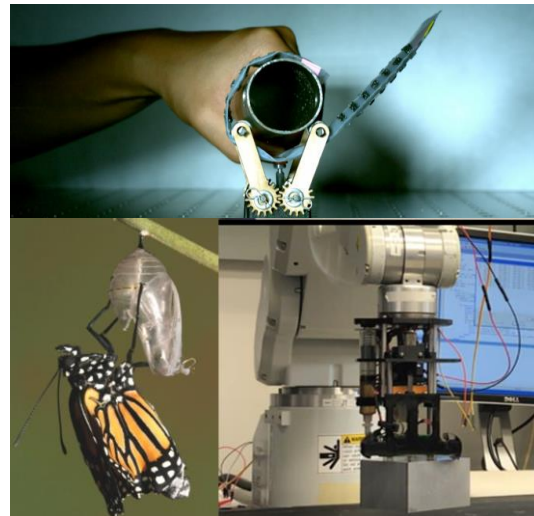
Impact on Students

My measure of student impact is seeing my students grown during their time with me and thriving after they leave my class or lab. One positive impact is enabling publications for both undergraduate and graduate students. These papers help them with their graduate school applications, fellowship applications, and networking for future jobs. Another positive impact is helping students enter graduate school and complete their desired degree. I have advised 10 graduate students through either their M.S. or Ph.D. thesis. I currently support 15 additional graduate students. Additionally, I have helped undergraduate students pursue their graduate education at other institutions. Lastly, I believe helping students remain in school is an impact that is hard to quantify. I strive to understand when a student is feeling overwhelmed or considering abandoning their dreams. I know I have helped at least 1 student remain in the Ph.D. program when she was ready to give up. I provide a quote from the student below:

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"Summer 2021 I left my initial advisor; I had become disillusioned with academia, burnt-out with the working environment perpetuated by my initial advisor. I told Ani that I was going to master-out; all my passion for research was gone. His response changed the trajectory of my career. He encouraged me to come to his group, to stay one more semester. If I still wanted to leave after, no hard feelings. Over one semester, he reinvigorated my passion for research."

I also provide a list of select undergraduate researchers and their accomplishments below.

Selected List of Undergraduate Researchers
- **Zachary Goddard**: Undergraduate student in ME 4451 (2018), joined my lab as my first undergraduate. Stayed on for Ph.D. (2023), best VIP mentor award winner, lead author of 3 journal papers. Currently engineer at Johns Hopkins Applied Physics Laboratory.
- **Kathryn Bruss**: Undergraduate student in ME 4451 (2018), joined my lab as an undergraduate researcher. Stayed on for M.S. (2020), lead author of 1 journal paper. Currently engineer at Georgia Tech Research Institute.
- **Kevin Choi**: Undergraduate student in ME 4451 (2019), joined my lab as an undergraduate. Stayed on for Ph.D. (2025). Co-author of 2 conference papers.
- **Kenneth Wardlaw:** Undergraduate student in ME 4451, joined my lab as an undergraduate, co-author of 2 journal papers.
- **David Booker-Early:** Undergraduate student in ME4451, joined my lab as an undergraduate, key contributor to robotics projects. Currently an engineer at Home Depot.
- **Rithesh Rajasekar:** Undergraduate student in VIP course, joined my lab as an undergraduate, co-author of a journal paper.
- **Rianna Jitosho**: Visiting undergraduate student as part of SURE-Robotics program, lead author on a conference paper, NSGRFP awardee. Currently a Ph.D. student at Stanford.
- **Esther Lee**: Visiting undergraduate student as part of SURE-Robotics program, lead author on a conference paper. Currently an engineer in the aerospace industry.
- **Mark Jimenez**: Visiting undergraduate student as part of SURE-Robotics program, co- author on a conference paper. Currently a researcher at Lawrence Berkeley National Laboratory.
- **Jessica Carlson**: Visiting undergraduate student as part of SURE-Robotics program, co-author on a journal paper. Currently a Ph.D. student at the University of Michigan.
- **Helenrose Jorgensen**: Visiting undergraduate student as part of SURE-Robotics program, co-author on a conference paper. Currently an MS student at the University of Minnesota.

Teaching and Learning Outside the Classroom

Education does not end in the classroom or in the lab. A key part of my education philosophy is preparing my students for their future career. I am privileged to be part of the Faculty Loan Program between Georgia Tech and Sandia National Labs. This has enabled me to understand the types of knowledge, skills, and habits that enable success at a National Laboratory in areas such as autonomous systems, robotics, and clean energy. I use these insights in my class, and I have even added topics to ME 4451 because I have found the methods to be critical to my career success. For example, Fig. 5 shows notes that I added to ME 4451based on my professional experiences.

Similarly, I also try to provide an education impact outside the classroom or lab. I currently mentor 4 junior engineers at Sandia. In addition, I have delivered lectures as part of a Sandia workshop and a Sandia training course.

I have provided some quotes from my ME 4451 students relating to how I incorporate relevant knowledge and lessons into my course.

Figure 5: An example of lecture notes I added to ME 4451. My experience outside the classroom taught me the value of Homogeneous Transformation Matrices (HTMs).

- *Had current industry experience and brought that experience into the classroom.*
- *The teacher's real-world experience with the subjects in class provided another point of view to learn from.*
- *I really liked the times that what we were learning was tied to real life examples and also utilized in a practical problem (even if just theoretical or simplified down for 50 minute class sake). Working problems out together really reinforced all the equations and tidbits to remember and then tying that problem back to why you would ever want to actually remember this made the class great. Any more of that that can be added will only continue to improve the class. I don't necessarily want to leave out any content - I thought it was all good. But I think the pace was a bit fast, so if there is anything that maybe could be cut for a few more days reinforcing the most important information that may be helpful.*
- *Class was fun and engaging, everyone got a chance to speak and contribute to the conversation. It was great to often be reminded how mathematical concepts could be related to real world application.*
- *The greatest strength of this instructor was his amount of knowledge in the field and his enthusiasm for the course.*
- *The labs were the best, and then the lectures that clearly explained real life applications of the material we learned.*

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February 8, 2024

CTL Award Evaluation Committee:

I am writing to wholeheartedly recommend Dr. Anirban Mazumdar for The CETL Outstanding Teaching award at Georgia Tech, based on his exceptional teaching abilities, outstanding support and guidance to students, and remarkable flexibility in working with administration to handle course demand. Asa Senior Academic Professional in the Woodruff School, I have had the pleasure of observing and interacting with Dr. Mazumdar for several years now and have consistently been impressed by his dedication to teaching and commitment to the students. As an advising manager, I meet with undergraduate students on a regular basis so I have an ear to the ground, listening to their comments and feedback.

Dr. Mazumdar's teaching methods are both innovative and engaging, making complex topics associated with robotics accessible and interesting for students. His ability to distill difficult concepts into understandable segments without diminishing the content's complexity is a rare skill. His teaching methods cater to the diverse learning styles in his classroom, ensuring that each student feels valued and supported in their learning journey. This teaching philosophy has not only ensured the continuity of high-quality education but has also prepared his students to be flexible and adaptive in their own careers.

I attended one of his lectures on January 31 and found it to be organized in a logical sequence, making it easy for the audience to follow the progression of ideas. He broke down complex concepts into manageable parts, and then tied everything together in a cohesive manner. He used questions and examples showing that he had thought about how to make the content accessible and interesting. The students were engaged in the presentation, taking notes and asking great questions during the lecture time.

Students have told me directly about their experiences in the course being very fulfilling yet challenging. The undergraduate robotics course that he teaches has inspired numerous students to pursue higher education or a career in robotics. *He has been described by many students as their favorite professor at Georgia Tech.* While I cannot quote any specific examples at this time, it is a comment I have heard numerous times.

Beyond his formal teaching responsibilities, Dr. Mazumdar goes above and beyond to assist students in their academic and research experiences. He is available for individual meetings, offering personalized advice and support that has made a significant difference in many students' lives. *His commitment to student success extends beyond the classroom,* often guiding students through research, advising and career suggestions.

As a department, we routinely monitor the demand in classes and adjust the course offerings to account for this. The department has often asked Dr. Mazumdar for extra seats in the class when we have long waitlists,

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asked him to move class or lab times and to make many accommodations to allow for additional students. Every time we have asked, he has accommodated our requests and allowed us to maximize enrollment in this high demand elective course. After being at Georgia Tech for almost 20 years, I can tell you that he is *one of the most accommodating professors that I have worked with*. His remarkable flexibility and adaptability, which I have experienced firsthand on the administrative side, are a rare combination.

In conclusion, I believe Dr. Mazumdar's exceptional teaching prowess, dedication to student success, and ability to adapt to and embrace requests for change make him an outstanding candidate for the CETL teaching award. His positive impact on our institution and on the lives of countless students is a testament to his professional and personal qualities. I can personally attest to his profound commitment to valuing his students and his role as an educator, mentor, and professor. As a student eloquently stated: *"I wanted to thank you for your mentorship these past two years. The advice and research opportunities that you have provided for me have [been] invaluable. You and your team have kept me inspired and on track to pursue a career in robotics. Years from now, when I have solved all of the world's challenges, I will know who to thank."*

Best regards,

Kristi Mehaffey
Academic Professional

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February 8, 2024

Dear CTL Selection Committee,

It is my honor and pleasure to write in support of my mentor, Dr. Anirban Mazumdar, for the CTL Junior Faculty Teaching Excellence Award. I took Dr. Mazumdar's 4th year Robotics course in Spring 2022, transitioned into his lab as a Graduate Research Assistant in Fall 2022, and helped him as a grader and then TA from the spring to fall semester of 2023. Over the past two years, Dr. Mazumdar's dedication to teaching has not only fueled my passion for a career in robotics, but also introduced me to the world of research. Thus, I believe his ability to excite students and motivate their love for learning is exceptional and worthy of recognition.

During my time in his class, I was drawn to Dr. Mazumdar's innovative approach to teaching. On top of being an amazing lecturer, he integrated several robots to illustrate each topic, showcasing a strategy where students learned a wide range of skills on top of the content. This required impressive coordination between the lecture notes, lab assignments, and problem sets to create an immersive environment that encouraged diverse forms of practice. Personally, I found this method highly effective as I reinforced my understanding of the material by applying content through hands-on activities. In his robotics class, we used two arm manipulators, two computer vision toolboxes, and three different sensors on a turtlebot, highlighting his desire for a comprehensive educational experience. He also added GPS-based labs to the curriculum to reflect current demands in the field. Such exposure to real-world applications within the classroom setting was instrumental in shaping my future career goals and made class fun.

Dr. Mazumdar also runs a large VIP program, consisting of more than 15 undergraduate students each semester who contribute to diverse research projects. Having mentored 8 students across three semesters, I observed how Dr. Mazumdar was involved in the selection of the research topic for each sub-team. He ensured that the students' interests were reflected in each semester's project while emphasizing connections to graduate research. Weekly graduate mentor meetings and a commitment to authorship opportunities for undergraduates showcased his dedication to student success and academic growth.

Dr. Mazumdar accessibility and genuine care for his students were highlighted in his management of the largest undergraduate ME elective. His policy allowing students to switch lab sections for out-of-town job interviews fostered a motivating and respectful learning environment. Regular office hours, online notes, and additional recordings enhanced learning. Most notably, his open recognition of the challenges faced by women in engineering during lab meetings demonstrated his commitment to inclusivity and his values as an educator.

I believe Dr. Mazumdar is a strong candidate for this CTL Award. His contributions extend beyond the classroom, reaching into research, community engagement, and mentorship. His passion for teaching is evident not only at the university level, but also in inspiring high school students through his help in the Georgia Tech Robotics Summer Institute. He has had a profound impact on my life, exposing me to numerous opportunities and transforming my approach to solving meaningful problems through science. In conclusion, I fully support his nomination.

Sincerely,

Divya Iyengar
MS Mechanical Engineering – Georgia Tech, 2023
BS Mechanical Engineering – Georgia Tech, 2022

Dear Members of the Selection Committee,

Dr. Anirban Mazumdar provided me with both the structure and the feedback for learning complex concepts, procedures, and real-world insight into the scientific wizardry of Robotics.

From teaching formulaic principles of how mechanical rigid bodies move throughout our physics-bound physical world, to providing hands-on experience with applied calculations and programming through various lab-experiments, Dr. Mazumdar designed one of my favorite classes in my entire collegiate journey. His course was both an engineering challenge and a creative outlet via STEM concepts.

Dr. Mazumdar's teaching style quickly separated him from the academic masses on campus as he demonstrated his domain-expertise both in the classroom and during office hours. Despite preparing for this course through several years of prerequisite classes and robotic-experiments in my limited free-time, I initially struggled with understanding the course's material. However, his superb teaching methods never wavered. Putting in the time, effort, and compassion, he would always illustrate on the board, in great detail, the multi-dimensional figures accompanying a complex sequence of applied formulas when providing lessons; this was unexpected and greatly appreciated as it made the course-material significantly more intuitive and less intimidating as the semester continued. I say "unexpected" because many of the professors of my other classes at GA Tech were not as invested as Dr. Mazumdar in "teaching to educate" as opposed to "teaching to test". While providing deeper insight into the nuances of Robotics, he challenged us to understand the "why" alongside the "how" regarding formulaic procedures, helped me apply and evaluate difficult core-concepts that baffled many of us in the class, and asked us clever and creative questions to better prepare for difficult exams.

Offering words of wisdom while challenging us to understand both the big-picture and its pixels regarding mathematical modeling and simulation of dynamic systems, Dr. Mazumdar's ME 4451 Robotics class made my semester very difficult, yet overwhelmingly exciting. Offering a chance to demonstrate what we've learned in the course, he encouraged collaborative efforts for students to form teams and complete a group-project near the end of the semester. Because he generously provided the lab-space and the technology, I was able to focus my efforts on both the "why" and the "how" when experimenting with concepts for autonomous mobile robots; more specifically, I could focus on the project and its exciting lessons without worrying more about financial setbacks, which was greatly appreciated, and again, differentiated his thoughtful teaching-style from many of my other classes across multiple semesters where I was required to pay out-of-pocket to buy the necessary tools for a given class assignment. These types of considerations and factors contributed greatly to why I enjoyed Dr. Mazumdar's teaching style, which also helped me succeed in his class.

As a result, my teammates and I successfully implemented what we called "Turtlebot Tag", where we used industry-level software, hardware, and algorithms to program two sets of autonomous rovers: one group of small TurtleBots to explore unknown areas using an attached Lidar sensor to detect and avoid nearby objects, while the large TurtleBot used an attached Xbox Kinect to detect, track and "tag" the small TurtleBots through color recognition. After presenting my team's final project to the class through a recorded demonstration that we uploaded to YouTube, Dr. Mazumdar invited me to join his Dynamic Adaptive Robotic Technologies (DART) Lab as a Robotics Research Assistant. Although my time in the DART lab was only

during my final semester at GT, the experience and the research helped me further fine-tune my engineering and scientific skillsets. While there, I worked with an academically talented graduate student on an innovative mobile robot project – Adaptive Ground Locomotion, which later achieved its goal: to autonomously traverse various forms of difficult terrain.

Within just one semester of meeting Dr. Mazumdar, I gained industry-level experience in Applied Research and Development for Robotics. By the end of the second semester of knowing him, and thus, ending my journey at GT on a very motivating note, I had already applied several concepts and formulaic procedures I learned from his Robotics class, and I gained even more hands-on experience as I tested and helped improve experiment-driven proof-of-concepts for various designs of multi-terrain mobile-robots that could help first responders evaluate situations safely and quickly during disaster relief.

Overall, Dr. Mazumdar is an excellent professor, honest mentor, and innovative researcher. I believe he deserves the recognition of this incredible, estimable CTL teaching award to further highlight how his passion shines through both his classrooms and his skillsets.

Sincerely, and with gratitude,

David Booker-Earley
Georgia Institute of Technology
B.S. Mechanical Engineering, Class of 2019

Dear Selection Committee,

It is my pleasure and privilege to endorse Dr. Anirban Mazumdar for the CTL Junior Faculty Teaching Excellence Award. After taking Dr. Mazumdar's Robotics course in Spring 2022, working as a Graduate Research Assistant in his research lab (the Dynamic Adaptive Robotic Technologies Lab), and serving as a Teaching Assistant for the Low-Cost Aerial Autonomy VIP course under his guidance, I can confidently say that he is fully deserving of this recognition. Dr. Mazumdar is an incredibly hard worker who has and will continue to have a lasting impact on my life through his help in my development both academically and professionally. Though, this does not just hold for me; I have witnessed Dr. Mazumdar have a positive influence and invest in the growth and development of numerous students and researchers. His passion and merit are truly unmatched.

In terms of education, Dr. Mazumdar is one of the main reasons that I decided to pursue a Master of Science in Robotics from Georgia Tech. As a member of his Robotics course in Spring 2022 (one of my last undergraduate semesters), I was still unsure of myself and my future. Dr. Mazumdar's class was engaging and inspired me. He tied in his research with lectures to keep me and the other students in the course attentive and focused. He did this by showing us fascinating videos and findings of real-world robots that he and his research lab were working on. For example, to this day, I can vividly remember a video of a robot that used manipulation to enable adaptive ground locomotion. On top of this, there was a lab component that provided the students in the course the opportunity to work with real robots. This was my first hands-on experience in the field of robotics, and it was eye-opening. Seeing a robot complete tasks programmed by me but without me being physically involved was incredibly rewarding. To me, this illustrated Dr. Mazumdar's innovative teaching style, and it definitely worked with me and the other students within the course.

As the end of that semester grew near, I approached Dr. Mazumdar about staying involved and continuing to grow in the field of robotics. I felt like my interest in the field had developed over the course of the semester, and I was interested in pursuing it further. He set-up meetings with me and provided me with career advice and guidance. He went out of his way for me, and I am very thankful for that to this day. We had no connections prior to this point, and this showed me his kindness and passion for his teaching, his research, and his students. Since that point, I have been a member of Dr. Mazumdar's research lab where I have been provided with a wealth of opportunities, such as a research project that has challenged me and helped me grow technically and an internship opportunity that has developed me professionally. Through all of these opportunities, I have learned that Dr. Mazumdar is intelligent and a true expert within our research scope, is always willing to meet and teach me new things, and is an

individual of immense integrity and honesty. In addition, Dr. Mazumdar has provided me opportunities to grow as a leader and public speaker through his VIP course.

All of this to say, the impact that Dr. Mazumdar has had on my life is immense. He has been an integral part in developing me academically and professionally. More importantly, though, he has helped me develop in other ways as well: consistency, honesty, self-discipline, reliability, accountability, etc. These are all qualities that describe him well and are qualities that he has helped establish and come to life in those that he works with, such as the students in both his courses and in his research lab. Without a doubt, Dr. Mazumdar stands out among the faculty at Georgia Tech, and I believe he would be a great recipient for the CTL Junior Faculty Teaching Excellence Award.

Sincerely,

Matthew Connelly
Georgia Institute of Technology
Master of Science in Robotics (2024)
Bachelor of Science in Mechanical Engineering (2022)