Computer Graphics

1 - Course Intro
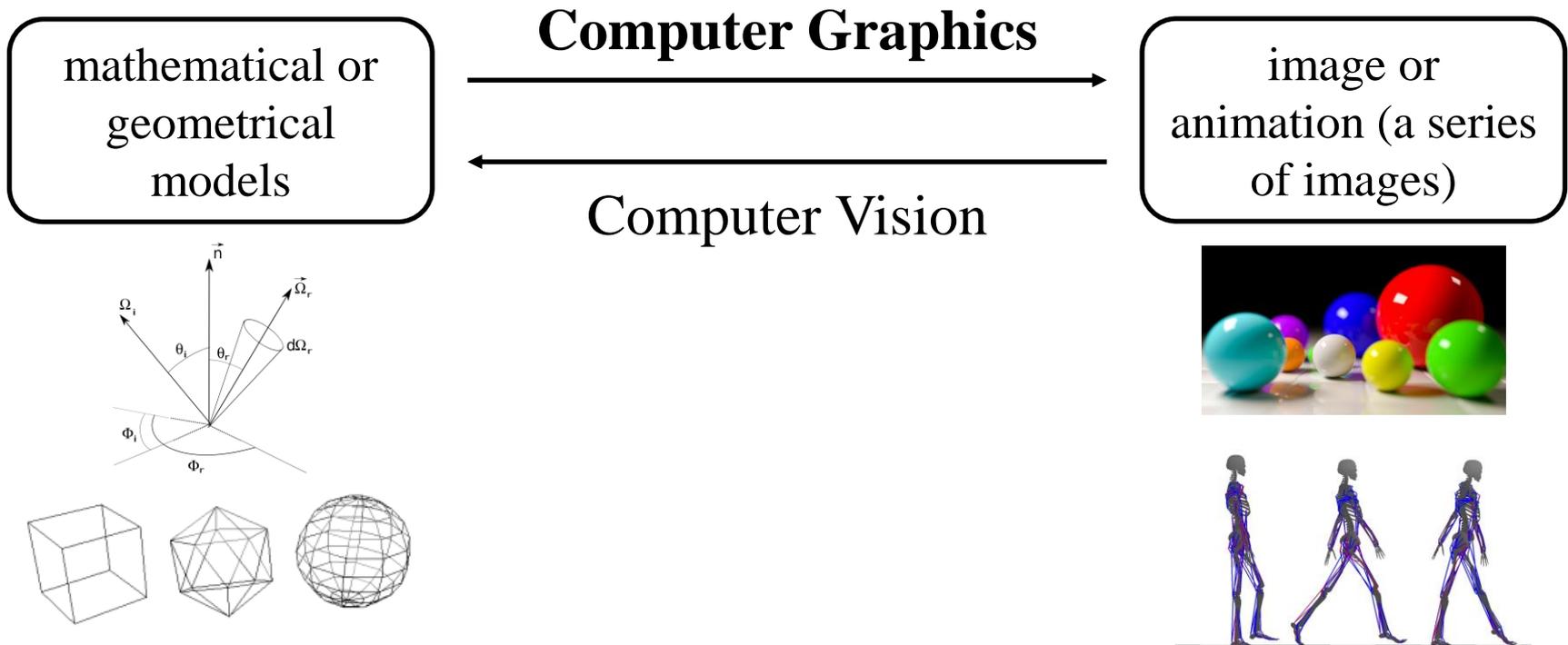
Yoonsang Lee
Hanyang University

Spring 2025

Course Information

- Instructor: Yoonsang Lee (이윤상)
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- Teaching Assistants:
  - Eunho Jung (정은호), Hauk Nam (남하욱), Bokyeong Jang (장보경), Chanwoo Baek (백찬우)
  - You can find their email addresses on https://cgrhyu.github.io/1-people.html

- Course Hompage
  - The LMS course homepage at portal.hanyang.ac.kr (or learning.hanyang.ac.kr)
  - Slides will be uploaded to Weekly Learning(**주차학습**), probably *just before the lecture*. So, please **download lecture slides at the beginning of each lecture.**
  - If you want to study the lecture slides **in advance**, please refer to last year's lecture slides (They won't change much): https://cgrhyu.github.io/courses/2023-spring-cg.html

What is Computer Graphics?

- The study of creating, manipulating, and displaying visual content using computers.

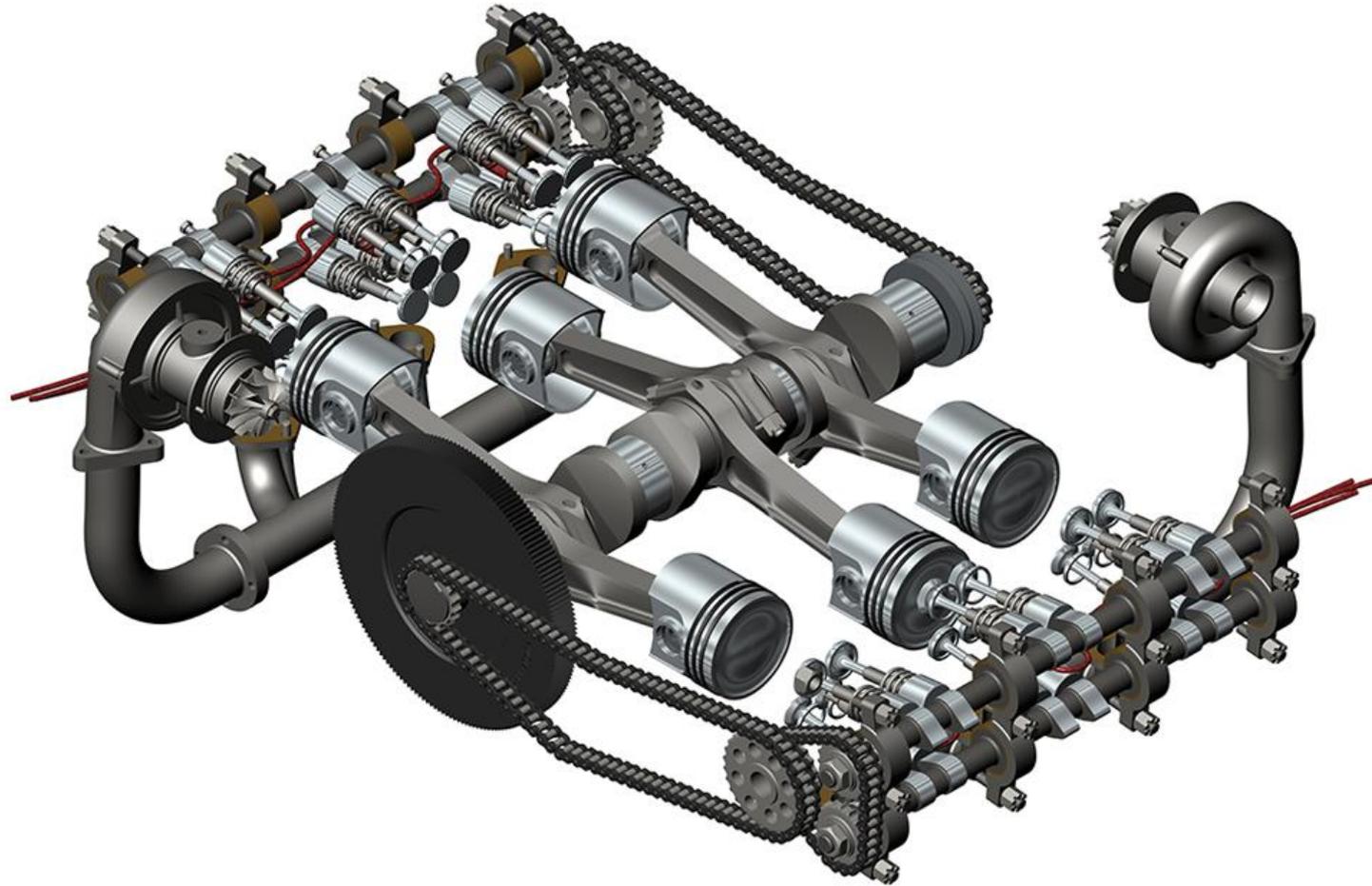| mathematical or geometrical models | **Computer Graphics** →
 ← Computer Vision | image or animation (a series of images) |

Movies & Games

Encanto

Red Dead Redemption 2

Engineering

Solidworks

Natural Science

Foldit
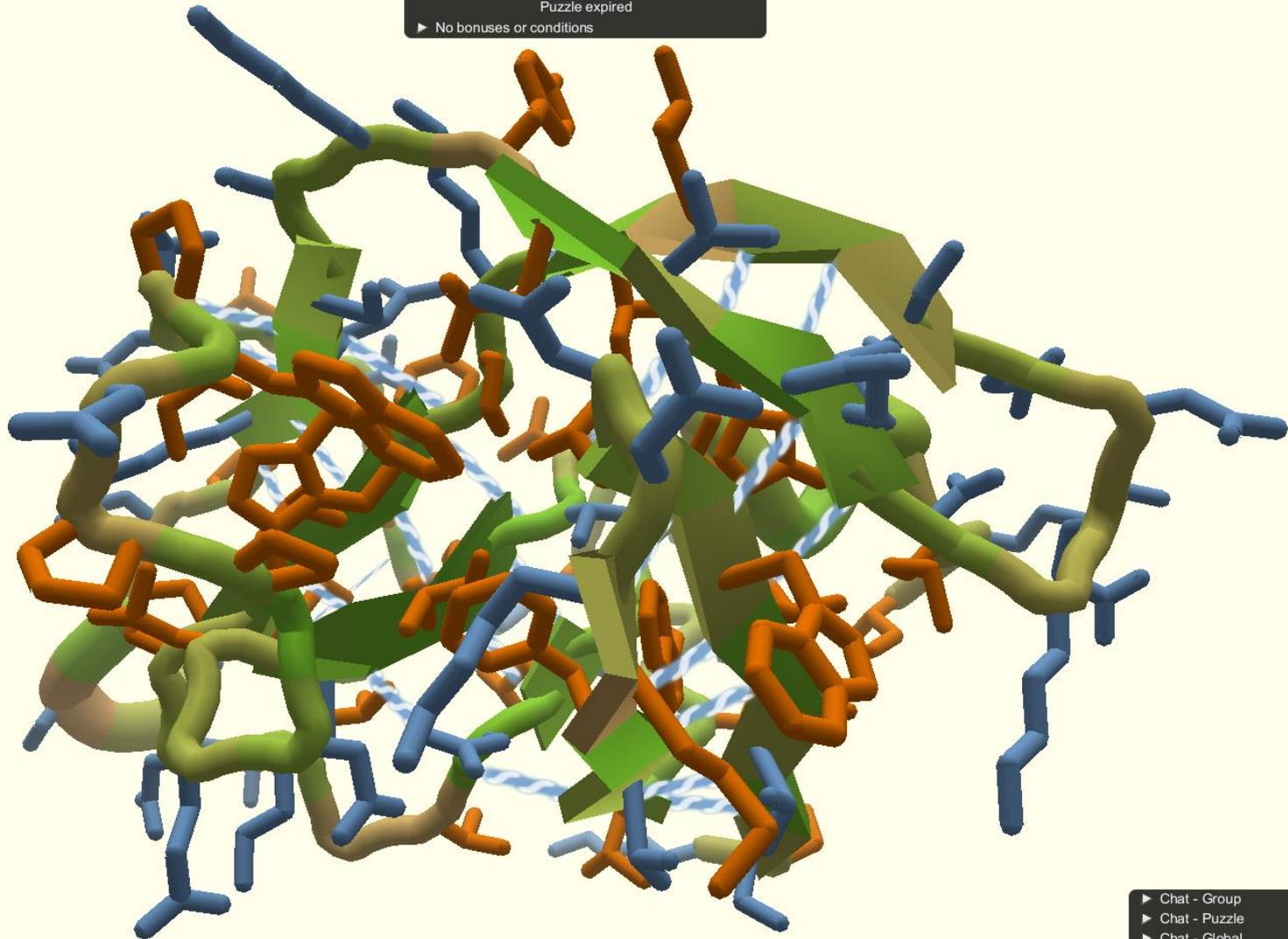
Medical Science
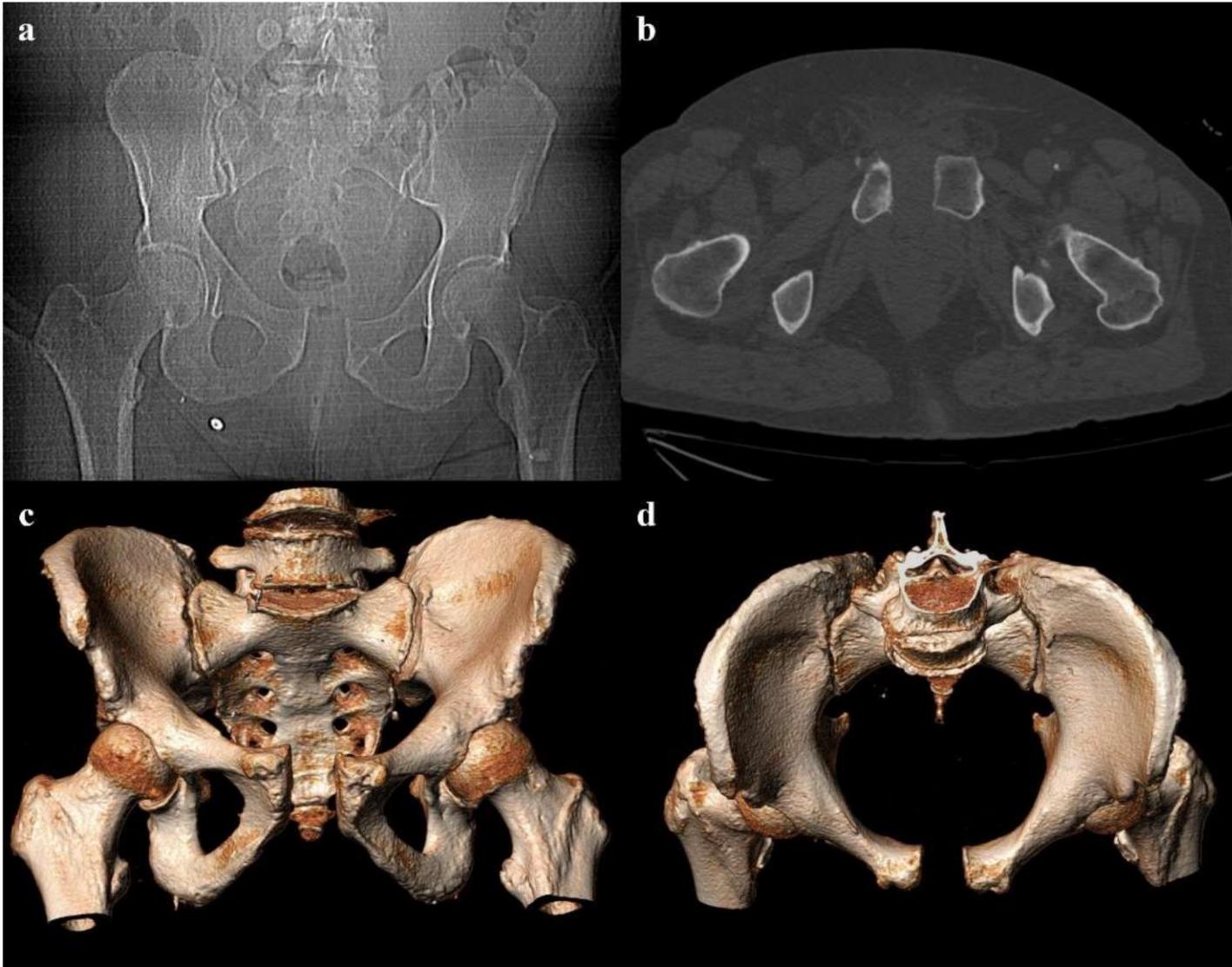
CT images and volume rendering

Course Overview

- Computer Graphics: Mathematics made visible

- In this course, you will
  - Explore **fundamental computer graphics & mathematics concepts**
  - Learn how to use **modern OpenGL**

- You will **not**
  - Learn sophisticated computer graphics techniques
  - Learn or use **legacy OpenGL**

Course Overview

- As "implementation examples" of the fundamental computer graphics concepts, we'll use:

- On-line WebGL demos (Lectures)

- Modern OpenGL API (Labs)

- Blender: An open-source 3D graphics tool (sometimes)

- These examples will help you understand the concepts more clearly.

Prerequisites

- Basic knowledge of linear algebra
  - Understanding of basic concepts and operations on vectors and matrices,
  - Such as matrix-matrix multiplication, matrix-vector multiplication, identity matrix, dot product, cross product, etc.
  - If you know these things, it is enough to take this course.

- Basic knowledge of programming skill
  - We'll use Python in this class.

- You don't need artistic sense!

Textbook

- **Textbook : Lecture slides**

Schedule (subject to change)

Week	Topic	Thu	Mon	TA
1	1 - Course Intro / 1 - Lab - Environment Setting	3/6	3/10	
2	2 - Rendering Basics / 2 - Lab - Hello Triangle!	3/13	3/17	정은호, 남하욱
3	3 - Transformations / 3 - Lab - Sending Data to Shaders	3/20	3/24	장보경, 남하욱
4	4 - Affine Space / Frame / Matrix / 4 – Lab	3/27	3/31	정은호, 남하욱
5	5 - Vertex Processing 1 / 5 – Lab	4/3	4/7	장보경, 남하욱
6	6 - Vertex Processing 2 / 6 – Lab	4/10	4/14	정은호, 남하욱
7	7 - Hierarchical Modeling, Mesh / 7 – Lab	4/17	4/21	장보경, 남하욱
8	8 - Lighting / 8 – Lab	4/24	4/28	정은호, 남하욱
9	**Midterm Exam**	**5/7**		
10	9 - Orientation & Rotation / 9 – Lab	5/8	5/12	장보경, 남하욱
11	10 - Character Animation / 10 – Lab	5/15	5/19	정은호, 남하욱
12	11 - Curves / 11 – Lab	5/22	5/26	장보경, 남하욱
13	12 - More Lighting, Texture / 12 – Lab	5/29	6/2	정은호, 남하욱
14	13 - Scan Conversion, Visibility / 13 - Lab	6/5	6/9	장보경, 남하욱
15	**Final Exam**	**6/18**		

Lectures & Labs

- Each pair of a lecture and a lab will be held on the same day.

- Lectures (by instructor)
    - Lectures for fundamental computer graphics concepts
    - Does not depend on specific libraries or software

- Labs
    - Part 1: Lectures for modern OpenGL (by instructor)
    - Part 2: Time to do your assignment (with support of TAs)

- One [Lecture+Lab] session is a **continuous 4-hour class**.
- **No break in between!**

Assignments

- One assignment per lab.

- A simple programming task.
  - The goal is to let you understand what you've just learned in lectures and labs every week.
  - You can ask TAs questions about things you do not understand.

Assignments

- How to submit:
  - Submit through LMS.

- The TA will quickly review and leave a comment on LMS (using SpeedGrader) whether it has passed or not.
  - If you pass, you may leave the classroom.
  - If not, you should revise your code and resubmit.

Assignments - Grading

- Submission (or resubmission) during the lab session (until 12:45):
  - If you finally pass → **100 points**
  - Resubmission may be requested even after the session.

- Resubmission after the lab session:
  - No more resubmission requests. Partial points if requirements are not met.

- Submission after the lab session: **-10 points penalty**
  - No resubmission requests. Partial points if requirements are not met.

- Submission after 23:59 on the lab day: Not allowed

Projects

- Total three projects will be given.
  - Individual projects, not team projects.

- Much more challenging programming tasks.

- The due date will be two to three weeks after the project is given.

- How to submit:
  - Submit through LMS

Policy for Projects

- **NO SCORE** for late submissions
  - Submit before the deadline!

- **NO SCORE** for copying
  - If A copies B's code, A and B will get 0 point.
  - If A, B, C copies the same code from the internet, they will all get 0 point.

Grading

Midterm exam	37.5%
Final exam	37.5%
Projects	15%
Assignments	5%
Attendance	5%

- You will get "F" for more than 5 absences in four-hour sessions of (lecture + lab)s.

- Absences from the midterm or final exam → F

Grading Policy

- Basic principle: Separating the grades where there is a big gap between points.

- Guideline:

A	20%~25%
B	25%~35%
C	40%

- **The grades are calculated by combining the students of the two computer graphics courses I'm teaching this semester.**

[Important] Midterm & Final Exams

- The exams are held on the following date and time, and **students who are unable to take the exam at that time should not take this course.**

- Midterm: May 7 (Wed) 6:00-8:00 PM

- Final Exam: June 18 (Wed) 6:00-8:00 PM

Language

- I will mainly use English in classes.

- But **the most important goal is improving your understanding**, both for English and non-English speakers.
  – So, I'll **"paraphrase" the explanation in Korean for many slides.**

- In lab part 2, TAs will mainly use English when making announcements to all students.
  – But you can ask TA personally in Korean or English.

- Now, let's quickly review the important slides in Korean.

Questions – Slido.com

- After lectures, post your questions on the LMS course's "Q&A Board" ("문의게시판").
  - TA will check and respond at least once a day.

- In lectures, we'll use an online, anonymous Q&A platform – slido.com to encourage questions.

Just Try Asking a Question!

- Go to https://www.slido.com/

- Join **#cg-ys**

- You do not need to log in to slido.com.

- **Do not bookmark a slido event page** because new events will be created every week!

- Ask any questions in English!

Questions – Slido.com

- In slido.com, you can
  - **Ask** your own questions anonymously
  - **Upvote** other questions

- We'll use the slido Q&A **only during lecture & lab time taught by the instructor.**
  - Not after lecture or lab session
  - Not in the lab TA time
  - No written answers

- Please ask questions **anonymously**.
  - Just leave your name blank when post a question.

Quiz & Attendance – Slido.com

- Three quiz problems per each lecture (using slido.com polls)

- Very simple questions – you have to submit your answer in two minutes.

- **Attendance will be taken based on quiz submissions.**

Quiz – Slido.com

- You **MUST** submit your answer in the following format:
  - **Student ID: Your answer**
  - **e.g. 2023123456: 4**
  - Whether your answer is correct or not **has nothing to do with your attendance.**

Attendance	Number of submissions in the format - **3 times &&** You are **in the classroom**
Late	Number of submissions in the format – **1~2 times &&** You are **in the classroom**
Absence	Number of submissions in the format – **0 times** || You are **NOT in the classroom**

  - **3 lates count as 1 absence.**

Quiz & Attendance – Slido.com

- If submitting a quiz answer without attending the class is detected,

- I think they have been also absent from the previous lecture.

- → Counted as "Absence" for these two lectures

Just Try a Quiz!

- Go to https://www.slido.com/

- Join **#cg-ys**

- Click "Polls"

- Submit your answer in the following format:
  - **Student ID: Your answer**
  - **e.g. 2023123456: 4)**

- Note that your quiz answer must be submitted **in the above format** to be counted as attendance.

About Laptop

- Bring your laptop to lectures and labs.

  – Lecture slides contains many WebGL demos, so you'll need a laptop to run them and listen to the lecture.

  – In labs, you will need your laptop for practice and assignments.

    - If you would like to rent a laptop, please contact the TAs (via email) by the next week lab. However, it is recommended that you bring your own laptop, as they will be quite old ones.

- Ensure your laptop supports **OpenGL 3.3 or higher.**

  – We'll use **OpenGL 3.3 Core Profile.**

Checking OpenGL Version

- Windows, Mac: Use "OpenGL Extensions Viewer"
  - https://support.esri.com/en/technical-article/000011375

- Ubuntu: Use "glxinfo" (need to install mesa-utils)

```
sudo apt-get install mesa-utils
glxinfo | grep version
```

  - Find 'OpenGL core proflie' version (we'll use the core profile).

- Reference: Supported APIs for Intel® Graphics
  - https://www.intel.com/content/www/us/en/support/articles/0000055 24/graphics.html
  - Intel CPUs with integrated graphics that do not support OpenGL 3.3 are quite old CPUs released in 2011.

Classroom Etiquette

- **DO NOT negatively affect other students** in the classroom. For example,
  - Doing other things with your laptop (e.g. playing games)
  - Looking at your phone for a long time
  - Private conversation
  - Sleeping on a desk

My Recommendation

- DO NOT recommend this class to those who...
    - want to easily earn a good grade.
    - expect lectures in fluent English.

- Recommend this class to those who...
    - wonder how movies/games render scenes.
    - are interested in the movement of objects/characters.
    - like to visualize something by your code.
    - have passion for computer graphics!

Lab Session

- We don't have a lab session today.

- However, you must set up the environment using "1- Lab - Environment Setting.pdf" to follow the next lecture.

- Submit Assignment 1 ("1 – Assignment.pdf") through LMS before the next lecture.

Lastly...

- If you agree on all these policies, see you next time!

- If not, please consider taking another class instead.