

CS4333, Current Directions in Artificial Intelligence (4-0)

Syllabus for Winter 2025

Course description

This is a reading course where we read recent articles on artificial intelligence and discuss them. Topics covered are military strategy and AI, personnel issues and AI, AI acquisition, national agendas in AI, autonomous vehicles, sensors and AI, generative AI, AI and planning, AI and cyberwarfare, interesting applications, and AI ethics. We also watch together some videos by researchers at our school describing their artificial-intelligence work. Prerequisites: Both CS3331 and CS3332 or both CS3310 and CS3315.

Instructor

Prof. Neil Rowe, ncrowe@nps.edu, (831) 656-2462 (office), (831) 373-1732 (home), GE-328, faculty.nps.edu/ncrowe. Please email assignments to that email address, and do not mail to the instructor account in Sakai. We will also have a number of guest lecturers from the AI faculty at NPS.

Classes

Classes will meet using Zoom on Tuesdays and Thursday 1700-1900 PST (2000-2200 EST). Sessions will be recorded for those who cannot attend live, and posted later on the Sakai site. Like most classes at NPS, we expect you to spend at least six hours per week on the class materials outside of class, for a commitment of 10 hours per week.

Grading

Grades are based on two exams, a discussion you lead of probably two papers, a term project including a class presentation, and some points on your participation in class discussions (absent students can submit questions for class discussions which count for this). Presentations can be prerecorded if you are traveling, but we prefer live presentations. The paper presented should come from the reading list, and you will select it in advance. The term project will involve at least 20 hours of work and will result in a written report on some area of AI technology (see guidelines below); it is due on Friday, March 22 at 1200 PST. Late submissions on homework and projects receive a 15% penalty on the grade. The median course grade is an A-.

Class materials

We will use a class site in Sakai that you can access using your NPS username and password. Required readings and tests will be posted there.

Schedule

1/6 & 1/8: Prepared lectures

1/13 - 2/26: Student-led discussions of papers, plus some videos

1/20: Holiday
2/12: Midterm exam
2/17: Holiday
2/25: Prof. Rowe will be on travel, but class meets online as usual
2/27: Prof. Rowe will be on travel, and will leave video or videos to watch
3/4-3/18: Project presentations in class
3/18: Last project presentations; final exam; last day of class
3/21: Final project due by 1200 PST

Required readings to be discussed in class

The following are in the “Readings25” folder in Sakai. We will read and have presentations of these in roughly the order below. A student will be assigned to lead each discussion; the discussion leader should take 5-10 minutes to summarize the paper, and then provide two discussion questions for the class for 15 minutes total. The paper summary should not be read from a document, and need not always agree with the claims in the paper.

Each student should choose two papers listed here to present. Here L means a long paper, S means a short paper, and * means an important paper we need a student to cover.

Military strategy with AI

- military_ai_and_human_judgment
- fog_of_ai_war (*)
- strategic_implications_weaponization_of_ai (*)
- ai_assisted_warfare (*)
- irresponsibility_of_not_using_ai
- ai-enabled_military_decision-making

- Personnel issues in AI
- ai-ready_military (*)
- ai_trust_and_team_cohesion
- will_ai_replace_army_commanders
- end_of_military_pilots (*)
- ai_in_af_squadrons
- singleton_paradox_for_human_machine_teaming
- academic_performance_prediction_risks
- ai_in_training_professionals (L)

AI acquisition

- on_the_testability_of_artificial_intelligence... (S)
- gao_requirements_for_ai_acquisition (*, L)

National agendas in AI

- eye_for_eye_in_ai (L)
- ai_in_china_and_russia (*)
- Israel_ai_tech_surprise
- ai_distorts_decision_making

Autonomous vehicles

- survey_on_autonomous_vehicles
- adaptive_drone_identification_and_neutralization (*)
- artificial_intelligence_for_the_undersea...
- drones_in_military_conflict
- small_drones_in_ukraine
- brain-computer_interfaces_for_drone_control
- sea_drones_in_the_Russia-Ukraine_War (*)

Sensors and AI

- acoustic_surveillance_Bushwick (S)
- reading_emotions_and_personality (*,S)
- ai_for_ew
- intelligent_naval_guns

Generative AI

- Microsoft_AI_Chatbot_WIRED
- big_tech_and_gen_ai
- social_dangers_gen_ai
- fact_checking_gen_ai_with_xai
- risks_of_large_ai_models (*)

AI planning

- 4d_ai_military_planning
- marines_serious_games (S)
- military_chess_game
- Koslowski_preventative_maintenance... (S)
- ai_for_military_ops_planning
- ai_in_business_and_management (L)
- Chinese_naval_ai_aux_dec_system (*)

AI and cyber warfare

- ai_and_cybersecurity
- moving_targets_for_adversarial_ai
- resilience_of_ai_algorithms (L)
- deepfakes_international_conflict (*)
- ai_security_threat
- adversarial_attacks_on_malware_detection (L)
- weaponization_of_ai_in_cybersecurity (*)

Interesting applications

- ai_and_polymers
- ai_for_medical_triage
- military_uniform_identification
- ml_for_detecting_exfiltration (L)
- ai_for_aeronautics

AI ethics

- day_zero_ethics... (S)

- future_warfare_and_responsibility
- can_lethal_aut_wpns_be_just
- sculley_machine_learning_debt
- ai_explainability_Jovanovic (S)
- ai jeopardizing safety_and_security
- ai_ethics_for_military (*)
- trustworthy_ai_survey (L)

Guidelines for the class project

General guidelines:

- Pick three related papers to read and summarize in a written report and a class presentation. The papers must relate to artificial intelligence and have some relevance to the military.
- The instructor must approve the topic. Email your list of papers to the instructor. If more than one student wants to do the same paper, we will negotiate who will do it.
- The project should involve at least 20 hours of effort.
- There should be some analysis of technical details in the writeup; it should not just report what admirals and generals said.
- You will give a presentation in class on your project towards the end of the course. The project may not be complete at the time of the presentation, but try to explain what you are trying to do. Do not read your presentation from a script.
- The project will be graded separately on the presentation, writeup, and ambition.

For the writeup:

- Submit the project writeup electronically to ncrowe@nps.edu in Microsoft Word or Adobe PDF format. Do not send the original papers or the presentation slides.
- It should be at least 3000 words in total, around 1000 words for each paper.
- It should be submitted as a single document covering all three papers. List the three papers you cover at the top of the first page of text.
- No particular format is required, but be sure to cover background, previous work, conclusions you draw about the usefulness of the work you survey, and your recommendations for future work on the topic.
- Try to offer insights rather than just repeating what other people said about the previous work. At this point, you have had some basic AI courses, so you should be smarter about what you read about AI.
- Discuss future directions that researchers or developers could take in working on your topic.
- If the paper reports work done by other people, as if it relates to an existing project in your organization, give credit to those people or their project in an “Acknowledgements” section.
- You may not use large language models like ChatGPT to prepare the writeup.

General criteria for evaluating AI applications

- Are the task and its metrics clearly identified?
- How difficult are issues of data acquisition?
- Is there buy-in from stakeholders?

- Have possible harms been adequately surveyed?
- How good is the process for fixing errors?
- Have adversary manipulations of the input data been adequately considered?
- How good are the procedures for reporting and assessing performance?
- How adequate are personnel resources for the application?
- Is it (or was it) a good idea, judging by what has happened so far?
- How successful is it or was it?
- How much of it depends on AI?