CSCI 390 – Artificial Intelligence

Fall 2023

**General Information**

* Teacher: Khalil Khan, Mao Bui, Nguyen Anh Tu.
* Offline class times: Tuesday: S1 (13:30-14:45), S2 (15:00-16:15), S3 (16:00-17:45)
* Class Location: 7E.429 (Tuesday)
* Online class times and office hours: Thursday (13:30-14:45 and 15:00-16:15)
* Teaching assistants:
  + TBA
  + TBA

**Pre-Requisites**

* CSCI 152 Performance and Data Structures (C- and above). Do not mention that you do not know how to do the programming.

**Course Overview**

The focus of this class is to introduce and familiarize the student with basic concepts of Artificial Intelligence, including but not limited to Problem-Solving, Reasoning, Probabilistic Reasoning and Learning, Learning from Observation, and Neural Networks. The student will be exposed to these traditional fields in order to understand many of the commonly used algorithms in computer science, robotics, or data mining. The preferred programming language is Python, but besides one or two assignments Java or C/C++ is allowed as well.

**Course Aims**

The aims of the course are:

* Learn and Understand what AI is, what intelligent agents are, and how they are used in problem-solving.
* Learn how to solve problems by searching, exploration vs. exploitation in strategies for problem-solving, and so on
* Reasoning under uncertain conditions (probabilistic reasoning)
* Learning (from observation, probabilistic, reinforcement)
* To be equipped with the tools to tackle new AI problems you might encounter in life.

**Course Materials**

The required textbook for this class is: “Artificial Intelligence: A Modern Approach, 2nd/3rd edition, Stuart Russell, Peter Norvig.”. Please be aware that most of the original slides coming along with the textbook is authorized to use for teaching and learning purposes.

The primary course resources are provided online via Moodle. The Moodle page contains video lessons, lecture slides, practice exercises, and readings created by the instructors, as well as links to off-site resources. We will also be using Moodle as the place to submit programming/written assignments, some quizzes, mid-term exams, and final exams.

Besides, we may use the Piazza platform for handling general questions and answers from students. The main purpose of the piazza is to help all of you if you are struggling with starting the assignments, lectures, and some other technical problems. Piazza should reduce the number of repetitions of the same questions due to the big number of students enrolled in the course. Please follow the following instructions:

1. Please use **YOUR REAL FULL-NAME** on Piazza. Any account which is NOT connected with a real student will be removed immediately. You can use Piazza to ask/answer questions, which were not clearly specified in the specification of the assignment, lectures, technical issues, or organizational issues.
2. The instructors will make some official announcements through Piazza and Moodle.  Students should make sure that Piazza sends email notifications to their NU address so that they can receive and read these announcements daily.
3. You should read the previously asked and answered question, and **please, do not ask the same question several times**. If the question will be repeated or very similar to the one which was already answered, your question will be removed or said that it was answered already, which means you should scroll down and find it.
4. **You are not allowed to post any codes/solutions on Piazza, regardless of public or private mode**. Anyone who does it will be counted as cheating.
5. **You are not allowed to insult each other and your TAs/Instructors.** The instructor and TAs have the right to suspend and remove any irrelevant topics.

**Class Structure**

We will conduct a hybrid teaching mode, where the video lectures are pre-recorded and provided online via Moodle, and in-class time will used for summazing the main points, doing excercises, and aswering the questions. Specifically, every week we have two lectures whose recorded videos will be uploaded to Moodle. The student can watch the materials at their convenient time.

We will have in-person lectures on **Tuesdays**, where the instructors will summarize the uploaded lectures, work through the problems/excercises, and get the questions answered. So, the primary content will be presented in the form of conceptual lectures, demonstrations, and discussions.

There will be a live session every **Thursday** using Microsoft Teams for each section where we answer students’ questions related to the lectures, assignments, and other provided materials.. Link to the MS Teams will be shared on Moodle. Students can join from the given link.

The class will consist of assignments, quizzes, midterm, and a final exam.

Assignments will be given with both written and programming parts. Each assignment is centered around an application and will also deepen your understanding of the theoretical concepts. Particularly, programming assignments will be closely related to the material covered in the lectures. They must be submitted before the given deadline to Moodle. Otherwise, you will receive no credit for the assignment. If you are caught plagiarizing code from other students or using code obtained online, or getting unauthorized help from others, you will get a zero for the programming assignment. Written assignments should be written up clearly and concisely. You may lose points if your answers are unclear or unnecessarily complicated.

Two quizzes are planned for this semester. These quizzes will test your knowledge and problem-solving skills on the preceding lectures and assignments. Note that the mid-term exam is not a quiz and will be concerning the knowledge from the whole mid-term. You cannot use any external aids, e.g., computers, phones, mobile devices, notes, etc. - **just a calculator, pen or pencil, and an eraser**. IF you miss a quiz because of a valid reason, for example, you have a **Spravka** confirmed by the Student Affairs office, you can be exempted from that quiz ONCE.

There will be an online exam during the exam week. Similar to the quizzes, you will not be allowed to use computers, phones, mobile devices, and notes during the exams. **Only a calculator, pen or pencil, and eraser are accepted**.

**Class Assessment**

The final grade is calculated as follows:

* Two 30-minute quizzes 20% (each quiz 10%)
* One mid-term 15% (**including all the content from the beginning to the midterm**)
* Assignments 30%
* One final examination 35% (**including all the content from the beginning to the end**)

**Note 1:** students from **other departments** are graded the same as **Computer Science students**, **no exception, no negotiation**.

**Note 2:** the content of the quizzes/exams will include the lectures’ slides and the corresponding narration/explanation from the instructors.

**Note 3:** all the lectures/quizzes/exams will be arranged based on Astana time. Any absence regarding the difference in time zone is unacceptable. In case you miss an offline lecture, you have to inform the instructor **before** the attendance check.

**Note 4:** exams and quizzes can be given outside of class time and venue according to the duration of the exam and/or the availability of the location. In this case, we will inform you at least one week before the exams.

**Note 5:** Students with spravka/valid reasons **MUST** inform the instructors at least **TWO DAYS** before the **offline lectures/quizzes/midterm exam** to be considered. For example, if the quiz is on 04th September, you have to report your problem **before 23:59, 02nd September**. The late report is **NOT** accepted.

**Note 6:** **important!!!** If you miss any quizzes/mid-term exams AND **have** a spravka/valid reason, the percentage of the quizzes or midterm exam will be **transferred** to the final exam. This policy is NOT applied to the assignments.

Final note: do NOT try to request any “extra” assignments/special favor to pass the course. This actually violates the school policy and really be unfair to other students.

Final letter grades will be assigned using the following:

| A | 95 or above | C | 65 up to 70 |
| --- | --- | --- | --- |
| A- | 90 up to 95 | C- | 60 up to 65 |
| B+ | 85 up to 90 | D+ | 55 up to 60 |
| B | 80 up to 85 | D | 50 up to 55 |
| B- | 75 up to 80 | F | 0 up to 50 |
| C+ | 70 up to 75 |  |  |

**Electronic Resources**

Given that everything is online this semester, you must check your Nazarbayev University e-mail, and Moodle and Piazza course pages on a daily basis (at least!) for updates and announcements about the course. Not checking your e-mail or the course pages is not an excuse for missing an announcement. You will also be required to use Moodle to submit in-class exercises, programming assignments, some quizzes, and presentation materials as instructed by your instructor.

**Late Policies**

Programming assignments must be submitted by the Astana time specified at the time of the assignment. They must be submitted to the proper place in Moodle on the announced due date. In case Moodle does not work, assignments need to be submitted by email to your instructors and teaching assistants by the same time and day as specified in the assignment.

If you finish your written assignments after the deadline, their scanned copy **must be submitted by email** to your instructors and teaching assistants.

**We do not allow late submissions**. Therefore, in cases of illness or family emergency, you must inform your instructor immediately if you believe you will not be able to submit your assignment on time. In such cases, an exception may be made at the discretion of your instructor. In addition, live grading will be done if the instructor feels that the assignment/homework is a result of plagiarism.

**Classroom Behavior**

You are expected to act respectfully toward your fellow classmates, TAs, and instructors inside and outside of the classroom. We have a limited amount of time to cover a lot of material this semester, so you need to pay attention during lectures and presentations and do your in-class work when it is assigned. Talking on your phone, texting, filming**,** chatting online, browsing Facebook or other social media sites, and talking excessively with your neighbors about non-class-related stuff are just a few examples of behavior that is not acceptable and will negatively impact your participation score. In fact, cell phones are prohibited in class. Anyone caught with a cell phone is automatically marked as not present at the lecture.

**Academic Integrity**

Nazarbayev University and the School of Engineering and Digital Sciences have established high standards for academic integrity, using an approach in which students are trained to produce original work according to professional standards, and to properly cite and reference the work of others when it is appropriate to do so.

The specific guidelines are published in the NU Student Handbook. In particular,

* The assignments in this class are designed to introduce important concepts and techniques, and enable you to explore the material independently so as to gain insight and comprehension of the subject. Doing the work is much more important than getting the right answer.
* The course is designed such that the new material presented each day builds on the skills developed in the preceding days; thus, any action that interferes with this process (missing class, skipping the assignment, copying) will seriously impede your progress.
* You are welcome—and encouraged—to talk through concepts and ideas with your fellow students and to study with them, but do not give or receive direct help from your classmates on a graded assignment.
* Assignments should be completed individually. If you distribute your work to others, even if you are not intending them to copy it, this is still considered academic misconduct.
* Even the appearance of cheating or inappropriate copying should be avoided.
* Students should be aware that the assignment submission process incorporates an automated plagiarism detector.
* You may only get help on graded assignments from designated people—the instructors or TAs for the course. If you are struggling with an assignment, by all means, please seek help from them.
* In the event that **academic misconduct such as plagiarism or cheating is discovered, the student will receive no credit for the work, and the event will be reported to the Dean of your school**. Egregious cases, or a second offense, can result in failure of the course and potential suspension or expulsion from the university.
* When a student suspects that another student has violated the academic honesty policy, a report should be made to the appropriate faculty member.

**Class Schedule**

| **Week** | **Topic covered** | **Book chapter** | **Assignments** | **Quizzes** | **Notes** |
| --- | --- | --- | --- | --- | --- |
| 14-18 Aug | Introduction | Ch 01, 02 |  |  | **Khan** |
| 21-25 Aug | Intelligent Agents  Problem Solving and Search | Ch 02, 03 |  |  | **Khan** |
| 28 Aug – 01 Sep | Informed Search  Local Search Algorithms | Ch 05 | As1 |  | **Khan** |
| 04–08 Sep | Adversarial Search | Ch 06 | As2 | Quiz 01 | **Mao** |
| 11–15 Sep | Fundamental Probability | Ch 13, 14 |  |  | **Khan** |
| 18–22 Sep | Bayesian Network | Ch 14 | As3 |  | **Tu** |
| 25 Sep – 29 Sep | Temporal Probability Models  **Note: Midterm** | Ch 15 |  | Mid-term | **Tu** |
| 02-06 Oct | Fall Break |  |  |  |  |
| 9-13 Oct | Learning from Observation | Ch 18 |  | Last day to withdraw | **Mao** |
| 16-20 Oct | Statistical Learning | Ch 19-21 | As4 |  | **Mao** |
| 23-27 Oct | Rational Decisions | Ch 16, 17 |  | Quiz 02 | **Mao** |
| 30 Oct-03 Nov | Reinforcement Learning |  | As5 |  | **Tu** |
| 06-10 Nov | Supervised and Unsupervised Learning |  |  |  | **Tu** |
| 13-17 Nov | Special Topics |  | As6 |  |  |
| 20-24 Nov | Review |  |  |  |  |
| 27 Nov – 01 Dec | Final Exam |  |  | Final-term |  |

Note: This outline is subject to change! Specific chapter sections for the readings will be given just before the accompanying lectures.