APS1041
Inventrepreneurship
(Invention + Entrepreneurship)

Learn to be both an inventor and an entrepreneur!

Winter/ 2018 (Starts January 2018)
Location: CEIE (lecture hall and laboratory room to be determined)

Instructor:	Professor Steve Mann (mann@eyetap.org)
Guest Lecturers:	Arkin Ai (VisionerTech Founder), Raymond Lo (Meta Co-Founder), Chris Aimone (InteraXon CTO and Co-Founder), Ken Nickerson (Kobo Co-Founder), Ajay Agrawal (Rotman CDL Founder), Norm Pearlstine (served as the Editor-in-Chief of the *Wall Street Journal*, *Forbes,* and Time, Inc.), Ryan Jansen (Transpod Co-Founder), Nahum Gershon (Father of Human-Information Interaction), Dan Braverman (MannLab COO/General Counsel) and others
Time/Location:	Wednesday 6-9PM, SF3202
Lectures:	One 3-hour lecture per week
Office Hours:	Immediately following each of the weekly 3-hour lectures.

I. Purpose:

This course is designed to 1) provide instruction and mentorship to students interested in the art and science of both invention and entrepreneurship and to 2) introduce Inventrepreneurship as a new field of teaching and academic inquiry. Course lectures and instructables will be rehearsed, recorded and made available online for select students around the world.

The main course deliverable will be a demonstration-ready prototype and patent application for an invention in the field of Phenomenological Augmented Reality/Wearable Computing/Humanistic Intelligence. It is expected that many students will go on to form startup ventures around their prototype, which will receive ongoing guidance and support.

Guest lecturers and mentors include Founders, CEOs, and CTOs from venture-capital backed companies in the U.S., Canada and China, many of which were born in Professor Mann's Toronto lab, as well as connections with Mannlab Silicon Valley and Mannlab Shenzhen.

II. Overall Course Philosophy, Aims and Outcomes:

You can't invent the future without understanding the past. Accordingly, students will first study historical examples of the process of invention, ranging from the light bulb to phenomenological augmented reality, as they learn to use and understand fundamental tools of invention such as the vacuum tube and the cathode-ray-oscilloscope.

Students will then explore present-day research at MIT, Stanford, Shanghai Tech and the University of Toronto, as well as future research and commercial applications (e.g. Metavision, InteraXon, Visionertech, etc.). Students will be taught the fundamentals of HI (Humanistic Intelligence) versus AI (Artificial Intelligence), and will learn how to formulate and nurture ideas, turn ideas into inventions, make market-ready prototypes, protect intellectual property, and form startup ventures, with the help of a supportive global ecosystem (Canada, the United States and China) consisting of mentors, friends and potential funders, sponsors, donors, and patrons.

Instruction will consist of both plenary and highly individualized mentorship for each student and their specific circumstances and interests. Therefore the course can and will accommodate a wide range of student interests, backgrounds, and disciplines; students from all departments are welcome.

III. Specific Learning and Evaluational Outcomes*:*

By the end of this course, students will:

- Know how to build a basic electro-mechanical wearable device, PAR, or HI product prototype by using computer-aided design, rapid prototyping machines (3D printing), and various other desktop manufacturing toolsl
- Have a ready-to-file patent application (students will get hands on experience in patent writing and applications, with examples); and
- Have a functioning prototype ready for demonstration.

Students will learn how to quickly turn ideas into inventions through a range of time-scales ranging from quick and sloppy “rapid prototyping” (rapid reduction-to-practice) to more well-made (longer time scale) prototypes designed for demonstration to others. Whereas other engineering courses often teach a slower more methodological approach akin to classical music, in this course, students will also learn “tinquiry” (tinkering as inquiry), more akin to jazz music (i.e.. quick improvisation, often making working prototypes to turn ideas into inventions in 90 minutes or less). Formal large lectures will be given, but there will be ample one-on-one and small-group mentorship as well.

IV. Teaching Methodology, Format and Procedures:

The course will be taught using the new medium of phenomenological AR (Augmented

Reality) and Open EyeTap. The courseware and textbooks will be generated using special eyeglasses and pointing devices provided by MannLab (http://mannlab.com) so that students can quickly touch, grasp, and feel fundamental past, present, and future concepts, and become great inventors and visionaries. Students will be invited to generate future courseware, and the process of writing the courseware will be a participatory process.

V. Selection Criteria

If this course is over-subscribed, priority will be given to those students who have demonstrated initiative by doing one or more of Professor Mann's Instructables. To guarantee full access to resources, this course will have limited enrollment. Students who enroll in this course should be able to demonstrate their proficiency in making things. The easiest way to demonstrate this ability, and to see if there's a good match to the student's interest, is to complete one or more of Professor Mann's Instructables (http://www.instructables.com/member/SteveMann/instructables/) and post the results (click "I made it" and post a result, pictures, text, etc.).

The course instructor devotes a lot of time to individual one-on-one mentorship of students, and will respond individually to each "I made it" post. Completing one or more of these Instructables will give students the opportunity to demonstrate aptitude for making things, and to get a sense of what kinds of topics the course instructor is best equipped to help you with.

VI. Course Readings:

Selected articles and publications from http://www.eyetap.org/publications and from http://weartech.com, as well as AR Metavision content. Additional readings and Instructables will be posted on http://weartech.com and http://www.instructables.com/member/SteveMann/instructables/ from time-to-time.

VII. Grading Procedures:

Grades for the different credit options will be based on:

(a) Assignments (15%)
(b) Labs (25%)
(c) Course Project (60%)

VIII. Tentative Course Schedule

(*May change to accommodate guest presenters & student needs*). Each week there is one 3 hour lecture, and one 2-hour lab.

Module	Weekly Topic	Guest Lecturer	Assignments and Deliverables
Module 1: Introduction and Historical Background	Week 1: (Jan 9-13): Inaugural Course Introduction: course instructor showcase, range of topics, along with some possible areas of exploration.		In 3 pages or less, sketch out or write possible improvements to any of the instructor's showcase items, or identify an invention of your own.
	Week 2: History of great inventors and their inventions, followed by group discussion on the spirit of true genius.		Hand in the Week 1 assignment.
Module 2: Course resources demo, and practical Computing technique	Week 3: PAR (Phenomenological Augmented Reality) will be used as the course teaching method. Students will use the open EyeTap eyeglass or other Mediated Reality devices to interact directly with course content rather than using courseware or textbooks. Topic: Computer Vision with wearable computer	Dr. Raymond Lo (Co-Founder, Meta)	- Return Week 1 assignment - In 3 pages or less, describe (1) how your invention builds on work of a previous inventor; or (2) how it might be taught or marketed using Meta, VMG, or EyeTap

	Week 4: - The inventor's mind, mindfulness, and the state-of-flow. - Brain computer interface, dream machine, mindmesh, Fractal nano-bio sensor - Practical Signal Processing	Chris Aimonie, Chief Technology Officer, InteraXon Muse (choosemuse.com)	Hand in the Week 3 assignment.
Module 3: Getting down to business	Week 5: Invention through Creative Destruction.	Ajay Agrawal, Founder of Rotman's CDL (Creative Destruction Lab).	- Return Week 3 assignment - In 3 pages or less, describe how you can use Muse/Inventometer, or Creative Destruction in furthering your invention.
	Week 6: How to write your first patent and structure your company	Dan Braverman, COO/General Counsel at MannLab	Hand in the Week 5 assignment.
Module 4: Getting it done	Week 7: Electro-mechanical design for wearable augmented reality	How to build things with zero budget	-Return Week 5 assignment - New assignment
	Week 8: Human in-the-Loop Intelligence in wearable augmented reality	Arkin Ai (Co-Founder, VisionerTech)	Hand in the Week 7 assignment.
Module 5: Inventrepreneurship in different fields	Week 9: Innovation for the mass. How traditional industry transform in this innovative era.	Norm Pearlstine, Senior Advisor, MannLab	-Return Week 7 assignment - New assignment

	Week 10: -Inventrepreneurship for Medical Augmented Reality - Brain surgery with Metawand - Abakographical medical data visualization	Dr. Michel Kliot, Professor, Stanford Medical School	Hand in the Week 9 assignment.
Module 6: Final Week	Week 11: How to properly present your work.	Nahum Gershon, Principal Scientist, The MITRE Group: Power of Storytelling	-Return Week 9 assignment - New assignment
	Week 12: Final Presentation		Hand in the Week 11 assignment.

IX. Academic Integrity

Each student in this course is expected to abide by the University of Toronto Code of Behaviour on Academic Matters. Any work submitted by a student in this course for academic credit will be the student's own work.

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e-mail, an e-mail attachment file, a diskette, or a hard copy.

Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Code can also be extended to include failure of the course and University disciplinary action.

During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

X. Accommodations for Students with Disabilities

In compliance with the University of Toronto policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances, so arrangements can be made. Students are encouraged to register with Student Disability Services to verify their eligibility for appropriate accommodations.

X1. Inclusivity Statement

We understand that our members represent a rich variety of backgrounds and perspectives. The engineering department is committed to providing an atmosphere for learning that respects diversity. While working together to build this community we ask all members to:

- share their unique experiences, values and beliefs
- be open to the views of others
- honor the uniqueness of their colleagues
- appreciate the opportunity that we have to learn from each other in this community
- value each other's opinions and communicate in a respectful manner
- keep confidential discussions that the community has of a personal (or professional) nature
- use this opportunity together to discuss ways in which we can create an inclusive environment in this course and across the Cornell community

Appendix. Available Course Equipment

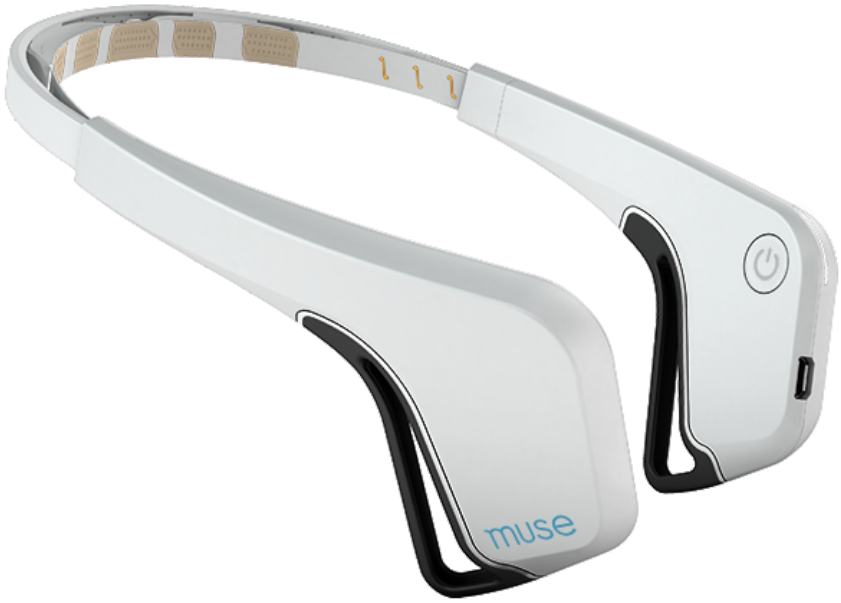
VisionerTech VMG-PROV

Related link: https://www.youtube.com/watch?v=T0m0qGA8xhk

Meta 2 Augmented Reality Eyeglasses

Related link: https://www.metavision.com

Muse Headband

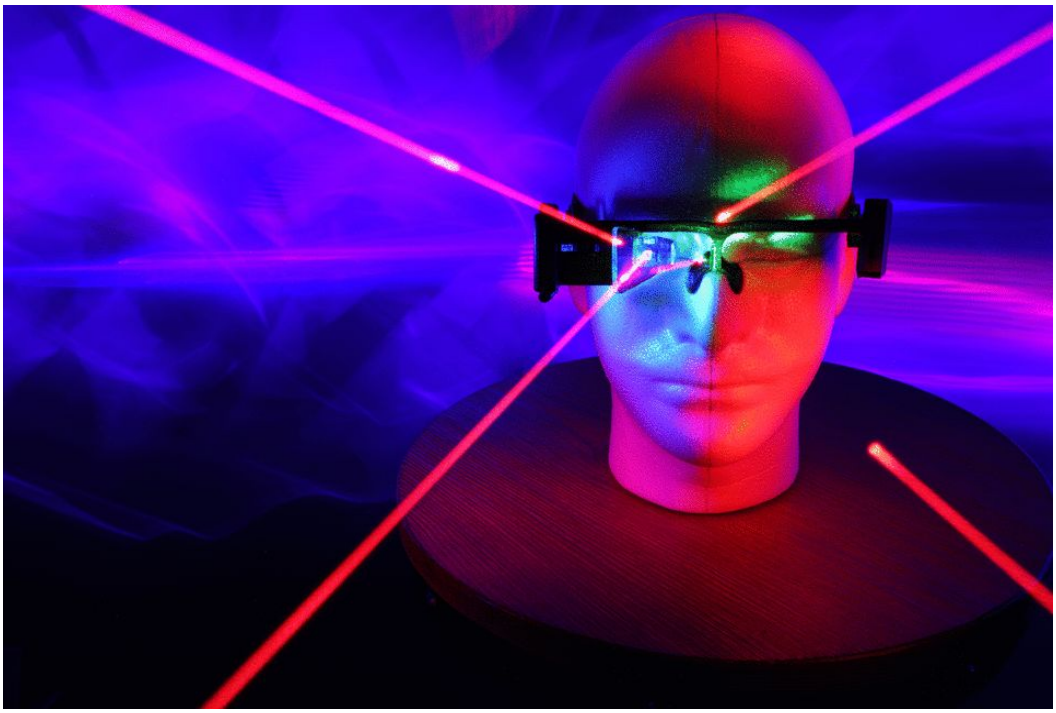


Related link: https://www.choosemuse.com

Muse Safilo Eyeglasses

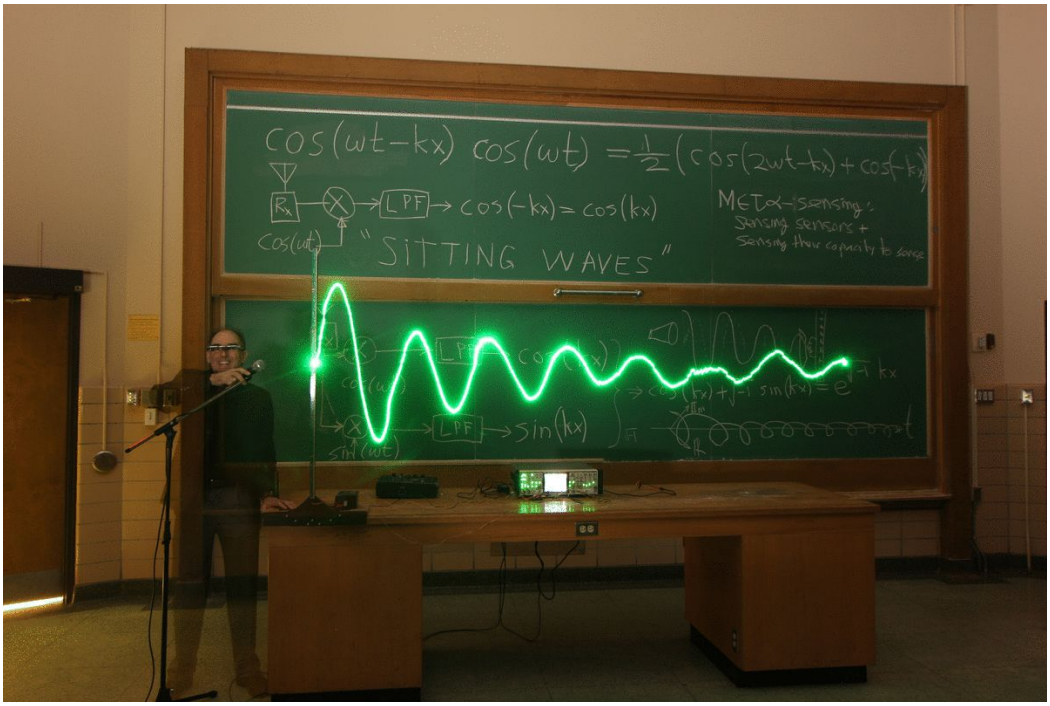
Related link:https://www.youtube.com/watch?v=5CZtoYbfbHU

Open EyeTap



Related link: https://www.openeyetap.com

“MannLab x SYSU” Lock In Amplifier & Phenomenological Augmented Reality



Related link: http://www.wearcam.org/par/