

AI 520: Natural Language Processing for Artificial Intelligence

School of Technology & Computing

3 Credits, Graduate Course
Grading Type: Decimal
Pre-requisite, Co-requisite: None
Summer 2022

Access to the Internet is required.

All written assignments must be in Microsoft-Word-compatible formats.

See the library's APA Style Guide tutorial for a list of resources that can help you use APA style.

Faculty Information

Professional experience information for instructors is found under *Faculty Information* in the online course menu.

Contact Information

Contact information for instructors is found under *Faculty Information* in the online course menu.

Email: [first name] [last name]

Phone: [xxx-xxx-xxxx]

Office Hours and Response Time: [I am available through MS Teams <day> and <day> between <xx>-<xx> pm PTS. I will respond within 24 hours. I will grade within 3 business days after the due date.]

Bio: (keep images under 300px wide)

Course Description

This course is designed to provide students with foundational knowledge and understanding of natural language processing (NLP) methods and strategies. Students acquire knowledge to evaluate the strengths and weaknesses of various NLP technologies and frameworks utilizing NLP toolkits to create practical applications. Topics include text classification, language modeling, speech tagging, parsing, semantics, text summarization, and machine translation. Students research the core principles of natural language processing and its use in current and emerging technologies; they investigate new research initiatives that try to solve difficult issues organizations are confronted with.

Course Resources

Required and recommended resources to complete coursework and assignments are found on the course Reading List. The reading list can be found under Course Information in Desires to Learn LMS, as well as from the library homepage.

Note: Required resources that must be purchased by the student are tagged “Purchase from a vendor of your choosing.” Required resources with a direct link, “Available through CityU Library”, are available at no cost to students.

Students in Canada will see required resources they need to purchase tagged “Purchase from the Canadian Bookstore.” Students outside the U.S. and Canada should contact their advisor or textbook coordinator for additional information.

Course Outcomes

At the end of this course, students:

1. Explain fundamental NLP concepts.
2. Integrate researched current, and future uses of conversational AI.
3. Apply current tools for text classification.
4. Evaluate deep learning algorithms used in NLP.
5. Evaluate tools and services for common use cases for text analysis and conversational AI.
6. Design and implement an AI solution using NLP.

Grading Scale

The grades earned for the course will be calculated using City University of Seattle’s decimal grading system, found in the current University Catalog (<https://www.cityu.edu/catalog/>).

Grading rubrics with details on how each assignment will be graded are located under *Assignments* and/or in *My Grades* in the online course menu. Students should review each assignment's rubric before completing their work to understand how it will be assessed.

| OVERVIEW OF REQUIRED ASSIGNMENTS | % OF FINAL GRADE | POINTS |
|---|------------------|---|
| <i>Instructor Determined Assignments</i> | 30% | |
| The Muddiest Point (MP) | 5% | 50 = 5 points * 10 modules |
| Concept Test (CT) | 5% | 50 = 5 points * 10 modules |
| Discussion Board (DB) | 10% | 100 = 10 points * 10 modules |
| Knowledge Check (KC) | 10% | 100 = 10 points * 10 modules |
| <i>Major Assignments</i> | 70% | |
| Hands-On Skills (HOS) | 20% | 200 = 20 points * 10 modules |
| Virtual Labs (VL) | 30% | 300 = 30 points * 10 modules |
| Team Project (TP) | 20% | Proposal: 30 points Progress: 70 points Final Report: 70 points Final PPT: 30 points Subtotal: 200 points |
| TOTAL | 100% | 1,000 points |

Course Assignments and Grading

The instructor will provide grading rubrics that will explain how this assignment will be graded.

The Muddiest Point (MP)

This activity ensures students engage in the course and understand the fundamental knowledge of Natural Language Processing (NLP) and how it is applied in conversational AI and intelligent

text generation. The instructor uses the MP to assess how students understood the required readings. The instructor also uses the MP to customize the lecture scope to implement Just-in-Time Teaching (JiTT). The MP consists of writing a brief reflective essay (<= 50 words) identifying the most confusing part (i.e., the MP) of the content covered in the upcoming module. If a student understood all concepts, the student needs to explain the most exciting aspect. There is one multiple-choice question from the required reading to demonstrate that the student understood the required readings.

| <i>MP Criteria</i> | <i>% of Grade</i> |
|---------------------------|--------------------------|
| Participation | 80% |
| Correctness | 20% |
| TOTAL | 100% |

Concept Test (CT)

The concept test reinforces what is learned in lectures and readings. Student reflect on specific aspects of recent research, current tools and algorithms which are applied to NLP. The instructor presents specific problems; after reflecting on the problem, students submit their responses, and the instructor reviews them and provides feedback. Students discuss their thought process and solution with a peer. Students then commit to an answer and re-submit their responses. Instructor reviews the responses and provide feedback.

| <i>CT Criteria</i> | <i>% of Grade</i> |
|---------------------------|--------------------------|
| Engagement | 100% |
| TOTAL | 100% |

Discussion Board (DB)

Each week, the instructor posts a topic related to natural language processing such as evaluating deep learning algorithms used in NLP, tools, services, and common use cases. Students engage in discussion demonstrating their knowledge of the concepts covered each week and how they are applied and integrated in developing back-end applications.

All classes are required to use the Discussion Board. Participation through DB is an integral part of this course. It is defined as active engagement in a discussion or other activity. Instructors determine the type of activities and their due dates; moreover, different DB activities have different substance and length guidelines. The instructor provides specific instructions to students.

A student posts an answer to a weekly discussion topic in Discussion Board. The student also posts a response to two other students' posts by the end of each module. Comments and questions should be clear and thoughtful, with correct grammar, spelling, and punctuation. The instructor grades the quality of the discussion postings on both content and response.

Questions or comments specifically for the instructor should be emailed directly to the instructor or posted in the Question and Answer Forum. Students who want to talk with other students about issues unrelated to the discussion forums should use the Coffee Talk Forum.

Although the DB postings' tone can be informal, the instructor expects the content to be on a professional level. Student comments and questions for discussion should be clear and thoughtful, with correct grammar, spelling, and punctuation. As with written assignments, the discussion postings' quality is graded on both content and presentation.

| <i>DB Criteria</i> | <i>% of Grade</i> |
|---------------------------|--------------------------|
| Participation | 50% |
| Writing | 50% |
| TOTAL | 100% |

Hands-On Skills (HOS)

The instructor assigns Hands-on Skill exercises to install tools such as PyTorch, Anaconda, and SciKit-Learn, and complete exercises using the tools. These exercises prepare students for the Virtual Labs and the Team project. Students can work in pairs in class, or individually online. For example, students use current applications used in industry to complete the programming exercises and complete the team project.

| <i>HOS Criteria</i> | <i>% of Grade</i> |
|----------------------------|--------------------------|
| Practice Exercise | 80% |
| Engagement | 20% |
| TOTAL | 100% |

Virtual Labs (VL)

Students complete a set of Virtual Labs using environments such as Azure AI NLP workloads, Google Colab, SciKit-Learn, or NLTK (Natural Language Toolkit). Knowledge of the applications, and how they are used to solve NLP industry problems. These VLs help students with design and development of their team project. The labs must be individually performed.

Programs should deliver correct answers to all valid input and produce comprehensible error messages on invalid input. Programs also run correctly on all test data given within a reasonable amount of time. Students should write programs that are easy for other people to read.

| <i>VL Criteria</i> | <i>% of Grade</i> |
|---------------------------|--------------------------|
| Accuracy | 80% |

| | |
|--------------|-------------|
| Writing | 20% |
| TOTAL | 100% |

Knowledge Check (KC)

Students demonstrate their understanding of NLP and how it is utilized in conversational AI and text generation through weekly quizzes. These weekly quizzes focus on the underlying principles and concepts rather than memorization to solve the quizzes.

| KC Criteria | % of Grade |
|--------------------|-------------------|
| Correctness | 100% |
| TOTAL | 100% |

Team Project (TP) – Research and design an NLP Model and create a conversational AI or text generator.

Students research NLP models, use cases, and create a conversational AI or a text generator to solve industry problem organizations are faced with currently, or will be faced with in the near future. Students use the most appropriate tools introduced in the HOPs and VLs to implement (or recommend) the solution. Students can use the Azure workload to solve the problem or any of the other tools researched. Proposed use cases need to be approved by the instructor.

Students can work on a specific project, but it must be approved by the instructor and be relevant to the course. Each project consists of four elements: a proposal, a progress report, a final report of 6-7 pages, and a final presentation with slides. Templates are provided for each element by the instructor. Students add to their project elements weekly, incorporating feedback from their instructor.

Students are expected to use evidence to support the contentions they have drawn from their findings and critically analyze their cited resources. Resources should include assigned course materials and additional sources students have investigated and researched not assigned by the professor. Students use industry technical style of reporting and are expected to employ APA formatting for citations and references.

The instructor provides specific team project requirements in the course shell.

TP Report

The students submit a report formatted based on a template provided by the instructor; students can use their own format, however all components need to be included as outlined in the agenda. Students are required to improve their writing iteratively and incrementally every week. Students add new required sections to the existing paper every week.

The final report is the culmination of applied research and activities conducted throughout the quarter. The final report/paper provides a detailed problem and its solution encountered in organizations.

Grading for TP01 and TP02

| <i>TP 01 & 02 Criteria</i> | <i>% of Grade</i> |
|--------------------------------|-------------------|
| Structure | 20% |
| Content | 30% |
| Writing | 30% |
| Reference | 10% |
| Collaboration | 10% |
| TOTAL | 100% |

Rubric for TP03

| | <i>TP03 Criteria</i> | <i>Outcome</i> | <i>% of Grade</i> |
|--|---|---|-------------------|
| Natural Language Processing for Artificial Intelligence (20%) | | | |
| 1 | Natural Language Processing (NLP) for Artificial Intelligence | Apply the knowledge to identify how NLP is used today and in the near future. | 20% |
| Critical Thinking (60%) | | | |
| 2 | Issue | Issue is stated and described thoroughly so that it is understood fully. | 20% |
| 3 | Evidence | Information is taken from source(s) appropriate to the scope with enough interpretation and evaluation to develop a comprehensive analysis or synthesis, and expert opinions are thoroughly scrutinized. | 10% |
| 4 | Context and Awareness | Thoroughly analyzes assumptions and biases, carefully evaluating contextual relevance when presenting a position. | 20% |
| 5 | Conclusions | Conclusions are logical and reflect an informed evaluation of evidence and perspectives in priority order. | 10% |
| Collaboration (20%) | | | |
| 6 | Teamwork | Works effectively on diverse, global and/or distributed teams. | 10% |
| 7 | Knowledge of Cultural Frameworks | Demonstrates sophisticated understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices. | 5% |
| 8 | Openness to Cultural Differences | Demonstrates sophisticated understanding of the complexity of elements important to members of | 5% |

| | | |
|--------------|--|------|
| | another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices. | |
| TOTAL | | 100% |

TP Presentation

The student report research outcomes, development, or other project efforts to an academically appropriate committee in a public forum. The nature of the presentation content determines the specific makeup of the audience. The student choose the format of the presentation in consultation with the advisor. The layout and design must be appropriate and adequate to represent the outcomes of the effort. While students must make some form of a visual presentation, the presentation of the results may include publishing in a refereed publication, publication in a trade or popular magazine or journal, broadcast in an appropriate medium, or, in exceptional cases, limited dissemination within a closed community.

Each Team has 15 minutes for a presentation and 5 minutes for questions and answers. Each presenter must keep the total presentation time limit strictly.

| <i>TP Presentation Criteria</i> | <i>% of Grade</i> |
|--|--------------------------|
| Structure | 20% |
| Visual Presentation | 30% |
| Verbal Quality & Engagement | 30% |
| Collaboration | 20% |
| TOTAL | 100% |

Course Policies

Course policies on Late Assignments, Participation, and Professional Writing are found under Course Information in the online course menu. Students are responsible for reviewing and applying these policies while enrolled in this course.

University Policies

You are responsible for understanding and adhering to all of City University of Seattle's academic policies. The most current versions of these policies can be found in the University Catalog that is linked from the CityU Web site.

Antidiscrimination

City University of Seattle and its staff and faculty are committed to supporting our students. We value equity, diversity, and inclusion as a way of life as well as the educational opportunities it provides. City U will not tolerate any form of discrimination based on race, color, ethnicity, sexual orientation, gender identification, socioeconomic status, or religious values. If you have

experienced any discrimination based on any of the above, we encourage you to report this to the University. Please report this to your instructor. If you do not feel safe reporting this to your instructor, please report to Dr. Scott Carnz, Provost or to the Vice President of Student Affairs, Melissa Mecham.

Non-Discrimination & Prohibition of Sexual Misconduct

City University of Seattle adheres to all federal, state, and local civil rights laws prohibiting discrimination in employment and education. The University is committed to ensuring that the education environment is bounded by standards of mutual respect and safety and is free from discriminatory practices.

In the U.S., the University is required by Title IX of the Education Amendments of 1972 to ensure that all of its education programs and activities do not discriminate on the basis of sex/gender. Sex include sex, sex stereotypes, gender identity, gender expression, sexual orientation, and pregnancy or parenting status. Sexual harassment, sexual assault, dating and domestic violence, and stalking are forms of sex discrimination, which are prohibited under Title IX and by City University of Seattle policy. City University of Seattle also prohibits retaliation against any person opposing discrimination or participating in any discrimination investigation or complaint process internal or external to the institution. Questions regarding Title IX, including its application and/or concerns about noncompliance, should be directed to the Title IX Coordinator. For a complete copy of the policy or for more information, visit <https://my.cityu.edu/titleix> or contact the Title IX Coordinator.

In Canada, in compliance with the British Columbia Human Rights Code, the Alberta Human Rights Act, WorksafeBC, and the Workers' Compensation Board of Alberta, the University believes that its environment should at all times be supportive and respectful of the dignity and self-esteem of individuals. Discrimination, harassment and bullying conduct, whether through person to person behaviour or via electronic communications such as email or social media is not acceptable and will not be tolerated. As an educational institution, it is our responsibility to cultivate an environment of excellence, equity, mutual respect and to recognize the value and potential of every individual. The University will take all necessary steps to meet or exceed the requirements of the law to prevent discrimination, harassment and bullying. The Respectful Workplace Policy for the prevention of discrimination, harassment and bullying policy and procedure can be found at <https://www.cityu.edu/discover-cityu/about-cityu/> under the Policies section or at <https://www.cityuniversity.ca/about/>.

Religious Accommodations

City University of Seattle has a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The University's policy, including more information about how to request an accommodation, is available in the University Catalog and on the my.cityu.edu student portal. Accommodations must be requested by the 20% mark of this course (e.g. day 14 of a ten-week course, day 7 of a 5-week course) using the Religious Accommodations Request Form found on the student dashboard in the my.cityu.edu student portal.

Academic Integrity

Academic integrity in students requires the pursuit of scholarly activity that is free from fraud, deception and unauthorized collaboration with other individuals. Students are responsible for understanding CityU's policy on academic integrity and adhering to its standards in meeting all course requirements. A complete copy of this policy can be found in the [University Catalog](#) in the section titled *Academic Integrity Policy* under *Student Rights & Responsibilities*.

Attendance

Students taking courses in any format at the University are expected to be diligent in their studies and to attend class regularly. Regular class attendance is important in achieving learning outcomes in the course and may be a valid consideration in determining the final grade. For classes where a physical presence is required, a student has attended if they are present at any time during the class session. For online classes, a student has attended if they have posted or submitted an assignment. A complete copy of this policy can be found in the [University Catalog](#) in the section titled Attendance under Student Rights & Responsibilities.

Final Assignments Due Date

Final assignments for each class at CityU must be due on or before the final date of the course as indicated in the university's course information system. Due dates that extend beyond the final date of the course may negatively impact tuition funding for students.

Support Services

Disability Services & Accommodations

Students with a documented disability who wish to request academic accommodations are encouraged to contact Disability Support Services to discuss accommodation requests and eligibility requirements. Please contact Disability Support Services at disability@cityu.edu or 206.239.4752 or visit the [Disability Support Services](#) page in the my.cityu.edu portal. Confidentiality will be observed in all inquiries. Once approved, information about academic accommodations will be shared with course instructors.

Library Services

CityU librarians are available to help students find the resources and information they need to succeed in this course. Contact a CityU librarian through the [Ask a Librarian](#) service, or access [library resources and services](#) online, 24 hours a day, seven days a week.

Smarthinking Tutoring

CityU students have 24/7 access to free online tutoring offered through Smarthinking, including writing support, from certified tutors. Contact CityU's Student Support Center at mycityusupport@cityu.edu to request a username and password.