Language Technologies, SCS Concentration

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Language Technologies Concentration

This concentration is available to SCS Students only.

With the recent advances in Large Language Models (LLMs), Human language technologies have become an increasingly central component not only of the field of computer science, but also a suite of key enabling technologies for work in every field. The work of our LTI faculty is impacting the human-critical fields of Education, Medicine, Law, and Finance. Just as a few examples, Dialog systems/chatbots, Information retrieval in many forms, machine translation and speech technologies are used daily by the general public. The LTI prepares students for this world by offering a minor that gives you the opportunity to not only learn about language technologies, but to also apply that knowledge through a directed project and prepares you for lucrative career options, either in this field or just about any other.

Students in our SCS Undergraduate Concentration have the opportunity to build on their undergraduate program requirements not only by learning more about this burgeoning field but also have the opportunity to do hands-on project work directed by one of our world famous faculty. Please feel free to reach out to Undergraduate Program Director Lori Levin if you would like to talk about this concentration.

Learning Objectives

Students should be able to...

- Apply the principles of phonetics, morphology, morphosyntax, syntactic formalisms, discourse analysis and pragmatics and sociolinguistics to analyze, describe and discuss languages that they do not normally speak.
- Implement algorithms for organizing and searching large text collections through data mining or building text-based search engines.
- Process natural language input computationally to create automated, intelligent systems to perform language translation, implement question answering, build conversation agents, and query databases using natural interfaces.
- Develop systems that recognize human speech and synthesize human speech.
- Describe the limitations of speech and language analysis systems to pick the most appropriate tools and techniques for the given problem.
- Apply principles in language technologies to a research problem or study to advance the state of the art in this field.

Curriculum

The Language Technologies Concentration requires that SCS students complete one core course and their choice of three elective courses of at least 9 units each. The electives can be chosen from a specific set of stand-alone courses. In addition to the four courses, students are required to do an undergraduate research project for at least 9 units or choose an additional elective to complete their concentration.

PREREQUISITES

		Units
15-122	Principles of Imperative Computation	12
15-150	Principles of Functional Programming	12
Strongly Recommended:		
21-120	Differential and Integral Calculus	10
21-122	Integration and Approximation	10
21-241	Matrices and Linear Transformations	11
or 21-242	Matrix Theory	
15-259	Probability and Computing	12
or 21-325	Probability	
or 36-218	Probability Theory for Computer Scientists	
or 36-225	Introduction to Probability Theory	

Core Course (12 units)

Students must take the core course below:

		Units
11-324	Human Language for Artificial Intelligence	12

Electives (minimum of 27 units)

Students must complete 3 electives from the following list of courses for a minimum of 27 units.

11-344	Machine Learning in Practice	12
11-411	Natural Language Processing	12
11-422	Grammar Formalisims	12
11-423	ConLanging: Lrng Ling & Lang Tech via Constru Artif. Lang	12
11-424	Subword Modeling	12
11-441	Machine Learning with Graphs	9
11-442	Search Engines	9
11-485	Introduction to Deep Learning	12
11-492	Speech Technology for Conversational AI	12
11-667	Large Language Models Methods and Application	12
11-711	Advanced Natural Language Processing	12
11-737	Multilingual Natural Language Processing.	12
11-751	Speech Recognition and Understanding	12
11-776	Multimodal Affective Computing	12
11-777	Multimodal Machine Learning	12
80-180	Introduction to Linguistics	9

Research or Additional Elective (MINIMUM OF 9 UNITS)

Students can apply one semester of a senior honors research thesis or research-based independent study in a topic related to this concentration, as approved by the concentration director/advisor, as one of the elective courses for this concentration. This research must have a significant communication component, including a paper or technical report, and a poster presentation. Any research course can count for at most 12 units toward the concentration and can count for at most one elective. Students who opt not to do research may take an additional elective from the list above.

Double Counting

Courses being used to satisfy the requirements for the Language Technologies Concentration may not be counted towards another minor or concentration. 11-324 Human Language for Artificial Intelligence and 80-180 Introduction to Linguistics are the only courses that may be double counted with any other major or minor. All other courses used toward the concentration cannot be counted toward any requirement other than free electives.

Advising

SCS students interested in the concentration in language technologies must apply for admission no later than September 30 of their senior year. An admission decision will usually be made within one month. Students may petition the LTI undergraduate program director to be admitted to the concentration earlier or later in their undergraduate careers. To apply, contact the program's director.

Management

A student working towards the Language Technologies Concentration will select a Language Technologies faculty member as an Advisor with the assistance of the Director. There is also a Language Technologies Concentration Program Coordinator who is a staff member in the Language Technologies Institute. Curriculum changes to this concentration will be reviewed by the Undergraduate Review Committee for approval.