

Unbounded Innovation Game Development Curriculum

Welcome to Unbounded Research and Development! Over the course of this 6-month mentorship program, we will guide you through a transformative journey in which you will learn about computer graphics, research methodology, shader programming, and AI, while also writing and publishing research papers. Below is a detailed outline of your week-by-week journey during this program.

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Core Instruction

Week 1

Activities

- Program orientation and introduction to the course structure
- Setting up the computer environment (installing necessary software and tools)
- Lecture and discussion on the fundamentals of game development
- Meeting your team members
- Introducing the mentors and their roles

- Overview of computer graphics research as it pertains to video games and the importance of scientific literature
- Setting up a suitable workspace

Learning Outcomes

- Understand the purpose of computer graphics science and game development
- Understand the benefits and deficiencies of programming on a GPU
- Set up their environment (connect to remote desktop virtual machine)

Deliverables

- None

Week 2

Activities

- Lecture and demonstration on setting up a basic scene in Godot
- Hands-on practice with Godot, creating simple side scroller game
- Guided project: Make a side scroller game

Learning Outcomes

- Analyze the role of game engines
- Understand how to use basic features of Godot
- Create a simple side scroller game

Deliverables

- Completion of simple coding and game development exercises (via Godot)

Week 3

Activities

- Lecture and demonstration on various perspectives in game (first person, or third person, ..etc), collisions, and raycasting.
- Add ways to lose in side scroller
- Guided project: Start on first person shooter game

Learning Outcomes

- Understand the purpose and types of various cameras and perspectives in games

- Understand how collisions and raycasting work
- Understand how to add win states and lose states to a game
- Understand the basics of first person movement

Deliverables

- Completion of simple side scroller game
- Draft of first person shooter game

Week 4

Activities

- Overview of AI in games
- Lecture and demonstration on adding AI to their first person shooter game
- Add win states and lose states to the game

Learning Outcomes

- Evaluate the roles and purposes of various methods of making AI in games
- Make a simple enemy AI
- Evaluate the role of AI as it pertains to game development

Deliverables

- Implementation of enemy AI actors in their first person shooter game

Week 5

Activities

- Lecture and demonstration on procedural development and design
- Experimentation with noise functions
- Add procedural aspects to first person shooter game

Learning Outcomes

- Understanding of procedural generation and development as it pertains to game development
- Implement procedural aspects to a game

Deliverables

- Implementation procedural aspects to their FPS game

Week 6

Activities

- Lecture and demonstration on how to implement animations and basic materials to a game
- Experimentation with animation controllers and animation states
- Addition of animations to the first person shooter game
- Finalize the first person shooter game

Learning Outcomes

- Understand the role of animation states
- Understand the role of animation controllers
- Create fully animated characters
- Understand the role of materials
- Create basic material and add it to a 3d model

Deliverables

- Implement animations to the first person shooter game
- All objects in game have a material

Collaboration With Scientists

Week 7

Activities

- Lecture on git, and various project management techniques and skills.
- Practice pushing and pulling code from the same repository
- Introduction to an Unbounded R&D open source project
- Setup the project on local machine
- Push code to project

Learning Outcomes

- Understanding Git and Project Management Techniques
- Exposure to Unbounded R&D Open Source Project
- Project Setup and Configuration
- Contributing to Open Source Projects

Deliverables

- Unbounded R&D open source project is setup and running on local machine
- Code is pushed to repository

Week 8-13

Activities

- Brainstorming on what we can add as a team to the open source project
- Developing tasks that can be divided amongst team members
- Implementing tasks
- Pushing code to the repo

Learning Outcomes

- Collaborative Brainstorming
- Task Development and Distribution
- Task Implementation

Deliverables

- Code is pushed to repository
- Kanban taskboard

Research and Development

Week 14

Activities

- Identify potential research topics
- Discuss project planning, milestones, and deliverables
- Assigning roles within the group
- Identifying available resources (software, hardware, etc.)

Learning Outcomes

- Research Topic Identification
- Project Planning and Management
- Role Assignment and Teamwork
- Resource Identification and Utilization

Deliverables

- A research topic chosen by each group
- Preliminary project plan

Week 15 - Week 20

Activities

- Catalog research and development of chosen projects
- Discuss progress and challenges in weekly meetings with mentors
- Reflect on feedback from mentors after regular checkpoints
- Align research with goals and objectives
- Draft research paper: Introduction, background, methodology, results, and conclusion

Learning Outcomes

- Document research and development
- Discussion progress and challenges
- Align research with predefined goals and objectives
- Draft a research paper

Deliverables

- Weekly progress updates
- Iterative improvements to a working prototype of the project
- Draft version of research paper

Week 21

Activities

- Integrate feedback from mentors
- Verify and finalize references of the research paper
- Lecture on the process of publishing research papers
- Prepare presentation

Learning Outcomes

- Integrate feedback in a research paper
- Verify sources
- Create presentation based on paper

Deliverables

- Completed research project
- Submission-ready research paper
- Draft of presentation

Week 22

Activities

- Submitting the research paper to conferences and/or journals
- Preparing a project presentation
- Celebrating the achievements and hard work of the participating students
- Present research

Learning Outcomes

- none

Deliverables

- A submitted research paper
- A final presentation showcasing the project