

Computational Linguistics (Tentative Syllabus)

Course Info	
Course#	LING 6300
Semester	Spring 2021
Time	M/W 3:00–4:20pm
Location	Online (Zoom)
Website	Canvas
Textbook:	<i>Computational Linguistics as Language Science</i> Chapters distributed weekly on Canvas.
Prerequisites	Review the “Prerequisites” section for more information

Instructor Info	
Instructor	Aniello De Santo
Pronouns	He/His/Him
Email	aniello.desanto@utah.edu
Department	Linguistics
Office	Zoom
Office hours	Review the “Office hours” section for more information

0.1 Course outline

0.1.1 Bulletin description (Official)

A survey of different subfields of computational linguistics. Topics include information retrieval, natural language processing, machine translation, and computer-assisted language learning. Students examine how linguistic concepts like syntax and morphology are articulated in a computational environment for specific purposes, such as text search. Basic programming knowledge helpful but not required.

0.1.2 Actual description

I did not write the bulletin description, so here is what the course is actually about! This course aims to be the bridge from introductory courses in linguistics (Syntax 1, Phonology 1, Phonetics)

and computational methods to advanced courses and seminars in computational/mathematical linguistics. In contrast to the NLP courses offered by the department of computer science, this course focuses on studying the properties of natural language from a computationally informed perspective. The question is not how computers can solve language-related tasks, but how language can be conceptualized as a computational problem. This emphasis is also reflected in the selection of topics for this course.

- **What this course is not about**
 - Computer-assisted research methods in linguistics
 - Software development for natural language tasks
 - modern Natural Language Processing (NLP) techniques such as Neural Networks and Transformers
- **What is not covered but benefits from what is covered**
 - Speech recognition
 - OCR
 - Text generation
 - Parsing
 - Semantic analysis
 - Machine translation
- **List of topics**
 - *Phonology and morphology*
 - The role of formalization
 - String languages
 - Subregular hierarchy
 - Regular languages
 - Generative capacity of phonology
 - String transductions
 - 2-level morphology
 - Equivalence of SPE and OT
 - *Syntax*
 - Tree languages
 - Syntax is more complex than phonology
 - Mildly context-sensitive formalisms (TAG, MGs)
 - Tree transductions
 - Regular representations of MCS formalisms
 - Reinterpreting the T-model
 - *Psycholinguistics*
 - Learning
 - Theory formulation and cognitive constraints
 - Competence vs Performance

A tentative outline of the course progression is given in the table below. Many of the topics we cover draw from very specialized areas of formal language theory that even most mathematicians and computer scientists do not know about, e.g. the correspondence between finite-state machines and monadic second-order logic, or the logical characterization of tree transductions. So this course might be of value to you even if you do not particularly care about natural

language. Make no mistake, though, we'll talk a lot about language and linguistics — this is not a math class. Topics might be shifted around based on student interests.

<i>Wk</i>	<i>Formal</i>	<i>Linguistics</i>
1	What is computation?	Marr's Three Levels
2	Formalizing phonology	Why formalize?
3	Strictly local languages	Local dependencies
4	Subregular hierarchy	How powerful is phonology?
5	Regular languages	Abstractness
6	String transductions	SPE-OT equivalence
7	Two-level morphology	Null morphemes
8	(Unofficial Spring Break)	
9	Weak Generative Capacity	Phonology < Syntax
10	Tree languages	Headedness, feature percolation
11	Local tree languages	GPSG
12	Recognizable tree languages	GB
13	TAG and MGs	Minimalist syntax
14	Tree transductions	Reinterpreting the T-model
15	Parsing MGs	Sentence structure and processing

0.1.3 Prerequisites

The only official prerequisite is LING 1200 and LING 6020 (or co-requisite LING 6020). However, programming skills in Python comparable with those acquired in my Fundamentals of Python course are desirable. Python will be used to illustrate formal concepts, and some of the homeworks will require you to implement an algorithm or procedure in Python.

I will also assume some basic familiarity with graduate level linguistics (phonemes, phrase structure rules, principles of SPE and OT, minimalist style syntactic trees). Knowledge of basic mathematics (sets, functions, relations, and first-order logic, for instance) helps, but I will not assume it and explain the fundamentals when needed.

0.2 Teaching goals

- **Practical skills**
 - conceptualize a problem in mathematical terms
 - optimize your programs through the use of adequate algorithms and data structures (dynamic programming techniques, hash tables, etc.)
 - a more abstract and theoretically informed perspective on current tools and techniques in NLP
 - an understanding for how linguistic insights can be invoked to simplify NLP tasks
- **Research skills**
 - assess linguistic phenomena from a computational perspective
 - evaluate linguists' claims about computational efficiency

- basic overview of current research in theoretical computational linguistics
- use computational concepts to identify new empirical generalizations
- bring linguistic data to bear on computational claims
- mathematically informed understanding of linguistic theories

0.3 Grading

Student grades are determined by the following components:

1. Attendance & class participation (60%)

- You are expected to be actively engaged, ask questions, and participate in class discussions.
- Of course I understand that life can get in the way (especially during these weird times). Thus, I allow for 2 absences without any need for justification. Extra absences can be discussed with me. In general, I trust your judgment. The attendance requirement is so that you can get the most out of the course.

2. Class summary (10%)

- At the beginning of each lecture, a randomly chosen student will be asked to give a 5 minute summary of the last lecture (and/or relevant readings).

3. Assignments (20%)

- exercises, programming assignments, or critical evaluations of assigned readings
- Homework submission and grading is done via email
- Code that does not run will be returned ungraded.
- Collaboration on homework problems is encouraged as long as you write up the solutions by yourself, using your own words, examples, notation, and code.
- Under no circumstances should you copy code from the internet as is. Using the internet for help is encouraged, but always write your own final solution.

4. Readings (10%)

- at most two readings per week, but sometimes none beyond the lecture notes
- It is presupposed in the lectures that you have done the required readings.
- Reading comprehension may be tested as part of the homework.

5. Final project

- Due to the novel and incremental nature of the material, I don't think it is reasonable to ask you to come up with a research project within one semester. However, I encourage you to think about linguistic issues you care about while we work on the formal machinery. If you want to work on a specific topic, a project proposal (1 to 5 pages) in the form of an abstract can be used to add 5% of extra-credit increase to your final grade.

0.4 University of Utah Grading Scale

Letter	Scoring
A	100% - 94%
A-	93.9% - 90%

Letter	Scoring
B+	89.9%–87%
B	86.9%–84%
B-	83.9% - 80%
C+	79.9%–77%
C	76.9%–74%
C-	73.9% - 70%
D+	69.9%–67%
D	66.9%–64%
D-	63.9% - 60%
E	59.9%–0%

0.5 Online component

0.5.1 Zoom Meetings

- Zoom Meetings will take place during normal class time, synchronously, and attendance is expected. However, meetings will be recorded and also made available on Canvas.
- Generally, Monday meetings will mostly involve me presenting materials in an interactive fashion. Wednesday sessions will be a free-style discussion and QnA format where you can ask about materials in the lecture notes, homework assignments, and so on.

0.5.2 Lecture Notes

- Lecture notes will (usually) be chapters from a draft of Thomas Graf's book *Computational Linguistics as Language Science*. But can be complemented by extra readings. Readings associated to the topic of the week will be made available online Sunday evening, on Canvas.

0.6 Spring Break

Per University calendar, there is no official Spring break. However, I believe that a mid-semester break is helpful for an optimal learning experience. Thus, I will have no new lecture nor assignment due in week 8 (03/08 to 03/10). I will, however, still be available for office hours.

1 General Policies

1.1 Contacting me

- Emails should be sent to aniello.desanto@utah.edu
- Please put LING 6300 as part of the subject of the email, and *never* leave the subject empty!
- Reply time < 24h in simple cases, possibly more if meddling with bureaucracy is involved.
- Do not expect quick replies to emails sent overnight and/or during the weekend.

1.2 Office Hours

Office hours will take place twice per week in a dedicated Zoom room (the link will be made available on Canvas). Extra office hours will also be available by appointment.

1.2.1 A Note on Office hours

You might feel like you need to have a specific question (e.g., about a homework) in order to come to office hours. This is *not* true. **Office hours are a space for us to discuss any issue/concern you might be having with the class, and you are always welcome regardless of whether you have a precise question or not.** Thus, you also do not need an appointment to show up to office hours. However, if you anticipate a longer meeting, it might be helpful for you to email me in advance so that we can set apart enough time and avoid collisions with other students.

1.3 Late submissions

Because of the highly incremental nature of the materials, I discourage late submissions. However, life can get in the way, thus I allow 2 late submissions without need for justification, as long as you warn me before the deadline. After those:

- Other Homework extensions must be requested **before** the deadline (and, within reason, are usually granted);
- Late submissions that had not been discussed before (as we know that last minute emergencies happen) will be evaluated on a case-by-case basis.

1.4 Names/Pronouns

Class rosters are provided to the instructor with the student's legal name as well as *Preferred first name* (if previously entered by you in the Student Profile section of your CIS account, which managed can be managed at any time). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class or on assignments. Please advise me of any name or pronoun changes so I can help create a learning environment in which you, your name, and your pronoun are respected. If you need any assistance or support, please reach out to the LGBT Resource Center: https://lgbt.utah.edu/campus/faculty_resources.php

2 Accommodations

Accommodations will be considered on an individual basis and may require documentation.

2.1 Americans with Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice

needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access. The website for the Center for Disability and Access: <https://disability.utah.edu>

2.1.1 Extreme personal circumstances

Please contact your instructor as soon as possible if an extreme personal circumstance (hospitalization, death of a close relative, natural disaster, etc.) is interfering with your ability to complete your work.

2.1.2 Religious Practice

To request an accommodation for religious practices, contact your instructor at the beginning of the semester.

2.1.3 Active Duty Military

If you are student on active duty with the military and experience issues that prevent you from participating in the course because of deployment or service responsibilities, contact your instructor as soon as possible to discuss appropriate accommodations.

2.1.4 An additional note on diversity and accessibility

It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: gender, sexuality, age, socioeconomic status, ethnicity, race, and culture.

I also aim to maximize accessibility for all my lecture materials. However, it is probable that I miss or underestimate some issues. Your suggestions are encouraged and appreciated.

Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

3 COVID Policies

Students must self-report if they test positive for COVID-19 via this website: <https://coronavirus.utah.edu/>

4 University Policies

4.1 Drop/Withdraw Policies

Students may drop a course within the first two weeks of a given semester without any penalties.

Students may officially withdraw (W) from a class or all classes after the drop deadline through the midpoint of a course. A “W” grade is recorded on the transcript and appropriate tuition/fees are assessed. The grade “W” is not used in calculating the student’s GPA.

For deadlines to withdraw from full-term, first, and second session classes, see the U’s Academic Calendar.

5 Plagiarism and Cheating

It is assumed that all work submitted to your instructor is your own work. When you have used ideas of others, you must properly indicate that you have done so.

Plagiarism and cheating are serious offenses and may be punished by failure on an individual assignment, and/or failure in the course. Academic misconduct, according to the University of Utah Student Code,

“...Includes, but is not limited to, cheating, misrepresenting one’s work, inappropriately collaborating, plagiarism, and fabrication or falsification of information... It also includes facilitating academic misconduct by intentionally helping or attempting to help another to commit an act of academic misconduct.”

For details on plagiarism and other important course conduct issues, see the U’s Code of Student Rights and Responsibilities.

6 Course Materials Copyright

The Content is made available only for your personal, noncommercial educational and scholarly use. You may not use the Content for any other purpose, or distribute, post or make the Content available to others, unless you obtain any required permission from the copyright holder. Some Content may be provided via streaming or other means that restrict copying; you may not circumvent those restrictions. You may not alter or remove any copyright or other proprietary notices included in the Content.

Please see the Code of Student Rights and Responsibilities, Section III.A.5 regarding use and distribution of class Content and materials. <https://regulations.utah.edu/academics/6-400.php> Section III.A.5. prohibits the following: Sale or distribution of information representing the work product of a faculty member to a commercial entity for financial gain without the express written permission of the faculty member responsible for the course. (“Work product” means original works of authorship that have been fixed in a tangible medium and any works based upon and derived from the original work of authorship.)

6.1 Safety at the U

The University of Utah values the safety of all campus community members. You will receive important emergency alerts and safety messages regarding campus safety via text message.

For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

To report suspicious activity or to request a courtesy escort, contact: Campus Police & Department of Public Safety, 801-585-COPS (801-585-2677), dps.utah.edu

6.2 Wellness at the U

Your personal health and wellness are essential to your success as a student. Personal concerns like stress, anxiety, relationship difficulties, depression, or cross-cultural differences can interfere with a student's ability to succeed and thrive in this course and at the University of Utah.

Please feel welcome to reach out to your instructor or TA's to handle issues regarding your coursework.

For helpful resources to manage your personal wellness and counseling options, contact: wellness.utah.edu or womenscenter.utah.edu

6.3 Addressing Sexual Misconduct

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

6.4 Campus Safety

The University of Utah values the safety of all campus community members. To report suspicious activity, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

7 Changes to the Syllabus

This syllabus is not a contract. It is meant to serve as an outline and guide for your course. Please note that your instructor may modify it to accommodate the needs of your class.

You will be notified of any changes to the Syllabus.