CSYE 7374
Research Methods in Artificial Intelligence
Course Syllabus

Course Information
Professor: Nik Bear Brown
Email: ni.brown@neu.edu
Office: 505A Dana Hall
Office hours:
Through Zoom by Appointment

Note: I am also a master's student at Northeastern. Do not send e-mail to my student e-mail
brown.ni@husky.neu.edu as I almost never read that e-mail.

All classes will be held via Zoom through Canvas

Course website: Canvas

Course Prerequisites

Python programming. A desire to publish projects and research related to AI.

Course Description

Welcome to the world of Research Methods in Artificial Intelligence, a comprehensive exploration of the methodologies and techniques essential for conducting effective research in the field of AI. In this course, you will embark on a journey that will equip you with the knowledge and skills needed to navigate the complex landscape of AI research.

Course Highlights

AI Research Foundations: Dive deep into the foundational principles of AI research, including problem formulation, hypothesis development, and data collection.

Advanced Data Analysis: Explore cutting-edge data analysis techniques specific to AI research, such as machine learning algorithms and statistical analysis.

Ethical AI: Discuss the ethical considerations surrounding AI research, including responsible AI usage and implications for society.

Practical Applications: Apply your newfound knowledge to real-world AI problems and projects, gaining hands-on experience in AI research.

Expert Instruction: Learn from experienced AI researchers and practitioners who will guide you through the intricacies of conducting research in this dynamic field.

Collaborative Learning: Engage in collaborative discussions and projects with fellow students, fostering a community of AI researchers.

By the end of this course, you will have a solid foundation in AI research methods and data analysis, enabling you to contribute effectively to the advancement of AI technology and its applications. Join us on this exciting journey into the world of AI research and innovation.

This course introduces students to the fundamental research methods, data analysis techniques, and reporting strategies necessary to conduct meaningful inquiry and research in the field of Artificial Intelligence (AI). Students will gain insight into research intent and design, methodology and techniques, format and presentation, and data management and analysis, all informed by commonly used statistical and AI methods. The course aims to equip students with the skills and knowledge required to contribute effectively to AI research and development.

Learning Objectives

Upon successful completion of this course, students should be able to:

- Formulate research hypotheses and define research problems in AI.
- Select appropriate research methodologies for AI investigations.
- Collect, process, and analyze data relevant to AI research.
- Effectively present research findings and data analysis to various stakeholders.
- Evaluate and critique AI research reports and proposals.
- Apply research findings to real-world AI applications and decision-making.

The course expectation is that a paper and project will be published by the end of the term.

Weekly Schedule

Introduction and Basic Research Concepts (2 weeks)

Research in the field of AI
Ethical considerations in AI research
Identifying research hypotheses and questions
Reviewing relevant AI literature
Introduction to data collection and analysis in AI
Qualitative Research Methods in AI (2 weeks)

Understanding qualitative data in AI

Qualitative data collection techniques
Qualitative data analysis procedures
Coding and thematic development in AI research
Quantitative Research Methods and Statistics in AI (6 weeks)

Types of quantitative data in AI
Sampling concepts in AI research
Quantitative data collection instruments
Introduction to applied statistics in AI
Descriptive and inferential statistics in AI
Regression analysis, t-tests, ANOVA, correlations, and chi-square in AI research
Mixed Methods Research in AI (1 week)

Advantages and design components of mixed methods research in AI
Explanatory and exploratory mixed methods frameworks in AI research
Reporting Results of Data Analysis in AI (3 weeks)

Presenting quantitative and qualitative findings in AI research reports
Writing about AI research findings
Critically reviewing and critiquing AI research reports
Completing the AI Research Project (2 weeks)

Applying research findings to AI applications
Finalizing and presenting the AI research project

Course GitHub

The course GitHub (for all lectures, assignments and projects):

https://github.com/nikbearbrown/CSYE_7270

nikbearbrown YouTube channel

Over the course of the semester I'll be making and putting additional data science and machine learning related video's on my YouTube channel.

https://www.youtube.com/user/nikbearbrown

The purpose of these videos is to put additional advanced content as well as supplemental content to provide additional coverage of the material in the course. Suggestions for topics for additional videos are always welcome.

Teaching assistants

The Teaching assistants are:

TBA

Programming questions should first go to the TA's. If they can't answer them then the TA's will forward the questions to the Professor.

Learning Assessment

Achievement of learning outcomes will be assessed and graded through:

● Quizzes
● Exams
● Completion of assignments
● Completion of term projects

Reaching out for help

A student can always reach out for help to the Professor, Nik Bear Brown ni.brown@neu.edu. In an online course, it's important that a student reaches out early should he/she run into any issues.

Grading Policies

A point system is used. Everything that you are expected to turn in has points. Points can range from 1 point to 1000 points Assignments get a 10% deduction for each day they are late rounded up. Exams cannot be made up unless arraignments are made before the exam.

I expect to use the following as a rough grading scale at the end of the semester. You should not expect a curve to be applied; but I reserve the right to use one. The curve may go up or down. That is it is possible for a 95 to be an A-.

Score	Grade
93 – 100	A
90 – 92	A-
88 – 89	B+
83 – 87	B
80 – 82	B-
78 – 79	C+
73 – 77	C
70 – 72	C-
60 – 69	D
<60	F

Scores in-between grades. For example, 82.5 or 92.3 will be decided based on the exams.

* Note the score is calculated using the grading rubric and IS NOT the average of the assignments that is displayed by Canvas.

There will be two major projects due near the end of the semester worth approximately 50% of the total grade. A VFX assignment in Houdini and a game/real-time 3D assignment in either Unreal Engine or Unity 3D.

Canvas

You will submit your assignments via Canvas _and_ Github. Click the title of assignment (Canvas -> assignment -> <Title of Assignment>), to go to the submission page. You will know your score on an assignment, project or test via Canvas. Canvas only represents only the raw scores. Not normalized or curved grades. A jupyter notebook file ALONG with either a .DOC or .PDF rendering of that jupyter notebook file must be submitted with each assignment.

_Your name MUST be part of your submission, for example Sanchez_Rick_Assignment_1.zip_

Multiple files must be zipped. No .RAR, .bz, .7z or other extensions.

Assignment file names MUST start with students last name then first name OR the groups name and include the class number and assignment number.

Assignment MUST estimate the percentage of code written by the student and that which came from external sources.

Assignment MUST specify a license at the bottom of each notebook turned in.

All code must adhere to a style guide and state which guide was used.

Due dates

Due dates for assignments at midnight on due date of the assignment.

Five percent (i.e. 5%) is deducted for each day an assignment is late. Solutions will be posted the following Monday. Assignments will receive NO CREDIT if submitted after the solutions are posted. Any extensions MUST be granted via e-mail and with a specific new due date.

Course Materials

Textbook: "Research Methods in Artificial Intelligence" by Nik Bear Brown (Free Online)
Additional readings: Academic papers, AI research reports, and articles related to AI research methods and technique

Participation Policy

Participation in discussions is an important aspect on the class. It is important that both students and instructional staff help foster an environment in which students feel safe asking questions, posing their opinions, and sharing their work for critique. If at any time you feel this environment is being threatened—by other students, the TA, or the professor—speak up and make your concerns heard. If you feel uncomfortable broaching this topic with the professor, you should feel free to voice your concerns to the Dean's office.

Collaboration Policies

Students are strongly encouraged to collaborate through discussing strategies for completing assignments, talking about the readings before class, and studying for the exams. However, all work that you turn in to me with your name on it must be in your own words or coded in your own style. Directly copied code or text from any other source MUST be cited. In any case, you must write up your solutions, in your own words. Furthermore, if you did collaborate on any problem, you must clearly list all of the collaborators in your submission. Handing in the same work for more than one course without explicit permission is forbidden.

Feel free to discuss general strategies, but any written work or code should be your own, in your own words/style. If you have collaborated on ideas leading up to the final solution, give each other credit on what you turn in, clearly labeling who contributed what ideas. Individuals should be able to explain the function of every aspect of group-produced work. Not understanding what plagiarism is does not constitute an excuse for committing it. You should familiarize yourself with the University's policies on academic dishonesty at the beginning of the semester. If you have any doubts whatsoever about whether you are breaking the rules – ask!

Any submitted work violating the collaboration policies WILL BE GIVEN A ZERO even if "by mistake." Multiple mistakes *will be sent to OSCCR for disciplinary review.*

To reiterate: **plagiarism and cheating are strictly forbidden. No excuses, no exceptions.** *All incidents of plagiarism and cheating will be sent to OSCCR for disciplinary review.*

Assignment Late Policy

Assignments are due by 11:59pm on the due date marked on the schedule. It is your responsibility to determine whether or not it is worth spending the extra time on an assignment vs. turning in incomplete work for partial credit without penalty. Any exceptions to this policy (e.g. long-term illness or family emergencies) must be approved by the professor.

Assignments will receive NO CREDIT if submitted after the solutions are posted. Any extensions MUST be granted via e-mail and with a specific new due date.

Only ONE extension will be granted per semester.

Student Resources

Special Accommodations/ADA: In accordance with the Americans with Disabilities Act (ADA 1990), Northeastern University seeks to provide equal access to its programs, services, and activities. If you will need accommodations in this class, please contact the Disability Resource Center (www.northeastern.edu/drc/) *as soon as possible* to make appropriate arrangements, and please provide the course instructors with any necessary documentation. The University requires that you provide documentation of your disabilities to the DRC so that they may identify what accommodations are required, and arrange with the instructor to provide those on your behalf, as needed.

Academic Integrity: All students must adhere to the university's Academic Integrity Policy, which can be found on the website of the Office of Student Conduct and Conflict Resolution (OSCCR), at http://www.northeastern.edu/osccr/academicintegrity/index.html. Please be particularly aware of the policy regarding plagiarism. As you probably know, plagiarism involves *representing anyone else's words or ideas as your own*. It doesn't matter where you got these ideas—from a book, on the web, from a fellow-student, from your mother. It doesn't matter whether you quote the source directly or paraphrase it; if you are not the originator of the words or ideas, *you must state clearly and specifically where they came from*. Please consult an instructor if you have any confusion or concerns when preparing any of the assignments so that together. You can also consult the guide "Avoiding Plagiarism" on the NU Library Website at http://www.lib.neu.edu/online_research/help/avoiding_plagiarism/. If an academic integrity concern arises, one of the instructors will speak with you about it; if the discussion does not resolve the concern, we will refer the matter to OSCCR.

Writing Center: The Northeastern University Writing Center, housed in the Department of English within the College of Social Sciences and Humanities, is open to any member of the Northeastern community and exists to help any level writer, from any academic discipline, become a better writer. You can book face-to-face, online, or same day appointments in two locations: 412 Holmes Hall and 136 Snell Library (behind Argo Tea). For more information or to book an appointment, please visit http://www.northeastern.edu/writingcenter/.