



Course Snapshot

AI for Game Development CSCE 3222 001

Term: 2026 Fall

Modality: In Person

Meeting Information: TR, 12:15PM-01:35PM, NTDP F204

Instructor Information

Name: Jonathon Doran

UNT Email Address: Jonathon.Doran@unt.edu

Office Hours and Location

Student hours held in-person in NTDP E260L

Zoom is available via appointments. Feel free to schedule appointments if the official hours do not work for you. If the list of times on Calendly does not work for you, please email me with your requested times.

Day	Time
Tuesday	2:30pm - 3:30pm
Wednesday	11:00am - 12:00pm
Friday	1:00pm - 2:00pm

[Book a meeting using Calendly](#)

Please put the course number in your subject line for all email communication. Canvas does that automatically.

Office or Department Phone Number: Please contact me via Teams or Email

Preferred Contact Method: Email is preferred for contact. Please put "CSCE 3222" in the subject line.

Expected Response Time: During the week I will respond within 24 hours.

During the weekend, response time may be longer.

Course Description

3222. AI for Game Development. 3 hours. Offers an in-depth exploration of Artificial Intelligence (AI) techniques applied in game development. Students learn to create intelligent game systems, including pathfinding, decision-making, adaptive AI, procedural content generation, and machine learning. Emphasizes hands-on projects, teamwork, and the development of a game prototype with integrated AI systems. Prerequisite(s): CSCE 2110 with a grade of C or better.

Course Structure

Our course meets twice a week for 80-minute sessions and is primarily lecture-based. Class time is used to discuss techniques, intents, and reasoning.

Hands-on work happens out of class. There are laboratory assignments where you are asked to work on something related to that week's topic, with a short lab report as a submission. The labs end after Week 8, so the remainder of the semester can focus on the term project.

Before each session you will submit a decision brief stating what you are working on and one technical question that is keeping you from making progress.

Please plan on spending three hours on work outside of class for each hour in class (scale based on your experience).

Instructor Welcome and Course Orientation

I am Jonathon Doran. My research is in procedural content generation for role-playing games, which we will spend a couple of weeks on later in the semester. I think it is an underexplored area, particularly because it

addresses production economics that studios routinely overlook.

I came to this subject early. As a kid I wanted a computer that could be a playmate, and I never really got over it. That turns out to be a useful thing to want, because it is not a question of making the computer smart. It is a question of making it good company, and those are very different engineering problems. Most of this course lives in the gap between them.

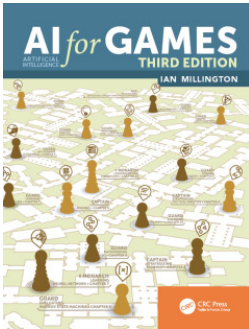
A note on how this course works: I do not grade code, and there are no exams. What I grade is whether your AI does what you intended, whether you can explain why you built it that way, and whether you understand what went wrong when it did not. If you can defend it, it counts.

Learning Outcomes and Alignment

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

1. Explain the goals and constraints that distinguish game AI from artificial intelligence generally.
2. Implement pathfinding and navigation for agents in a game environment.
3. Select and implement an appropriate decision-making architecture, including state machines, behavior trees, and goal-oriented planning, for a given behavioral requirement.
4. Justify a choice of AI technique against at least one rejected alternative.
5. Apply procedural content generation techniques and evaluate the output of a generator.
6. Assess where machine learning and adaptive techniques are appropriate in a game context, and where they are not.
7. Verify that an AI system behaves as intended and articulate the evidence for that claim.
8. Diagnose faulty agent behavior by isolating whether the failure lies in the decision mechanism or in the information driving it.

Course Materials



AI For Games
ISBN: 978-1-138-48397-2
Authors: Ian Millington
Publisher: Taylor & Francis
Publication Date: 20190221
Edition: Third

Cost Notes

Voertman's currently has this text for \$20 less than the UNT bookstore.

Course-Specific Technology

This course requires Unreal Engine. You will need regular access to a computer capable of running the Unreal editor comfortably. Windows is strongly recommended.

NTDP F204 has machines that meet this requirement. Hours will be posted on Canvas and on the door to F204 once the schedule is set (probably around week 2).

Major Assignments and Assessments

Labs (Weeks 2 through 8). Short, constrained exercises tied to the week's technique. The deliverable is a brief lab report: what you chose and why, how you verified it behaves as intended, and what you would change. Labs are graded on completion and good-faith engagement and are returned quickly. They end after Week 8 so the remainder of the semester goes to the term project.

Decision briefs. Submitted before each session. State what you are working on and one technical question that is blocking your progress, along with the reasoning that led to it.

Reward-hacking exercise (Week 10). A short written assignment. Specify the observations, actions, and reward function for a learning agent, then identify the reward hack in another design.

Term project. An individual project demonstrating the integration of multiple AI techniques from this course. You choose the application. Reviewed at three milestones, each graded against milestone-appropriate criteria rather than the finished ideal:

[Week 8] scope and approach,
[Week 11] implementation progress, "
[Week 14] working system.

The term project will be presented during finals week.

Final interview. An individual oral defense of your project: what you built, why you chose that approach, how you know it works, and what you would do next.

There are no exams in this course.

Grading and Feedback

Category	Weight
Labs and Written assignments	30%
Decision Briefs	10%
Project Milestones	30%
Final Project and Interview	30%

Letter grades

A standard 10-point scale (90 and above A, 80 to 89 B, 70 to 79 C, 60 to 69 D, below 60 F). This scale is a guarantee of the maximum required for each letter grade. I reserve the right to adjust favorably for students near a boundary.

Submission and late work

All work is submitted through Canvas and/or GitLab by the posted due date. Late submissions are not accepted outside of university-authorized absences. There is no extra credit.

Labs

Labs are assigned at the end of the week whose material they cover and are due at the end of the following week.

Decision briefs

Credit requires both submitting the brief and attending the session it belongs to. Arriving late means no credit. A brief submitted for a session you miss will still receive feedback, but no credit. Each brief is worth a small fraction of the course grade, so a single missed session is not something to worry about; a pattern of them is.

Final examination period

This course has no written final examination. The scheduled final examination period, Tuesday 8-December, is used for project presentations and attendance is required. Missing it is equivalent to missing a final examination. Do not schedule travel before 8-December.

Feedback

Rubrics for each assignment are posted in Canvas. I aim to return feedback within one week of the due date.

Course Calendar

Week	Dates	Topics	Due
1	Aug 17-21	What game AI is and is not; history and examples; game AI versus general AI. Overview of techniques covered; project introduction and proposal requirements.	
2	Aug 24-28	Pathfinding, world representation, and navigation meshes. Steering behaviors, obstacle avoidance, and flocking.	Lab 1, Informal Pitch
3	Aug 31-Sept 4	Finite state machines: states, transitions, events. Patrol, chase, and attack behaviors; hierarchical state machines and state explosion.	Lab 2, Formal Pitch
4	Sept 7-11	Behavior trees: ticking, return values, selectors and sequences, blackboards, decorators and interruption. Implementation in Unreal.	Lab 3
5	Sept 14-18	Perception: sight, sound, memory, and environment queries. Smart objects and utility-based decision making; choosing among decision architectures.	Lab 4
6	Sept 21-25	Goal-oriented action planning: motives versus goals, world state, actions as preconditions and effects. Planning search, backward chaining, and when planning is the right tool.	Lab 5
7	Sept 28-Oct 2	Tactical and strategic AI: spatial reasoning and influence maps. Coordinated and squad behavior.	Lab 6
8	Oct 5-9	Procedural content generation: motivation and production economics; controllability and expressive range.	Lab 7, Milestone 1
9	Oct 12-16	Procedural content generation: generator, simulator, and screener; evaluating generator output.	
10	Oct 19-23	Machine learning in games: supervised versus reinforcement learning, overfitting, exploration and exploitation, Black and White. Where machine learning actually ships, and player modeling.	Reward hacking exercise

Week	Dates	Topics	Due
11	Oct 26-30	Neural networks and adaptive systems; evaluating a machine learning proposal; out-of-distribution failure and the cost of illegibility.	Milestone 2
12	Nov 2-6	Testing and debugging: correct, believable, fun, and consistent; detection across content, agents, and systems. Diagnosis: reproducibility, decision versus information, and debugging tools.	
13		Performance: the frame budget, measurement, caching, and precalculation. Prioritization, time-slicing, and level of detail for AI.	
14		Advanced architectures, State Trees, and where the field is heading.	Milestone 3
15		Thanksgiving break. No class.	
16		Course wrap-up; the future of game AI as method rather than prediction. Last class Dec 3.	
Finals	Dec 8	Project presentations and individual interviews. Attendance required.	Final Deliverables

This schedule is subject to change. Changes will be announce in class and reflected here.

Authorized Absences Policy

An absence will be excused by the university for: a. religious holy day, including travel for that purpose; b. participation in an official university function; c. required military service, including travel for that purpose; d. pregnancy and parenting under Title IX; and e. when the University is officially closed.

For more details and procedures regarding UNT Authorized Absences, please see [Policy 06.039](#).

Absences that do not fall under Title IX, Required Military Service, and Official University Absences (religious holy days, participation in an official university function, and when the University is officially closed), are

deemed a matter between the student and their faculty member. If the absence is due to an illness or extenuating circumstance that exceeds 5 consecutive days, the faculty member may request for the student to provide documentation through the Dean of Students' office.

Course Level Absence Practice

Notify me in advance whenever the situation allows, and as soon as possible when it does not. Religious holy days and university functions are known well ahead of time; tell me early in the semester rather than the week of.

For absences outside the university-authorized categories above, such as illness or another extenuating circumstance, I expect documentation from a relevant third party that identifies the dates involved.

Absence accommodations exist for situations that are genuinely unavoidable and could not reasonably have been scheduled around. Please schedule what you can schedule.

For an authorized absence, we will arrange a reasonable substitute for the missed work. For a decision brief, this generally means the credit is waived rather than made up.

If something is affecting your ability to complete work, raise it when it arises rather than at the end of the semester. Options that exist in Week 6 do not exist in Week 15.

UNT Academic Integrity Policy

According to [UNT Policy 06.003](#), Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

Course Specific Academic Integrity Practice

Using external code, assets, and tutorials is permitted and expected in this course; representing them as your own work is not. Cite what you used, in a code comment or in your report.

You are encouraged to discuss approaches, debug together, and explain techniques to each other. Writing code for another student, or submitting code you did not write and cannot explain, is not collaboration.

Your project repository is a record of your own work, and I look at commit history.

AI Use Practice

You may use generative AI in this course. I would rather you learn to use it well than pretend you are not using it.

Two things are non-negotiable. You are responsible for everything you submit, and you must be able to explain it. This is not a special rule for AI; it is the same standard applied to every assignment in this course. If you cannot say what your code does and why you chose that approach, it does not matter where it came from.

Note briefly what you used AI for when you used it substantively. This is not punitive. It is what I would expect from a colleague.

Two places where it will work against you. Decision briefs and lab reports exist so that you practice articulating your own reasoning; generating them produces a document that satisfies the assignment and teaches you nothing, and it will be obvious in the interview. And accepting output you cannot evaluate is the failure mode this course spends fifteen weeks training you out of. We will spend a whole week on why a system you cannot interrogate is dangerous even when it is usually right. A model that writes your behavior tree is that system.

Being a good user of these tools means knowing what they are good at, checking what they produce, and being able to tell when they are confidently wrong. That is a skill worth having, and this is a reasonable place to practice it.

Course Level Practices

This is a small class, which means it is a discussion whether we plan it that way or not. I will ask you what you think, and I would rather hear a half-formed answer than silence. Being wrong out loud is how this material gets learned, and nobody in this room is going to hold it against you.

A word on participation. When there is a problem on the table, the useful people in the room are the ones offering ideas, questions, and objections. That holds here and it holds in industry, where the ability to engage with a problem in front of other people is part of the job rather than a bonus. It is a skill, and this is a good place to practice it while the stakes are low.

I am not asking you to be the loudest person in the room. I am asking you to show up having thought about the material and to be willing to say what you think. The decision briefs exist partly for this reason: if speaking up in the moment is hard, the brief is a place to put a real question in writing, and we will often take those up in class.

Regarding the course structure: I do not grade code, there are no exams, and a good deal of your grade comes from explaining your decisions rather than demonstrating them. That is deliberate. Specific techniques in this field go out of date quickly, and the thing worth carrying out of this course is the judgment to choose an approach, verify it does what you intended, and work out what went wrong when it does not. Those cannot be tested on paper, so they are assessed by asking you.

Student Success Guidance

Labs are due weekly and feel urgent; the project has no deadline until

Week 8 and feels like it can wait. It cannot. In my experience, the students who start a semester project in October are the ones presenting something they are not proud of in December. Do something small on it every week, starting in September.

Milestone feedback is written to be acted on before the next milestone, and the next milestone is graded partly on whether you did. If a comment is unclear, ask me what I meant. Feedback you do not read is work we both wasted.

The decision briefs are practice for this. A good question says what you were trying to do, what you tried, and where it stopped making sense. That question usually gets answered in five minutes. "It doesn't work" takes an hour and often does not get resolved.

Academic Support and Student Services

Technology Support

Part of working in the online environment involves managing the inconveniences and frustrations that can arise when technology breaks down or does not perform as expected. Here at UNT, we have a [Student Help Desk](#) that you can contact for help with Canvas or other technology issues:

- Phone: 940-565-2324
- Email: helpdesk@unt.edu
- Current list of [Student Help Desk hours](#)

Academic Support Services

- The [UNT Academic Resource Center](#) provides links to the bookstore, registration and advising information, tuition information, financial aid, and more.
- The [UNT Academic Success Center](#) offers academic support services and free individual tutoring.
- [UNT Writing Lab](#)
- [UNT Libraries](#)

Student Services

- [Counseling and Testing Services](#)
- [Student Affairs Care Team](#)
- [Student Health and Wellness Center](#)
- [Student Legal Services](#)
- [UNT Food Pantry](#)

Civil Discourse

As a leading public university, the University of North Texas has a fundamental responsibility to create enduring value for the public good. The fulfillment of our mission as a university depends upon the free exchange of ideas in the pursuit of knowledge. We bring these commitments into action by centering civil discourse in our culture and curriculum. We define civil discourse as the practice of constructive dialogue to broaden understanding, grounded in our shared values and deep respect for each other's potential. By committing to this practice, we seek to equip every student with skills and mindsets to engage, contribute, and lead—at UNT and throughout your lives.

Engaging with different ideas, asking questions, and debating are essential to a university education. This course may include ideas you disagree with, find unwise, or even find offensive – that we include for purposes of academic inquiry and critical examination. You may be asked to demonstrate understanding of these ideas without being required to believe or endorse them. My role as an instructor is to help you build understanding and foster critical thinking. If any claim – mine, yours, or a fellow student's – seems unclear or unsupported, we should be able to ask each other to explain it. Vigorous debate is welcome. Speech that violates the Student Code of Conduct, including speech that harasses a specific individual or disrupts the course is not. You may expect that views expressed in class will not be attributed to specific individuals outside of class, and that you will be evaluated fairly based on the learning objectives of this course.

University Policies

ADA Accommodation Statement: UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.

Emergency Notification & Procedures: UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to the UNT Learning Management System (LMS) for contingency plans for covering course materials.

Retention of Student Records: Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Blackboard online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and

Retention for additional information.

Acceptable Student Behavior: Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. The Code of Student Conduct can be found at deanofstudents.unt.edu/conduct.

Access to Information – Eagle Connect: Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail: eagleconnect.unt.edu/.

Student Evaluation Administration Dates: Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website at spot.unt.edu or email spot@unt.edu.

Survivor Advocacy: UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore

prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT's Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim's compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565-2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.

Pregnancy Modifications Under Title IX and Parenting Resources: UNT is committed to supporting students who may need pregnancy and parenting modifications in compliance with Title IX. If you are a pregnant student or have a pregnancy related condition, please visit report.unt.edu and complete the 'Request Pregnancy/Parenting Modifications' form. Parenting students who may need resources can seek support and guidance from the Dean of Students and the Eagle Engagement Center. [Pregnant and Parenting Students Policy number 16.008](#).

Copyright Notice: Materials used in connection with this course may be subject to copyright protection. Materials may include, but are not limited to: documents, slides, images, audio, and video. Materials in this course website are only for the use of students enrolled in this course, for purposes associated with this course, and may not be retained for longer than the class term. Unauthorized retention, duplication, distribution, or modification of copyrighted materials is strictly prohibited by law. For more information, visit the [UNT Policy Office](#), or [Copyright.gov](https://copyright.gov).

Web Accessibility & Privacy: Please find the web accessibility and privacy statements for UNT and Canvas.

UNT

- [Web Accessibility Policy](#)
- [Privacy Statement](#)

Canvas/Instructor

- [Accessibility Statement](#)
[Privacy Policy](#)