SLHS 1942 Freshman Seminar: Language and Communication Technologies

Fall Semester 2014

Lectures: M, W 1:00-2:15 pm at Room 110 Shevlin Hall

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Office Hours: M., W 10:00 – 10:50 am, and by appointment (49 Shevlin Hall)

Course Overview

The interdisciplinary field of speech-language-hearing sciences has been at the forefront of driving technological changes in our modern society. In this course, we will study the history of language technology and the relationship between language and technology that have shaped and continue to shape our day-to-day lives. We will discuss the social impact of technological developments from the invention of writing systems to the cutting-edge applications of brain-computer interface. We will also examine the ethical implications of advances in language and communication technologies. Topics include signs and symbols, script decipherment, automatic speech recognition and synthesis, text-to-speech systems, human-machine dialog systems, machine translation, hearing aid and cochlear implant as well as assistive technologies that support users with language and communication disabilities. Students will have opportunities to watch in-class short videos and demos, conduct speech analysis and synthesis labs, evaluate online text-to-speech systems and machine translation systems, and observe brain imaging experiments in small groups.

This is an introductory level course that does not require computer programming skills or other technical background. Materials will be delivered through a combination of learning formats and assignments (reading, lecture, demos, tutorial labs, multi-media including film and internet, class discussion, student presentations). These activities will be completed individually, in small groups, or in pairs, depending on the activity. Students turn in activity sheets with written responses after extensive class discussion.

This course is designed in accordance with the Technology and Society Theme criteria for Liberal Education at the University of Minnesota.

- The course examines one or more technologies that have had some measurable impact on contemporary society.
- The course builds student understanding of the science and engineering behind the technology addressed.
- Students discuss the role that society has played in fostering the development of technology as well as the response to the adoption and use of technology.
- Students consider the impact of technology from multiple perspectives that include developers, users/consumers, as well as others in society affected by the technology.
- Students develop skills in evaluating conflicting views on existing or emerging technology.
- Students engage in a process of critical evaluation that provides a framework with which to evaluate new technology in the future.

Liberal Education Theme Statement

All theme courses have the common goal of cultivating in students a number of habits of mind:
- thinking ethically about important challenges facing our society and world;
- reflecting on the shared sense of responsibility required to build and maintain community;
- connecting knowledge and practice;
- fostering a stronger sense of our roles as historical agents.

This course, in particular, examines language and communication technologies that have fundamentally changed our day-to-day lives. Discussion topics cover a list of modern language technologies, including digital reading, automatic speech recognition and synthesis, text-to-speech system, human-machine dialog systems, machine translation, hearing assistive devices (hearing aid and cochlear implant), and brain-computer interface. For instance, the invention of cochlear implant is considered ground-breaking in bioengineering, which empowers individuals with severe hearing loss (or complete deafness) to restore their hearing via direct electric stimulation of the auditory nerve. To help students understand the science and engineering behind each technology, the course will introduce the brief history of the technological innovations and the key concepts and scientific principles that these inventions depend on. Students will be given a number of assignments, including in-class labs of speech analysis and synthesis, evaluation of machine translation technologies, and video observations of brain imaging technology and brain-computer interface. Students will also be required to work in pairs to develop an in-depth understanding of a language technology of their own interest, identify the strengths and weaknesses of the current technology, find up to five articles that discuss the positive and negative impacts of the technology and the potential ethical issues, write a critical summary, do an oral presentation of their findings and discuss with the rest of the class during their oral presentation.

Specifically, students will be asked to discuss the role that society has played in fostering the development, adoption and use of the technology, how it impacts the organization and everyday activities of people who develop, use, or reject the use of the technology for various reasons, what the conflicting views are on the use of the technology, and how the technology can be improved in the future. For instance, neuroscience discoveries have led to the invention of brain-computer interface (BCI), which aims to establish a direct communication pathway between the brain and an external electronic device by decoding the electrical activities in the sensory and motor cortical neurons. BCIs have been shown to be capable of assisting, augmenting or repairing human cognitive or sensory-motor functions. The first neuroprosthetic devices implanted in humans appeared in the mid-1990s after successful experimentations on animals. But brain implant technologies also bring important ethical, legal, and societal issues regarding the risks and benefits, mind-control and privacy, personality or personhood and its possible alteration, consequences of the BCI technology for the quality of life and side-effects, and responsibilities of the health care industry and government regulations.

Students will be required to identify and describe various communication disorders and the needs and limitations of the existing assistive technologies. By exploring these issues related to BCIs and other language technologies, students will develop skills in evaluating conflicting views and engage in a process of critical evaluation. Students will gain a better understanding of how these technologies may enhance the relationships or connections between individuals with or without brain-related communication disabilities and the shared sense of responsibility required to build and maintain community. They will assess potential ethical issues from multiple perspectives by connecting knowledge and practice. The learning process will also help foster a stronger sense of our roles as historical agents and identify the corresponding needs for changes in policies and services regarding the adoption of use of technologies such as BCI. These skills are necessary for preparing students to be thoughtful, informed and engaged citizens in the 21st century.

Student Learning Outcome

This course fulfills three student learning outcomes upon its completion.

- Students can identify, define and solve problems.
- Students can communicate effectively.
- Have acquired skills for effective citizenship and life-long learning

Throughout the course, students will be asked to identify and evaluate the present and future technological changes that will fundamentally shape their personal and public lives. More specifically, students will be introduced to a variety of technologies that depend on signal processing techniques and natural language processing including automatic speech recognition, text-to-speech systems, machine translation, and brain-computer interface. In-class demos, activities, and assignments are designed to help students understand the uses and limitations of these modern language and communication technologies and highlight the pivotal role of language technology in shaping interpersonal communication and empowering individuals with disabilities. Students will be required to identify and describe various brain-related communication disorders and the needs and limitations of existing assistive technologies. Students will gain understanding of how technology may enhance the relationships or connections between individuals with or without brain-related communication disabilities, assess potential ethical issues from a broad perspective, and identify the corresponding needs for changes in policies and services. These skills are necessary for preparing students to be thoughtful, informed and engaged citizens who will be able to apply such skills for their life-long learning.

Organization of Course

Course Materials

1. Textbook (required): Sproat, Richard. (2010). Language, Technology, and Society. Oxford: Oxford University Press. (ISBN 978-0-19-954938-2)
2. Supplemental reading materials and handouts will be provided on the designated university Moodle web site. Course materials, grades, and discussion board will be accessible on course web site.

Class Time: 50% lecture, 50% demos, lab exercises, and discussion

Work Load: reading (approximately 25 pages a week on average); writing (3~4 pages); in-class labs/exercises; exams (one midterm and one final); project and oral presentation.

Examinations (60% of grade): Two exams will be given. Each exam will make up 30% of the final grade. Review sheets are provided before each exam. The format will include multiple choice, true/false, and short answer questions. Each test will cover designated material from lectures, discussions and readings. Make-up exams are allowed if you are ill, notify the instructor prior to the exam and bring in written evidence. If this occurs, the make-up exam must be taken within 1 week.

In-class Labs/Exercises (20% of grade)*: There will be five labs/exercises. Detailed instructions will be provided for each activity. Lab report is due one week from the day the lab activity is conducted.

Project (20% of grade)*: Students will form groups (2-3 students in each group) to select a technology of their interest, identify the strengths and weaknesses of the current technology, find up to five articles that examine the positive and negative impacts as well as ethical issues associated with the selected technology, write a critical summary (10%), do an oral presentation of their findings and discuss the results with the rest of the class (10%).

Class participation: Class participation is required. Absence from class without justified medical excuse or other legitimate reasons will affect the grades you receive for the in-class activities and project.

*LATE ASSIGNMENTS: FOR EACH DAY LATE 10% WILL BE DEDUCTED FROM THE GRADE YOU WOULD HAVE RECEIVED FOR AN ASSIGNMENT

GRADING

A	93 -100	Achievement that is outstanding relative to the level necessary to meet course requirements
A-	90 - 92	
B+	87 - 89	
B	83 - 86	Achievement that is significantly above the level necessary to meet course requirements
B-	80 - 82	
C+	74 - 79	
C	66 - 73	Achievement that meets the course requirements in every respect
C-	60 - 65	
D+	57 - 59	
D	50 - 56	Achievement that is worthy of credit even though it fails to meet fully the course requirements
F	<50	Represents failure and signifies that the work was either 1) Completed, but at a level of achievement that is not worthy of credit, or 2) Not completed and there was no agreement between the instructor and the student for the student to be awarded an I
S		Achievement that is satisfactory, which is equivalent to a C- or higher
N	<60	No credit
I		Assigned at the discretion of the instructor when, *due to extraordinary circumstances, e.g., hospitalization or family emergency, a student is prevented from completing the work of the course on time. The awarding of an "I" requires a written agreement between the instructor and the student.* Failure to complete assignments or examinations that is not attributable to "extraordinary circumstances" does not justify the assignment of an "I" grade.

Summary of Grades

Exam #1	30%
Exam #2	30%
In-class labs/exercise	20%
Project	20%
	100%

Expectations for Students

University of Minnesota Senate Policy states that for each semester credit the average workload expectation is 1 hour of class and 3 additional hours of preparation per week. Therefore, a 3-credit course will involve approximately 9 hours of outside class preparation on your part, plus 3 hours of in-class time. *Students are expected to attend all lectures and to participate actively in exercises and discussion. Each student is responsible for information presented in class and for any announcements that are made in class and by Email sent to their UMN account.*

ACADEMIC MISCONDUCT
Academic dishonesty in any portion of the academic work for a course shall be grounds for awarding a grade of F or N for the entire course.

Please familiarize yourself with the UMN's policy on Student Conduct:
http://www1.umn.edu/regents/policies/academic/StudentConduct.Html and
http://www1.umn.edu/regents/policies/humanresources/AcademicMisconduct.html

CLASSROOM CONDUCT
1. Please consult with instructor regarding permission and accommodations for special needs.
2. All students are expected to behave as scholars at a leading research university. This includes arriving on time, not talking during lecture (unless addressing the instructor or in group discussions), and not leaving the classroom before the end of the lecture. Use of cell phone in class is generally not allowed.
3. Disruptive students will be warned and potentially dismissed from the classroom.

Accommodations for Students with Disabilities

It is University of Minnesota policy to provide on a flexible and individualized basis, reasonable accommodations to students who have disabilities that may affect their ability to participate in course activities or to meet course requirements.

Please contact the instructor if you would like to discuss your individual needs for accommodations.

Use of Email and Course Web Site

In accordance with Academic/Administrative Policy 2.2.3, "A University assigned student email account shall be the University's official means of communication with all students on the Twin Cities campus. *Students are responsible for all information sent to them via their University assigned email account and the designated course web site.*

If a student chooses to forward their University email account, he or she is responsible for all information, including attachments, sent to any other email account." As a matter of good practice, *students are urged to check their UMN Email account at least once daily and also at least once over the weekend.*

THIS MATERIAL IS AVAILABLE IN ALTERNATIVE FORMATS ON REQUEST. PLEASE CONTACT THE INSTRUCTOR IF YOU REQUIRE AN ALTERNATIVE FORMAT.

The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

Course Schedule*

Fall, 2014

Date	Lecture Topics	Readings	Assignments
9/3	Introduction: Language, Technology and Society	Chapter 1	
9/8 9/10	Signs and Symbols: Writing as a Language Technology	Chapter 2 and 3	
9/15 9/17	Literacy in a Digital World	Chapters 4 and 5	
9/22 9/24	History of Spoken Language Technology	Chapters 6	
9/29 10/1	Automatic Speech Recognition and Synthesis	Chapter 7	Lab 1: Speech Synthesis
10/6 10/8	Text-to-Speech Systems	Chapter 7	Lab 2: Evaluation of online TTS systems
10/13 10/15	Natural Language Processing	Chapter 8	
10/20 **10/22**	Machine Translation **Mid-term Exam (in class)**	Chapter 8	Lab 3: Evaluation of online machine translation systems
10/27 10/29	Hearing Technology: Hearing Aid	Supplemental reading on Moodle	
11/3 11/5	Hearing Technology: Cochlear Implant(CI)	Supplemental reading on Moodle	Lab 4: Perception of Stimulated CI Speech
11/10 11/12	Augmentative and Alternative Communication Technologies	Supplemental reading on Moodle	
11/17 11/19	Neuroscience Technology Brain-computer Interface	Supplemental reading on Moodle	Lab 5: Observing a Brain Imaging Experiment
11/24 11/26	Brain-computer Interface The Future	Chapter 9	
12/1 12/3	Student Project Presentation Student Project Presentation	Individually assigned	
12/8 12/10	Student Project Presentation Final Review		Written project report due

Regularly Scheduled Final Exam: official date to be determined by University Regulation for the Fall semester, 2014.

Alternate final exam date to be announced.

*Note: The course schedule is tentative and subject to change depending on actual course progress.