Expressive Machinery Studio

CS 4903/8903 M16 cross-listed as LMC 4699 / 6650 BM

Fall 2025 Syllabus

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This syllabus is a living document subject to change during the term.

Course Description

This class focuses on working on collaborative interdisciplinary research projects with members of the Expressive Machinery Lab that investigate the intersection of creativity, cognition, and technology. Students will have the opportunity to work on brand new research that has just started this year as well as on new versions and offshoots of projects that have more than a decade of prior work to build on.

Our current projects offer many opportunities for publishing, portfolio building, and thesis topics. Project meetings will be scheduled based on team availability & will be online to provide access to OMSCS students. However, some projects heavily involve physical computing and will have some roles that must be able to work in TSRB on campus.

Below are brief descriptions of the projects and roles we are looking to fill.

1) LuminAI: Improvisational Embodied AI

The LuminAI project has been, through course collaborations and a 3 year long NSF M3X grant, iteratively designed and developed for over a decade. It is an AI that "learns how to dance by dancing with people" and bootstraps how it recognizes and reasons about the human body through a knowledge representation based on dance movement theory. A collaboration with the KSU School of Dance last year yielded the world's first human/AI collaboratively improvised dance performance, as well as several student-led papers at ACM conferences.

Depending on project team makeup, we will be contributing to one or more of the following LuminAI-based projects:

LuminAIx: an ongoing AI literacy installation with a three panel design that engages learners in public spaces by classifying their movements, having a "dance battle" with the improv AI dancer and learning a bit about how it (and machine learning more broadly) works.

LuminAI Duet: a new project offshoot, focused on creating two LuminAI installations (potentially 1 in Atlanta and the other in France or Istanbul) where local users in a public space can train the AI on their "local dance moves", which are then shared with the AI across seas for users in that other country to dance with an AI that uses the other country's dance moves. This project is seen as a form of AI-mediated cultural exchange and has the potential for publication and festival submissions.

LuminAI++: A new investigation into modern ML models for representing the human body (and non-human bodies) and generating movement.

2) Sound Clouds

Sound Clouds is an experiment in ambient AI as interactive soundscape. Debuting to over 200 people at the Goat Farm Arts Center in May 2025, this larger-than-life installation features 8-12' floating spheres that are instrumented both with onboard circuit boards and sensed with a webcam and custom CV model that allows the position & state of the spheres to be an input into a musical generation algorithm.

Work this semester will focus on a) material research to make "tougher" spheres; b) alternative sound and interaction designs; and c) connecting the different software packages used in Sound Clouds into TouchDesigner for enabling rapid prototyping, visualization, and new physical designs of the installation. Likely outputs will be festival and demo submissions and an authoring platform prototype.

3) The Neuroscience of Creative Sensemaking

The basis of a lot of our work is in the understanding of human cognition and creativity to inform the design of new technologies and experiences. This early work explores the neurological indicators of different cognitive states related to creativity as both evidence to support our theories about cognition as well as to inform the design of AI collaborators that can modulate their behavior to a human's perceived collaborative state.

Likely outputs will be conference publications.

4) Designing AI Literacy Experiences for Public Spaces

This team, which includes LuminAIx above, will continue our field-leading research on studying the relationship between design and AI literacy needs of various populations. We are currently evaluating several exhibits and are open to the design and development of others. Students involved in this work may be involved in the design and execution of the final evaluation of our 3 current exhibits at the Museum of Science and Industry in Chicago.

Graduate students interestLikely outputs include conference papers, journal articles, and new AI literacy artifacts.

Undergraduate & M.S. Learning Objectives

- Demonstrate the ability to analyze and critically evaluate existing digital media artifacts, services, and environments using formal knowledge, and to explain and defend one's critical evaluation.
- Demonstrate the ability to devise, design, create, and assess prototypical digital media artifacts, services, or environments and to contextualize them within recognized traditions of practice.
- Demonstrate use of digital media to create prototypes
- Demonstrate good time management skills
- Develop interactive media artifacts
- Can justify the design choices in their works
- Can formulate and test design hypotheses
- Can communicate, coordinate, and work productively as a team member

Ph.D. Learning Objectives

- Students can identify and analyze a domain within the field of digital media and identify areas for original contribution as well as methods to pursue these contributions.
- Apply theoretical concepts to specific digital media works

- Students can formulate and explore the answers to critical questions in the domains of Arts & Entertainment, Public & Civic Media, and Knowledge & Creativity as related to new media
- Summarize and paraphrase key theoretical works

Attendance & Participation

Class attendance and participation is mandatory. Participation in class discussion is imperative because it allows you to explore the work collaboratively, and in the process, discover meanings and ideas that you probably would not discover on your own. Participation in class also challenges you to continuously question, refine, and articulate your own ideas and interpretations.

In addition, much of this class is based in critiques, which require full participation and cannot be replicated outside of class. Extensive teaching and learning occur through critiques: it is through critiques that you will develop your skills for both making and discussion of the made. Thus, your attendance and participation in critiques is an important and required aspect of this class.

Grading

If you complete all of the requirements for the assignment reasonably well, you should expect to earn a B. In order to earn an A, you must complete and go "above and beyond" all of the requirements and your work must be exceptional across multiple grading factors.

Absence from more than two classes will result in the loss of 1-letter grade for the course.
Tardiness for more than three classes will result in the loss of 1-letter grade for the course.

Information for Students with Disabilities

Please notify the instructor if you have any disabilities with which you need special assistance or consideration. The campus disability assistance program can be contacted through ADAPTS: http://www.adapts.gatech.edu.

Honor Code Statement

Students are expected to adhere to the Georgia Tech Honor Code: http://honor.gatech.edu.

Student-Faculty Expectations

I expect you and myself to meet the expectations outlined here:
https://catalog.gatech.edu/rules/21/

Assignments

Students will be graded based on their class participation (½) and the final research presentation during our scheduled Finals time (½).

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Final Project Rubric

The final project presentation is your graded deliverable for the term and is graded on the following rubric:

- 25%: Quality of presentation materials & delivery (each team member should participate in the presentation)
- 25%: Presentation of a working computational prototype (this can be a pre-recorded video or live demo) and/or a summary of research data & analysis (e.g. material research, surveys, etc.)
- 25%: Quality of the communicated design process & documentation
- 25%: Contextualizing the work (and potential future work) related to previous published research & works (by others)

Let's do something special.