Robotics Research Fnd I, II - AE-8750/51

Time: Mon/Wed 3:30-4:20 PM

Classroom: LOVE 183

*__Note__: We will meet in class at our assigned classroom as a group during only a subset of the Mon/Wed over the term (see Key Dates below).

Coordinator's Contact Information

- ***Name***: Nader Sadegh
- ***Office Hours***: M11-12Links to an external site., W3-4Links to an external site.
- ***Office Location***: GTMI, Room 475
- ***E-mail***: sadegh@gatech.edu | Please use the Subject line "[8750] - ..." or "[8751] - …."

Course Description

The Multidisciplinary Robotics Research course is a project-oriented course that is designed to introduce students to research in robotics. The objective is for students to work on a "small" research project supervised by 2 faculty members. As part of the course the student should generate (i) a research plan, (ii) a literature review, (iii) a test protocol, and (iv) a paper that documents the results from the project. Oral presentations are made throughout the course to enhance research communication skills. Additionally, peer evaluation will be used to provide students with practice giving and receiving feedback from peers as is the gold standard in research evaluations across disciplines.

Course Format

This is technically a hybrid course, offering integral on-campus research experiences for those students who benefit from such experiences. However, if your project is remote, then this course is remote for you, since all interactions can be remote, aside from your attendance at the on-campus poster session on the final day of classes, or at some more appropriate event near the end of the semester. If your project is on-campus, then this course is hybrid for you, but only because of your on-campus research activity. If your project is off-campus AND if you are remote by necessity, virtual presentation at the on-campus poster session may be allowed with permission from the instructor.

Learning Outcomes

The objective of the course is to introduce students to research in robotics through execution of a small research project. This involves:

- Generation of a project description including research objectives/questions and a schedule
- Conducting a literature survey to understand prior work in the area
- Designing a methodology and testing protocol ("the approach") for the project
- Conducting the research
- Documenting the project in a conference style paper
- Presenting the research to others
- Evaluating peer research – oral presentations
- Evaluating peer research – written

Project Areas

The course description specifically states that a course outcome for each student is "critically assessing the prior art in an area *outside* his/her own," so the chosen project should not be a project within the core of a student's proposed doctoral research. It can be related to such research, and it may ultimately result in something like an application related chapter of the dissertation, but 8750/8751 is not a substitute for doctoral thesis hours.

Choosing Advisors

The project is conducted in cooperation with two project advisors that will supervise the project. The two project advisors must be academic, research, or clinical faculty, and they must have distinct areas of specialty to ensure that there is good multi-disciplinary coverage within the project. Often this is facilitated by having advisors from different academic units, schools, or research units (including GTRI), but this is neither a necessary condition nor a sufficient condition to satisfy the multidisciplinary requirement.

***Examples**:*

- Having two HRI specialists in different schools does NOT satisfy the multidisciplinary requirement (or two control theorists, or two perception experts, or two mechatronics specialists, etc.).
- Having a control theorist and an HRI specialist (as just one of many examples) within the same school DOES satisfy the multidisciplinary requirement. In other

words, we recognize that at Georgia Tech, we often have faculty in the same school with widely different research specialties.

Many more examples could be given, but hopefully the point is clear: robotics is inherently multidisciplinary, but it is not enough to have two faculty in the same robotics niche. Students must explore cross-disciplinary activities, so they should consider how the faculty members describe themselves at robotics.gatech.edu and elsewhere. They should use this course as an opportunity to get out of their comfort zone and acquire new knowledge and skills. One of the two advisors need not even be a robotic specialist or an engineer or a computer scientist, if it is pertinent to the research objectives.

One of the advisors may be the student's primary research advisor, but this is not a requirement. Upon prior approval from the instructor, one of the project advisors may be from an institution outside of Georgia Tech. Such requests must be accompanied by a short CV for the proposed project advisor.

*Note for 8751 students: 8751 is not a continuation of 8750. The official course description specifically incudes the words that the course sequence follows a "laboratory-rotation" format. The most obvious way to "rotate" to a different "laboratory" is to have a set of different advisors than the ones for the 8750 project, and this is a requirement that would only be waived in the most unusual circumstances. One advisor, possibly the student's primary research advisor, can be carried from 8750 to 8751, but not both. So, in summary, 8751 students must have a distinctly new project, requiring a new research survey and having a different set of advisors.

Student Expectations

At Georgia Tech we believe that it is important to continually strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See http://www.catalog.gatech.edu/rules/22/Links to an external site. for an articulation of some basic expectations – that you can have of me, and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech, while in this class.

Attendance

Attendance is mandatory for all in class sessions. Any absences without a valid excuse will result in an automatic 5% reduction in the weighted score for the assignment scheduled for that day. Hence, if a particular in class presentation has 5% weighting and you are absent on that day, your score will be 0% for that assignment.

Canvas

Canvas is the primary means of navigating the course through assignments, using the Modules page. You may have already viewed some Canvas content, including announcements. If not, go to http://canvas.gatech.eduLinks to an external site.,Links to an external site. log in with your Tech credentials, and you should see this as one of your courses. Important class-wide announcements will be made on Canvas.

Collaboration & Group Work

Students are allowed (even encouraged!) to collaborate with each other during the semester. But note that projects are individual efforts. While similar or complementary projects are allowed, students are expected to engage in independent research efforts, with distinct and *non-overlapping* objectives.

Assignment Turn-In

Students are responsible for managing the project and for providing the required material in time as specified in the schedule. All assignments must be turned in by uploading files on Canvas.

- ***Presentation deliverables***: PowerPoint (.ppt) format.
- ***Written/poster deliverables***: PDF format.

Written deliverables are to be provided in a single-space, 10 to 12-point font, 1” margin format. Using the IEEE styleLinks to an external site. with LaTeX from the beginning will make it easiest to integrate all project text for the *final report*. The report must contain the following sections (or equivalent section titles): Abstract, Introduction, Methods / Approach, Experimental Design and Results, Discussion, and Conclusions.

Late Assignments, Extensions & Re-Scheduled/Missed Exams

Late submission policy

The cutoff for on-time submission of deliverables is the posted due date on Canvas. Late days past the due date are counted in 24-hour periods. Late written or presentation deliverables will be accepted with a deduction of 10% per day. Written or presentation deliverables over 1 week late will not be accepted.

Extensions & re-scheduling policy

All extensions for any assigned work must be discussed in person with the instructor. Only on the approval of the instructor will the extension and/or rescheduling be permitted. Your score will be deducted based on the above late submission policy for

any assigned item that is turned in late, unless the instructor has agreed to grant an extension for turning in those items late. Acceptable reasons for late submission (not an exhaustive list) include: health or religious reasons, family emergency, etc. Appropriate acceptable documentation may be required by the instructor for it to be a valid excuse. Failure to provide the appropriate acceptable documentation, if requested by the instructor, will result in the grade per the late submission policy for that specific assignment.

Additional details about medical emergency or an illness as well as other class attendance matters can he found at: http://www.catalog.gatech.edu/rules/4/Links to an external site.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. All students are expected to abide by the Georgia Tech Honor Code. Honest and ethical behavior is expected at all times. All incidents of suspected dishonesty will be reported to and handled by the office of student affairs. Read Georgia Tech's Academic Honor CodeLinks to an external site., and visit http://honor.gatech.edu/Links to an external site..

Grading

Assignment/Presentation	Weight
3-slide presentation [= 5 min max] outlining the objectives of your project	5%
1-page research project abstract with signatures from the two project advisors	15%
2-page literature survey with at least 8 references to related work	20%
2-3 page methodology and planned evaluation	20%
Interactive 5-min presentation outlining objectives, methodology, and preliminary results	10%

Interactive poster session presentation summarizing the project	5%
Final report formatted as a 6-8 page IEEE style conference paper & signatures from the two project advisors with approval	25%

Grading Scale

Your numeric score in the course will be computed ONLY according to the weightings of the various graded components mentioned above. Any requests for supplemental course work to increase the student grade will not be considered. Your final grade will be assigned as a letter grade based on your numeric score in the course according to the following scale:

A: Numeric score≥90%

B: 80%≤Numeric score<90%

C: 70%≤Numeric score<80%

D: 60%≤Numeric score<70%

F: Numeric score<60%

Outcome-based grading

Assignments will be graded according to course outcomes, defined as follows:

- *Research skills* – Ability to identify, absorb, and summarize relevant research, especially in the context of producing an annotated bibliography.
- *Conveying technical content* – Organization of thoughts and the ability to convey technical content.
- *Project development* – Convincing demonstration of progress toward project goals. Suitability of presented work for the current stage of the project.
- *Salesmanship* – Presentation of material in brief contexts that convincingly relate the project and convey confidence in its scope and goals.
- *Speaking ability* – Use of voice (inflection, speed, pauses), body language, and eye contact.
- *Writing ability* – Clarity, grammar, spelling, and audience-appropriate conent
- *Visuals & graphics* – Effective use of graphics to convey information, saving spoken/written words. Appropriate data representations for the material (graphs, charts, other). Suitable visibility for presentation format.

Support Resources

These uncertain times can be difficult, and many students may need help in dealing with stress and mental health. The CARE Center and the Counseling Center, and Stamps Health Services will offer both in-person and virtual appointments. Student Center services and operations are available on the Student Center website. More information, by topic is below:

Accommodations for Individuals with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/Links to an external site. as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please email Prof. Ravichandar as soon as possible in order to set up a time to discuss your learning needs.

Academic Support

- Communication Center (http://www.communicationcenter.gatech.eduLinks to an external site.). Individualized help with writing and multimedia projects

Personal Support from Georgia Tech

Students in crisis may walk in during business hours (8am-5pm, Monday through Friday) or contact the counselor on call after hours at 404-894-2204.

- *The Office of the Dean of Students:*
  https://studentlife.gatech.edu/Links to an external site.
  404-894- 6367
  Smithgall Student Services Building 2nd floor.
- *Student Mental Health and Well Being*:
  https://studentlife.gatech.edu/services/mental-health-well-beingLinks to an external site.
- *Counseling Center:*
  http://counseling.gatech.edu/Links to an external site.
  404-894-2575
  Smithgall Student Services Building 2nd floor.
  Services include short-term individual counseling, group counseling, couples counseling, testing and assessment, referral services, and crisis intervention.
- *Students' Temporary Assistance and Resources (STAR):* https://studentlife.gatech.edu/content/star-Links to an external site. servicesLinks to an external site.
  Can assist with interview, clothing, food, and housing needs.
- *Stamps Health Services:*
  https://health.gatech.eduLinks to an external site.;

404-894-1420.
Primary care, pharmacy, women's health, psychiatry, immunization and allergy, health promotion, and nutrition.

- *OMED: Educational Services:* http://www.omed.gatech.eduLinks to an external site.;
- *Women's Resource Center:* http://www.womenscenter.gatech.eduLinks to an external site.; 404-385-0230
- *LGBTQIA Resource Center:* http://lgbtqia.gatech.edu/Links to an external site.; 404-385-2679
- *Veteran's Resource Center:* http://veterans.gatech.edu/Links to an external site.; 404-385-2067
- *Georgia Tech Police:* https://police.gatech.edu/Links to an external site.; 404-894-2500

[TENTATIVE] Key Dates and Description of Graded Components [Red=In Class/ full-group interactive meetings]

August 17	[in class] Review this syllabus. During the next ~month, identify and discuss a potential project with x2 co-advisors. One co-advisor can be your dissertation research advisor, but you are encouraged to test your 'comfort zone'.
September 7&9	[in class] 3-slide presentation [= 5 min max] outlining the *objectives* of your project. Upload your slides in PPT format to Canvas. *(5% of grade)*
September 30	A 1-page research project *abstract* with formal approval (via signature or e-mail confirmation) from the x2 project advisors. Upload to Canvas in PDF format. *(15% of grade)*
October 14	A 2-page *literature survey* with at least 8 references to related work. Surveys should provide i) a summary of discoveries and inventions in the project area and any relevant categorizations, and ii) identify the gap(s) in existing knowledge or capabilities that the proposed effort will attempt to fill.

	Upload to Canvas in PDF format. *(20% of grade)*
October 28	A 2-3 page *methodology* and planned evaluation section summarizing the main approach, current progress on the project, and plans for evaluation, including a list of specific metrics that will be used, if appropriate. Upload to Canvas in PDF format. *(20% of grade)*
November 9 & 11	[in class] Interactive presentation [5 min] outlining the *objectives, methodology, and preliminary results*, if any. Upload your slides in PPT format to Canvas. *(10% of grade)*
December 3rd Time: 4-6pm Location: Exhibition Hall, 2nd Floor	[in person] Interactive poster competition summarizing the *final project* results, during the **IRIM Robotics Days for Industry.** Upload your poster in PPT format to Canvas. IRIM Robotics Days for Industry RegistrationLinks to an external site. *(5% of grade)*
December 10	*Final report*, a 6-8 page IEEE style conference paper, with formal approval (via signature or e-mail confirmation) and a letter grade (A-F) recommendation from the 2 project advisors. Upload to Canvas in PDF format. (25% of grade)