Ling 508
Jackson
Summer 2025

Computational techniques for linguists[1]

Course Information

This course aims to prepare students for careers in computational linguistics, where some basic software engineering skills are required.

Course objectives

In this course students will design and implement a project using industry best practices, with a focus on designs that can scale up to meet the needs of a large number of potential users. We will discuss topics such as test-driven development, object oriented programming, databases, web scraping, and RESTful APIs. There will also be a discussion of how to prepare for a technical job interview. By the end of the course, students will have a project that they can show to recruiters, contacts, and potential employers, and have a plan to prepare for getting a job in the HLT field.

Learning outcomes

By the end of this course, successful students will...

1. design and implement a complete NLP software application using industry best practices. *(relates to HLT program outcomes 1,2,3)*
2. be able to use and explain strategies for building software that can function at industrial scale.*(relates to HLT program outcome 1,2,3)*
3. be well prepared for a technical job interview. *(relates to HLT program outcomes 1,2,3,4)*

HLT program learning outcomes

By completion of the HLT program, students will be able to:

1. **Write, debug, and document readable and efficient code** in programming languages commonly used to develop, implement, and evaluate HLT models, as demonstrated through course projects and a professional internship.
2. **Select and apply appropriate algorithms and core concepts** in HLT to perform common tasks and solve realistic problems, as demonstrated through course projects and a professional internship.

[1]The original development of this course was done by Jeff Berry.

3. **Apply common tools and libraries** used in HLT by integrating them into course projects and real-world applications or workflows, as demonstrated through course projects and a professional internship.
4. **Demonstrate professional skills** in the field of HLT, including effective teamwork, clear and concise communication, professional networking, understanding of business procedures and team-based code development, leadership, and critical thinking, as demonstrated through course presentations, projects, and a professional internship.

Locations and Times

This is an asynchronous online course. According to University of Arizona policy, class attendance is demonstrated by active participation in course-related online activities, such as interacting with D2L pages, the course forum, OpenClass exercises, and so on. Course sessions will not be held in-person. Please see the course D2L page for important dates and further information.

Prerequisites

Some familiarity with programming in Python is expected, such as basic flow control, looping, and built-in data structures such as lists and dictionaries. We will be using Python 3.9 in this course.

Instructor

name	Eric Jackson
email	ejackson1@arizona.edu
hours	Mondays 10:00am–12:00pm (Arizona time, UTC-7) in person (COMM 114A) and online via Zoom at `https://arizona.zoom.us/j/84420158691` (passcode 074337), and by appointment.

My working hours are normal business hours in Arizona, and I generally do my preparation and grading for the course at that time.

The best way to contact me is to send me an email or a forum message. I try to respond within 24 hours, but *during* working hours, I may be grading coursework, meeting with someone, or recording lectures, so my response may not come immediately. If there's a chance you may need my response, don't wait to discover that when a deadline is upon you.

I know that normal business hours in Arizona are not convenient for everyone in this course. If you need to meet outside of Arizona business hours, I'm holding Thursday evenings open. Contact me in advance to set up a time and a link; I won't otherwise be online then.

Course forum

For this course, we'll use the HLT forum, outside the course D2L website though still hosted by the university. Make sure you sign up for this course's stream in the first week. Please

be respectful of others in your interactions on the forum.

`https://forum.hlt.arizona.edu/#narrow/stream/66-ling-508-su-2025`

In addition to the already-planned course forum activities, you're free to start discussions there with the class, or post questions about the course. Bear in mind that responses from the forum (from me or from other students) may come quickly, but it is not guaranteed that you will receive responses faster than one working day. You should plan for deadlines as if forum responses will take 24 hours or more.

Textbook and readings

There is one required textbook that **you** are responsible to obtain a copy of. You can purchase a copy through the UA Campus store or through any other source.

Laakman McDowell, Gayle. 2015. *Cracking the Coding Interview*, 6th edn. CareerCup.

ISBN-13: 978-0984782857

There will be other supplemental readings each week, assigned through the course website. Although you're free to purchase copies of these books for our own reference, all of these other readings are available online for free (digitally) through the UA library. You'll need to log in to UA Libraries or the O'Reilly Learning site with your NetID and password to access these other readings.

Course schedule

The course is divided into seven topical modules, one each week, with lectures, readings, and assignments for each module. All course materials are available on D2L or are linked from within D2L. Specific pages for each official reading assignment will also be found in D2L. All dates and times for the course are in Mountain Standard Time (GMT-7).

Start date	Unit topic
07/07/2025	Unit 1: Introduction; Test-driven development; Scalability
07/14/2025	Unit 2: Object-oriented programming; Universal Modeling Language (UML)
07/21/2025	Unit 3: Web scraping
07/28/2025	Unit 4: Databases & SQL
08/04/2025	Unit 5: Services & orchestration
08/11/2025	Unit 6: RESTful API; User interface
08/18/2025	Unit 7: Job interviews

The first day of the course is July 7, 2025, and the last day of the course is August 22, 2025. All work must be submitted by the last day of the course.

Requirements and grading

Students are expected to actively participate in the course by watching the recorded lecture videos, reading and digesting the assigned readings, completing the assigned work, and engaging with the instructor and other students in the course forum. You are all adults, and I expect you to take responsibility for your own learning.

Technology

This is a fully online course. As such, you will need a stable internet connection to access course content and submit assignments. To complete your assignments, we recommend that you use a computer with >6GB of RAM. To complete your assignments, you will also need

- `git` and a GitHub account (programming assignments will be distributed through GitHub Classroom)
- Python (version 3.9)
- Docker
- A modern web browser (Firefox or Chrome recommended)
- We recommend an IDE like PyCharm, available at `https://www.jetbrains.com/pycharm/`. You can use the community edition (for free) or get a student license.

If you are an HLT student, the Linux development environment that you've used for other HLT courses should be fine for this course. If you are not a current HLT student and would like help setting up a Linux-based development environment, please contact the instructor.

For students who need help with R, Python, GIS, data management and data visualization, the University of Arizona Library's iSpace provides free virtual drop-in hours throughout the semester. Times vary by semester, so if you're interested, check the library website to follow up. `https://libcal.library.arizona.edu/calendar/`

ResBaz Arizona hosts a variety of events providing researchers opportunities to connect with experienced data scientists and engineers. For more information, see their homepage: `https://researchbazaar.arizona.edu/#portfolio`

Required reading

Readings are assigned for each unit of the course. You may read the assigned sections before you watch the lectures, or after—it's up to you. However, you must read the assigned sections and complete any activities before the end of that week.

Videos and lectures

Lecture videos will be provided through Panopto on the course website (D2L). Some required videos are hosted on sites outside D2L, such as at Youtube.com; in such cases, links to external sites will be provided within D2L. You are expected to watch all videos and

understand the content. If you for any reason cannot access a required video, please notify the instructor immediately.

If the content of a unit is not clear to you on the first viewing, don't panic. Make sure you've done the required readings and try re-watching the lectures. You're free to search for other presentations of the same topic online. If a concept is still unclear, you are expected to send a question to the instructor by email, meet with the instructor in regular office hours or arrange another time to meet, or post a question for clarification on the course forum.

Assignments and grading

There are 360 points available in the course: 340 are required and 20 are bonus points.

There will be one graded quiz each week, available via D2L (quizes are 10 questions, 1 point per correct answer, for a total of 70 points for the course; quizes can be retaken 10 times).

There will be six programming assignments, each worth 20 points; the programming assignment in Week 3 will be a bonus assignment. Programming assignments will be submitted and graded through GitHub Classroom. The full 20 points will be given for on-time submissions that pass all tests (showing a green check in GitHub), and 10 points will be given for on-time submissions that pass at least one but not all of the tests (to see how many tests your code passes, run it locally or check the status log to by clicking the red X in GitHub).

There will be one course-long project in which you will apply what you learn in this course to design a web-based application from the ground up. There will be graded milestones that are due each week, and you will also create a demonstration video for your application. At the end of the course, you'll have a project for your portfolio or that you can show to potential employers. Altogether this project will constitute 170 points, or half your grade for the semester. Detailed descriptions of the point break-down for each week are given in the Project module in D2L. **Since the purpose of this project is to apply the new concepts you'll learn each week, you are strongly encouraged not to work ahead on your project.** You should have sufficient time to complete it following this timeline.

Week 1: 20 pts: Documenting what your code should do using a Use Cases document

Week 2: 20 pts: Representing data relations with UML Class Diagrams

Week 3: 20 pts: Test-driven development and good OOP principles;
BONUS 10 pts: code scrapes data from a permissible web source (can be completed any time before the end of the course)

Week 4: 20 pts: Code uses a database

Week 5: 20 pts: Code has at least one function that implements a use case from #1

Week 6: 20 pts: Code has a working Flask API server;
10 pts: Code has a documentation page

Week 7: 20 pts: Code is complete and has a simple HTTP form page;
20 pts: Demo Video

All your quizes and assignments are graded on a point basis, with the number of points available specified for each assignment. Grades may be curved, and a final course grade of A, B, C, D, or F will be given. The following minimum percentages will guarantee the corresponding letter grades, in accordance with university policy:

A: 90–100%
B: 80–89.9%
C: 70–79.9%
D: 60–69.9%
E: 0–59.9%

Grades will be accessible within D2L. More details about the programming assignments and project are posted on D2L. Based on these point values, the quizes, assignments, and project will contribute to your final grade as follows:

type	number	point total (percent of total)
D2L quizes	7	70 (21%)
programming assignments	5 + 1 bonus	100 + 20 bonus (29% w/o bonus)
project	1	170 + 10 bonus (50% w/o bonus)
total		340 + 30 (100% up to 108.8%)

The due date for each assignment will be posted with the assignment in D2L. All times will be given in Arizona time (Mountain Standard, GMT-7). If you have an unexpected life event that will keep you from completing an assignment on time, talk to me about accommodation as soon as you can. Accommodations for late submission will be made for reasons that are accepted by University policy. **Late work will otherwise not be accepted.**

Student collaboration and appropriate use of AI

The purpose of this course is to train **your** mind, and to do that, you need to **use** your own mind. You will gain the most benefit from the programming and other assignments in this course if **you** are the one who has come up with all the code, analysis, or examples, even if this requires a bit of mental struggle on your part to get it right. **Don't be afraid to struggle for a bit, because that struggle is likely helping you learn.** Beyond a reasonable amount of struggle, however, it's reasonable to seek outside help from the instructor or another source.

Students are encouraged to discuss problems and general approaches for solutions with the instructor and with others in the course, but everyone must turn in work that is the product of their own mind. You may not submit assignments that are substantially the same as any other source (your classmates, someone online, or an AI tool), including using someone else's code but simply changing the variable or object names.

If you do feel you need outside help, using portions of code you found online or created with Generative AI is acceptable, but it must constitute no more than 25% of your total code. If you obtain code other than writing it yourself, **you must evaluate it critically and cite where it came from**.

If you discuss an assignment with a peer, if you find inspiration from a web resource, or if you use AI for appropriate help (ie, not simply copying and pasting its answer as your own), you must cite that fact on your assignment:

- "I discussed this assignment with Jane Studentname and Joe Wildcat."
- "I used ChatGPT 4 for brainstorming of approaches to this coding task."
- "I wrote this code following a suggestion from StackOverflow at <URL>"

Generative AI is a useful tool, like a calculator is a useful tool for doing math, but generative AI for programming is like a calculator that is sometimes completely untrustworthy. In some contexts, being able to use a calculator is an important skill—while in other contexts, like when you're taking a math test to see whether you know basic math facts, solely using a calculator short-circuits your own learning. A bicycle is a tool that allows us to get from one place to another faster and more efficiently than running—but if you're going to be tested in your time for a 5k run, it won't help you to train for running solely by riding a bicycle. You will likely need to know how to use generative language models for tasks at some point, but having one write your homework or forum posts for this class is not appropriate. Put in the thinking yourself, so that you can reap the mental benefit for yourself. You need to know how to perform these programming tasks on your own well enough that you can see where some AI-generated code is partially or completely off the mark, or introduces logic errors even if it runs without runtime errors.

The general principle in all such cases is that the majority of the work you turn in must be new and must be your own. Do your own work, and please ask me in advance if you are unsure whether something will be acceptable or not. Assignments that seem suspiciously similar, or those that seem to have been mostly produced using generative AI, will be forwarded to the Dean of Students office in accordance with the Code of Academic Integrity (linked below). Please be a responsible adult and don't run the risk of losing credit for an assignment by copying, by allowing others to copy from you, *or* by having ChatGPT do your assignment for you.

The UA Library has a guide for students as to what is and is not appropriate use of AI and similar resources:

`https://libguides.library.arizona.edu/students-chatgpt/`

University boilerplate

All of the following items are required by the university to be included on syllabi. If you find something here that is surprising or unexpected, please bring it up with me as soon as possible.

By way of a brief summary:

Disabilities If you have a disability that affects how you will need to do the work in this class, please let me know *within the first week of class.*

Academic Code of Conduct Cheating and plagiarism are not remotely acceptable in any way. You are responsible for knowing whether your own behavior qualifies as plagiarism, and whether your use of AI is inappropriate. Disruptive behavior in class—which here includes audio, video, or text on any of our course websites or by email—is not acceptable. Please be respectful of others.

Sensitive Material This is a university and you are adults. It is possible that we may touch on topics that some students could find sensitive during the semester. Given the focus of this course, this seems unlikely, but I alert you nonetheless.

Health & Wellbeing

The university has a specific site for COVID information: `http://covid19.arizona.edu`. If you are experiencing personal or financial challenges from any health-related issue, let me know as soon as you can if we need to make accommodations, and please stay safe.

The semester ahead may come with ups and downs in both physical and mental health, but there are lots of ways to support yourself. Eat well, get regular exercise, and don't neglect things like self-care, talking with friends and family, or getting a fresh perspective from a supportive group. Stress is a normal part of life and may even motivate you sometimes, but chronic or overwhelming stress can affect your physical and mental health and wellbeing. Pay attention to your personal signs that you're overly stressed, like changes in your mood, appetite, sleep, behavior, or new physical symptoms (aches, pains, etc.) that interfere with school and daily life. If you notice these signs or have questions about helpful resources, I welcome you to talk with me. You can also visit `caps.arizona.edu/mental-health` for mental health tools and resources.

Mental Health & Wellness Resources

- **Health & Wellness:** Campus Health provides quality medical, mental health, and wellness services for students. Visit `health.arizona.edu` or call 520-621-9202 (520-570-7898 for help after hours)
- **Mental Health:** Campus Health's Counseling & Psych Services offers a range of mental health support tools and services like self-care strategies, peer support, groups and workshops, and professional mental health services. Visit `caps.arizona.edu/mental-health` or call CAPS 24/7 at 520-621-3334 to learn more.
- **Crisis Support:**

  Suicide & Crisis Lifeline: call 988 Crisis Text Line: text TALK to 741-741 Visit `preventsuicide.arizona.edu` for more suicide prevention tips and resources

Absence and Class Participation Policy

Attendance in an all-online course is not evaluated like attendance in an in-person course. For this course, attendance will be represented by active reading, completion, and participation

in online course activities, including loading/viewing materials and completing activities posted on D2L, OpenClass, our course forum, and any other related websites.

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop

The UA policy regarding absences is that any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities.

Students are asked to refrain from disruptive conversations with others in the course, including on asynchronous course platforms. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue inappropriate behavior will be removed from that venue and may be reported to the Dean of Students.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu/) to establish reasonable accommodations.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. **If you use a code snippet that you came up with from discussions with a classmate, that you found online, or even that you got from a large language model, it's important to cite where it came from,**

whether that source was Sally Classmate, GitHub.com, stackexchange.com, or ChatGPT.

Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: `http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity`.

The UA Library provides a helpful learning module for students to understand and avoid plagiarism: `https://libguides.library.arizona.edu/info-strategies/plagiarism`

The UA Library also has resources to guide you to appropriate and safe use of AI and large language models: `https://libguides.library.arizona.edu/students-chatgpt/integrity`

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see

`http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy`

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.