Washington
University in St. Louis

Computation and Learnability in Linguistic Theory

Course Number	L44 Ling 427	Instructor	Dr. Nick Danis
Semester	Spring 2020	Contact	nsdanis@wustl.edu
Time	MW 1–2:20pm	Office Hours	TBD
Location	Life Sciences 118	Office Location	Somers 402F

1 Description

This course introduces the advanced linguistics or computer science student to the fields of learnability and computation, as they apply to the study of linguistic theories and natural language. Topics covered include the formal language hierarchy including the subregular languages; issues in the learnability of phonology, morphology, and syntax; and algorithms specific to constraint-based linguistic grammars. Prerequisites: either CS 130 or Ling 317 and at least one of the following: Ling 309, Ling 311, Ling 313, or Ling 315

2 Course Goals

- Explore the relationship between natural language and the formal language hierarchy
- Critically examine the comparison of theories from a computational point of view
- Implement and understand various learning algorithms defined for linguistic theories in a hands-on way

3 Required Materials

All required readings will be posted to Canvas as PDFs. Occasionally, we will make use of specific software (e.g. Praat, Python). This software is free and cross-platform.

4 Assessment

Your final grade is based on the following assessments:

- Problem Sets 30%
- In-class Workshops 20%
- Formal Language Squib 20%
- Final Project 30%

There will be 6 problem sets throughout the semester that test both conceptual understanding and formal application of the course material. Additionally, certain classes throughout the semester are dedicated as workshops, where you will work in groups applying the concepts as we have learned them to real-life linguistic data.

The formal language squib will be a paper completed roughly midway through the semester. You will find an existing (published) analysis of some phonological pattern, and you will reformulate the pattern in terms of formal languages as discussed in the class. A squib is a short paper (about 5 pages in length) that makes a brief but cogent argument. You will be expected to follow standard linguistics style, which will be gone over in class.

The final project is an exploration of an issue in learnability or computation beyond what is covered in class, where you can bring in your additional and individual expertise. This can be a research paper, an annotated computer program, or something of similar scope with instructor approval.

The final project is split into three stages, to ensure that appropriate progress is made (percentages are of course grade):

1. Proposal (2%): The first class session after spring break, a 500-word project proposal is due. This should contain an initial idea for a research paper or project, and the project may change based on feedback and direction.

2. Presentation (8%): During the last weeks of class, each student will present on their current state in the final project. This is an opportunity for feedback from your peers; you should be prepared to give comments and suggestions for others as well as incorporating others' suggestions into your own work.

3. Project (20%): This is the final product of your work. Specific guidelines on formatting and requirements will be given in class, but this will either consist of a research paper or a program that incorporates methods used in class. This will be due during finals period, so there is time to work in suggestions from the presentation stage.

5 Grade Policies

Letter grades are assigned based off the following scale. Numerical grades are **not** rounded.

100	$\geq$	A+	$\geq$	97	80	$>$	C+	$\geq$ 77
97	$>$	A	$\geq$	93	77	$>$	C	$\geq$ 73
93	$>$	A-	$\geq$	90	73	$>$	C-	$\geq$ 70
90	$>$	B+	$\geq$	87	70	$>$	D+	$\geq$ 67
87	$>$	B	$\geq$	83	67	$>$	D	$\geq$ 63
83	$>$	B-	$\geq$	80	63	$>$	D-	$\geq$ 60

If you are taking this class pass/fail, you must receive at least a C- (70%) to pass.

If you believe there has been an error in grading, I am happy to discuss it with you. However, you must bring it up to me within one week of the graded assignment being returned to you. After this, the grade is considered final.

6 Academic Integrity

This course adheres to the university's Academic Integrity Policy (`https://studentconduct.wustl.edu/academic-integrity/`), and takes cheating and plagiarism very seriously. All work completed online must be done alone, and no resources not approved by the instructor may be used during exams.

Schedule (tentative)

Week	Unit	Topics	Readings
1	**Issues in Learnability**	Learnability vs. Acquisition	
2		Math & Logic Preliminaries	Partee et all 1990
3	**Formal Languages & Phonology**	Formal Language Hierarchy	Heinz 2010
4		Strictly Local Languages	Rogers et al 2013
5		Finite State Machinery	Chandlee 2014
6	**Syntax**	Context-Free Languages	Chomsky 1957
7		Learning CFGs	Clark 2017
8		Language Modeling: n-grams	Jurafsky and Martin ch. 3
9	(break)		
10		Neural Networks and the Past Tense Debate	Pater 2019, Pinker and Prince 1988
11	**Constraint-based Grammars**	Rules vs. Constraints	McCarthy 2008
12		Phonotactic Learning	Prince and Tesar 2002
13		Varieties of OT Learning	Hayes and Wilson 2008

7 ADA Compliance

Washington University is committed to providing accommodations and/or services to students with documented disabilities. Students who are seeking support for a disability or a suspected disability should contact Disability Resources at 935-4153. Disability Resources is responsible for approving all disability-related accommodations for WU students, and students are responsible for providing faculty members with formal documentation of their approved accommodations at least two weeks prior to using those accommodations. I will accept Disability Resources VISA forms by email and personal delivery. If you have already been approved for accommodations, I request that you provide me with a copy of your VISA within the first two weeks of the semester. Please see more information at `http://cornerstone.wustl.edu/`.