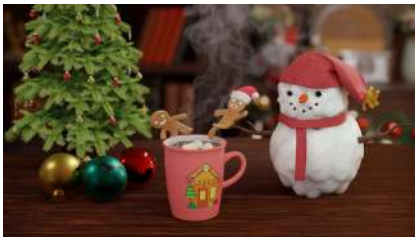
CS148 Final Project

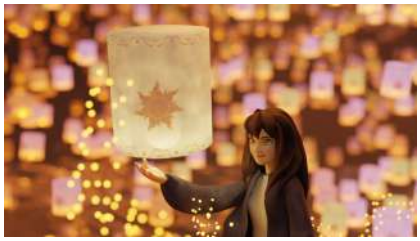
Proposal due Nov 11th at 11:59 PM PST

Final Project due Dec 12th at 11:59 PM PST

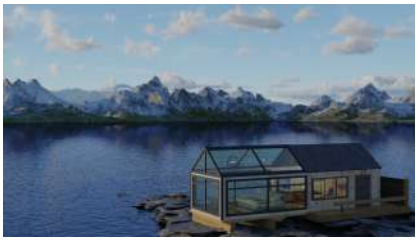


Luna Yang & Xuelin Yang,FA 21

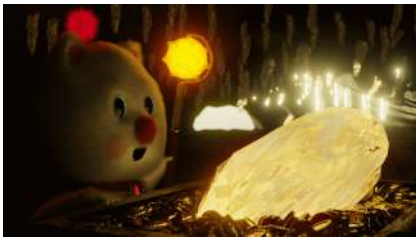
Yan (Mia) Miao, SU 22



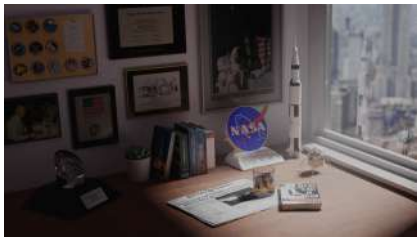
Romrawin (Jin) Chumpu, SU 23



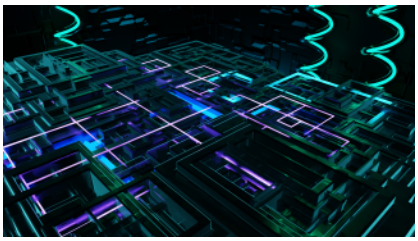
Po-Ya Wu, FA 21



Kent Vainio, FA 20



Lingjie Kong & Yanjia Li, FA 20



Anthony Xie, FA 21

Manpreet Kaur, SU 23

Yifan Wang, FA 20

Larger versions of these images (and others) along with their respective project reports can be found under the Showcase page on the course website. Click on the images in the showcase to see the reports.

1 Introduction

The final project is an image that you create using Blender's ray tracing engine: Cycles. You must put together a coherent scene using geometry, materials, and textures that you made and/or found

online. Examples of exemplary projects from previous course offerings are shown above and on the website.

You can work with a partner or work on your own. We will grade both solo and partner projects on the same scale, primarily basing the grade on the quality and merit of the image. However, if we get notice that one partner in a group might've done less work, then we may adjust grades for that group accordingly.

We recommend that you spend time asking for feedback from the teaching team, as well as even friends, family, etc. A lot of the evaluation will be on the artistic aesthetic of your image, so the more opinions the better! Feel free to come to office hours and/or make posts on Ed to get feedback. We're always happy to look at your progress and help improve your project anyway we can. We want everyone to succeed and are here to help!

2 Project Proposal (Due Nov 11th)

Find a motivational image (or a couple), and write 1-2 short paragraphs explaining the goals for your project as motivated by the reference image(s). This proposal is meant to give the teaching team an idea of what you're trying to do, so that they can give appropriate feedback on how to best complete your project. Please give as much information as you think will help us understand your goal.

The proposal will be due electronically over a Google form that will be posted closer to the deadline. It will be graded on a 0-5 scale and count towards extra credit, making up for up to 5 missed points on the **homeworks** throughout the class. Your HW and Quiz total will **NOT** exceed 100% though. **If you are working in partners, then only one of you needs to submit the proposal.** Feedback on your proposal will be sent over the week following the deadline, but you may ask for earlier feedback in office hours if you're already making progress on your project.

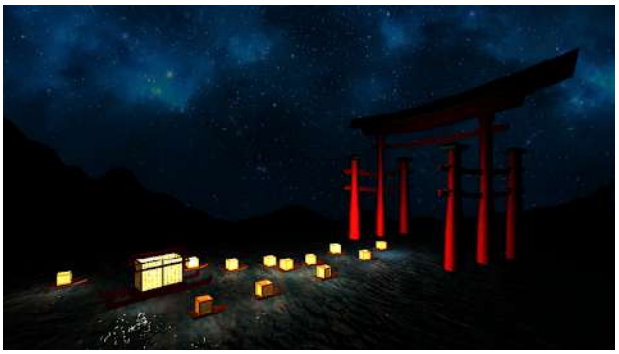
3 Final Project Requirements

- **Leveraging the power of ray tracing:** A big focus of this class is on how ray tracing leads to photorealistic lighting for 3D computer graphics. This discussion included topics such as area lighting, global illumination (color bleeding), shadow rays, reflected and transmitted rays, volume rendering, etc. Even if you are not aiming for a realistic scene for your project (e.g. you plan to use stylized models), you will still want and need realistic lighting effects to make your image stand out aesthetically. Think of how even in 2D cartoons or anime or 3D stylized movies, good lighting and shading make a big difference in making the art appeal to the audience. This Youtube video might help you get started on thinking about lighting.

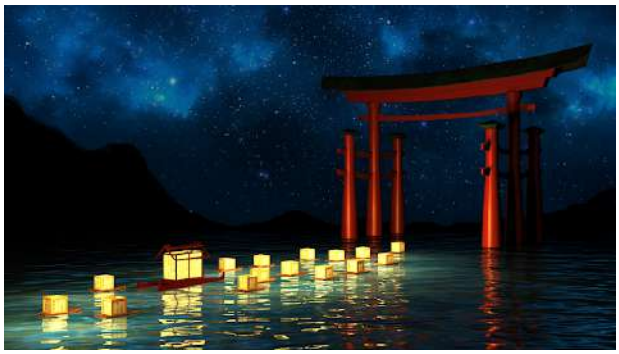
  As an example of what we expect, consider the following comparison of a ray traced image vs a scanline rendered (not ray traced) image of the same scene. Notice how the ray traced image on the right has much better illumination along with softer shadows than the not ray traced image on the left. It also has clear reflections of the lantern lights, objects, and sky background on the water. While you might be thinking that Blender Cycles will handle all these lighting effects for you, it is still very possible to make the scanline rendered image on the left even within Cycles. This can result from various mistakes such as:

  - Not using area lighting, but instead only point lighting, which can lead to harsh shadows.
  - Not giving the water the right reflective and transmissive material to appropriately interact with the light.

- Ill placement or directing of light such that it cannot hit the objects around it at natural looking angles for realistic reflections.
- Ill placement of objects within the light such that minimal color bleeding occurs.



Scanline Render



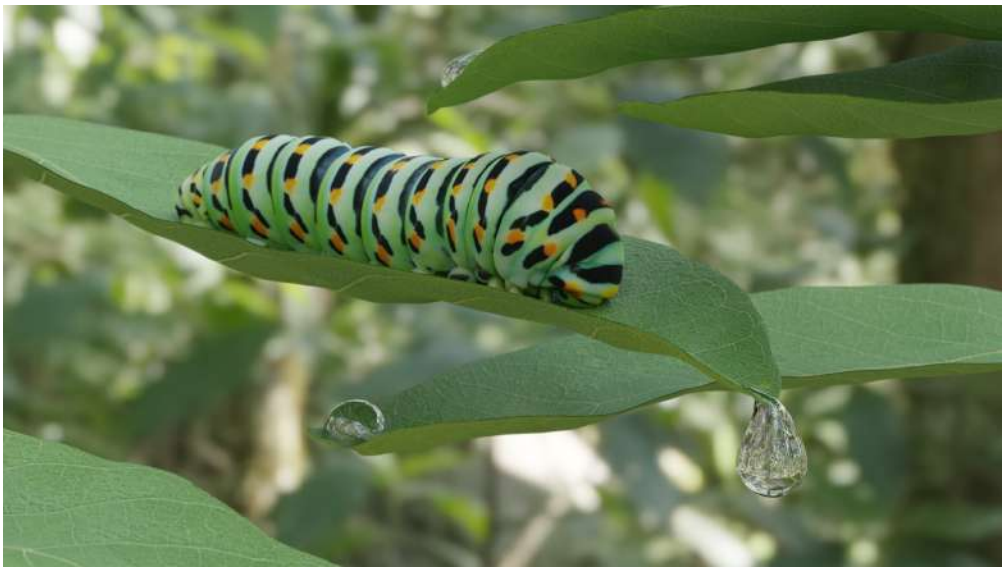
Ray Traced

We DO NOT want to see any final projects that look like scanline renders! You will NOT receive a very good grade, even if you satisfy all the other requirements!

To look at this from another perspective, consider giving two photographers, an amateur and a professional, the same camera and asking them to create and photograph their own scene. The professional is more likely to have a better eye for aesthetics and produce a better photo, even though both were given the same tool. Similarly, for this project, even though you're given a very powerful tool in Blender Cycles, it alone is not enough to show off the capabilities of ray tracing. It needs to capture a scene with appropriate objects, lights, and camera angle to actually produce a quality looking ray traced image.

- **Main geometry from scratch**: The geometry that makes up the main focus of your image must be modeled, sculpted, or simulated by you from scratch. Furthermore, at least half the overall geometry that make up your scene must be made by you from scratch.

  For example, consider this image from the Fall 22 showcase by Kate Eselius and Jamie Ullman:



The main focus of the above image is very clear – it is the caterpillar, and that is also an object that the students created from scratch (by assembling multiple spheres and toruses as detailed in their report). These students went beyond and also made their leaf objects from scratch, but for the sake of the project requirements, we would've allowed the leaves to be imported models found online.

The point is – we want the star of the show in your image to be something you made, not something that you simply found online. The surrounding geometry that complements your main object(s) however may be objects you find online.

- **UV mapping and texturing from scratch**: For at least one of the objects made from scratch in your scene, you must 1) UV unwrap the object yourself and 2) create a texture from scratch either via hand-painting or procedural generation with Blender's material nodes. These two requirements can be done on two different objects.
- **Blender/Cycles advanced feature**: Use at least one advanced feature in Cycles or Blender, such as depth of field, motion blur, volumetrics, etc.
- **Cite your sources**: You are welcome to use any assets or Blender addons that you find online. In fact, we highly encourage you to do so, since it can be incredibly time intensive to construct your whole scene from scratch! **BUT**, you must cite your sources in your report!

  Here are some resources that you might find useful (for obtaining .obj or .blend files). You'll need to make an account for some of these, but from there, you should be able to download models for free:

  - General Objects: Poliigon, TurboSquid, cgtrader, 3dsky, Dimensiva, Poly Haven
  - Blender Assets: Blend Swap
  - Unique Scanned Objects: Sketchfab CC0
  - Landscapes: Quixel Megascans
  - 3D Map Models: Map Models Importer

4 Final Project Submission

All **submissions will be done online via Google forms and Google drive**, both of which you should have access to with your Stanford account. If for some reason, this is not an option for you, then please make a private Ed post on the matter ASAP. **We will provide a link on Ed for submission of your image and report on the week the project is due.** You are welcome to submit multiple times; however, only your latest submission before the deadline will be graded.

Your submission should include the following. All the filenames should **include the SUNet ID(s) of everyone in your group**, concatenated by underscores (e.g. `rfedkiw_kevli016.xxx`).

1. Your image: `student1_student2.png`. The resolution along the short edge of your image should be at least 1080 pixels, but the resolution along the long edge should be no more than 1920 pixels.
2. Your report: `student1_student2.pdf`. Your report must clearly state:
   - How you met the project requirements
   - What each member of the group did

- What assets you downloaded from online vs. what assets you made yourself
- What tutorials (documents/videos) you referenced if any

3. A "Variant A" of your image: `student1_student2_a.png`. Render your image from a different camera angle. This image DOES NOT have to look nice. This "Variant A" is just for us to quickly confirm that you yourself made (and thus can edit) the Blender file for your image.

4. A "Variant B" of your image: `student1_student2_b.png`. Render your image with no textures. This image DOES NOT have to look nice. This "Variant B" is just for us to quickly confirm that you yourself made (and thus can edit) the Blender file for your image.

   The fastest way to remove the textures from your render is to create some default, basic material with no texture. Then go to the Properties Editor tab and look for the "View Layer Properties". Scroll down to "Override". Change "Material Override" to the basic material.

5. Link to your source Blender file: `student1_student2.blend`. Pack all the data into the Blender file (**File** → **External Data** → **Pack All**) into `.blend` and upload that file to a Google Drive. Provide the link to the drive file in the submission form. If you have some assets that are too big to upload (e.g. high-res geometry or textures), then you can leave them out. Be sure to keep all the assets that you manually created, since they will be checked against the list of requirements.

5 Grading

Your image will be graded on a curve that separates all the images in the class into buckets:

- Buckets 10-9: Both of these buckets are reserved for the best images in the class. These images have excellent scene composition, polished geometry, clear lighting, and masterful utilization of ray tracing, plus artistic merit, with few to no visible artifacts. These might also have superior technical merit through the effective use of custom geometry, custom shaders, etc. The difference between Bucket 10 vs Bucket 9 is that Bucket 10 will contain the images that the professor wants to showcase on the website – some of these might not necessarily be better than the images in Bucket 9, but feature a unique aesthetic that would serve as good motivation for future students.

- Buckets 7-8: These buckets are for images that rank above average compared to the rest of the class. These images make great use of all the high-level concepts we've discussed in the class regarding scene composition, geometry, lighting, and utilization of ray tracing, but still have obvious room for improvement.

- Buckets 5-6: These buckets are for the average images in the class. These images make decent use of all the high-level concepts we've discussed in the class, but may lack scene complexity or have lighting or texturing issues, etc that caused them to not rank higher in the class. Good effort scenes that unfortunately still end up looking like scanline renders often end up in this bucket.

- Buckets 1-4: These buckets are for images that leave a lot to be desired. These images may have scene compositions that are too simple, suffer from serious lighting/texturing issues, have very noticeable artifacts, etc.

As noted on the class website, this final project makes up 50% of your overall grade.