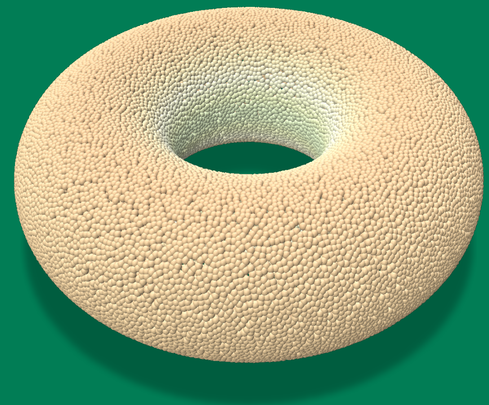
Exploring the Laplacian in Computer Graphics

Week 1

Crane He Chen

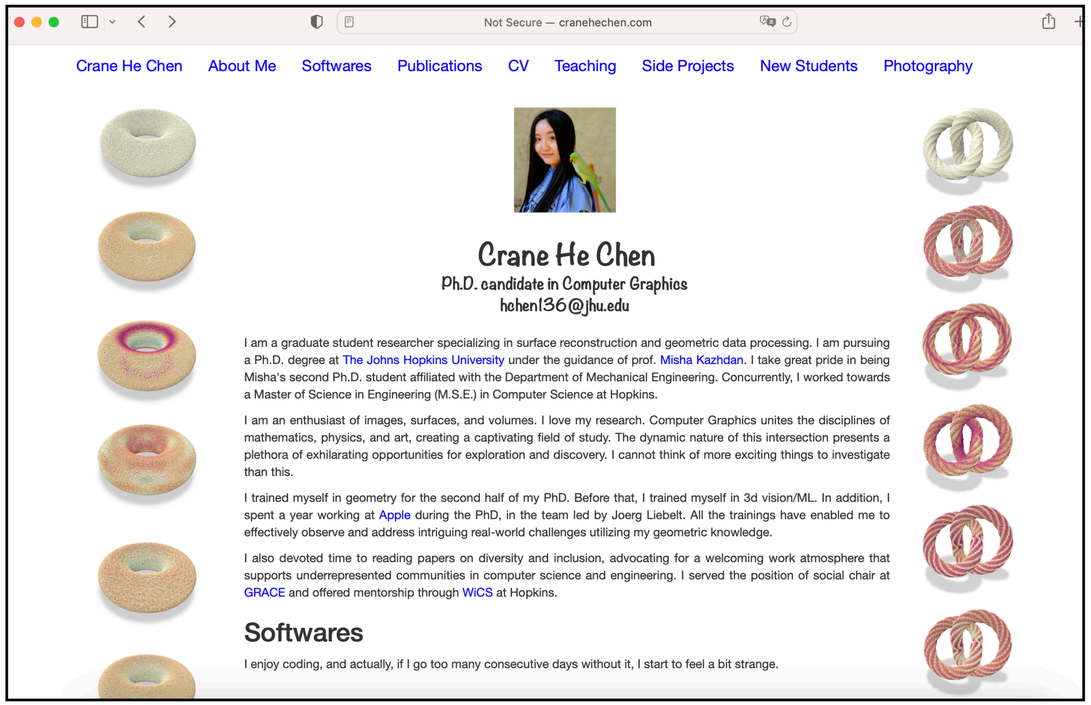
The Johns Hopkins University



2023 Fall

Introduction

instructor (cranehechen.com)



- Final-semester PhD student in computer graphics.
- Part-time research scientist intern with Adobe.
- Enthusiast of surfaces/volumes/images.
- I enjoy art. I appreciate geometry.
- I believe pursuing some elegance in problem-solving leads to a deeper understanding of the problem.
- I spend most of my spare time on yoga/ wildlife photograhy.

Now, your turn!

Let’s Dive In

Exploring the Laplacian in Computer Graphics

How many people are here for Computer Graphics?

How many people are here for Laplacian?

Let’s Dive In

Most information can be found on the course webpage:

http://cranehechen.com/teaching.html

What is Computer Graphics

How do you communicate/interact with a machine (your computer) most frequently?

A. Audio
B. Haptics
C. Visual

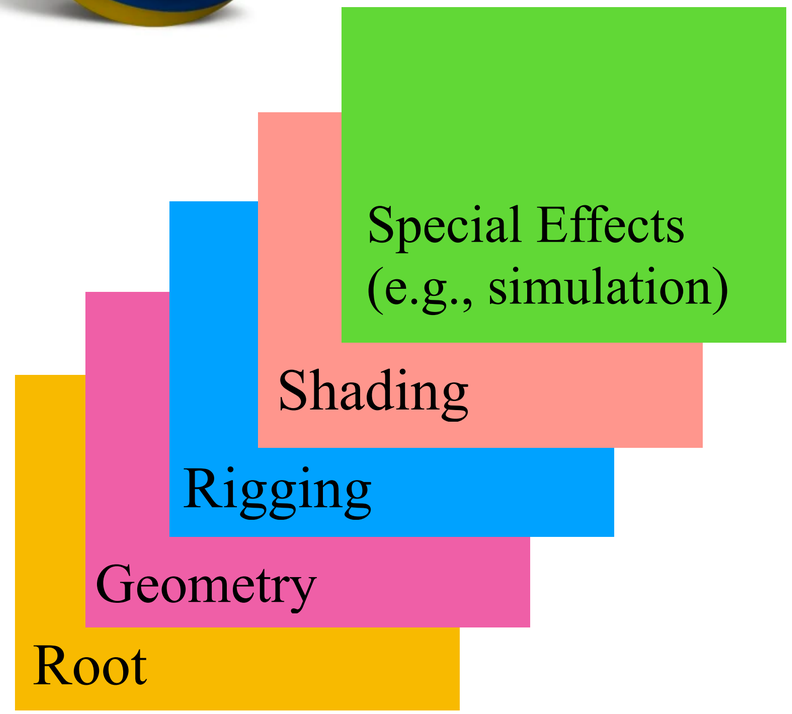
What is Computer Graphics

https://peach.blender.org/

What is Computer Graphics

OpenUSD (Universal Scene Description)

Invented by Pixar, Open sourced in 2016



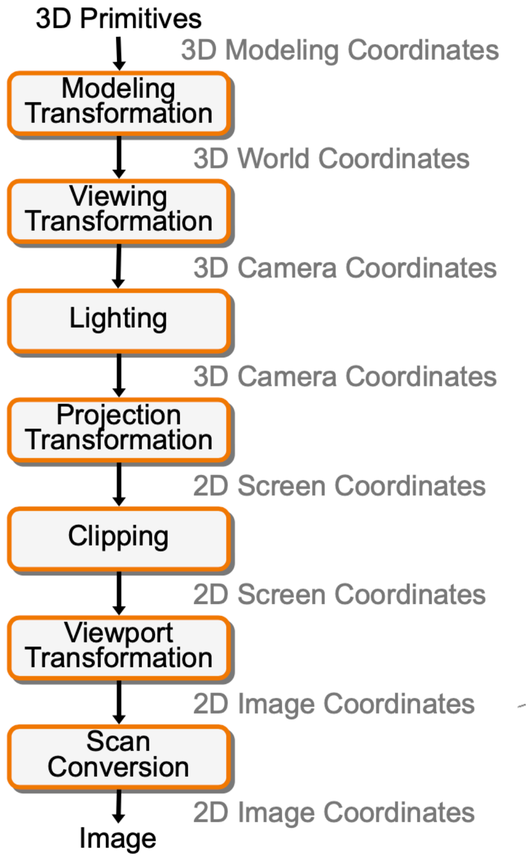
data layer stacks

https://3dvf.com/en/pixar-adobe-apple-autodesk-and-nvidia-form-alliance-for-openusd/

openUSD stage

What is Computer Graphics

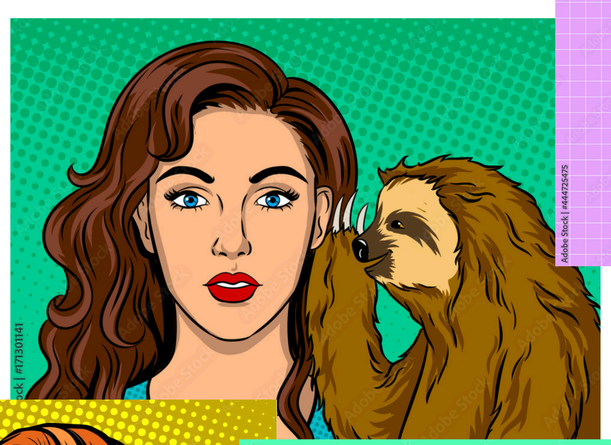
If you are later-on taking 601.457/657 computer graphics course, by prof. Misha Kazhdan

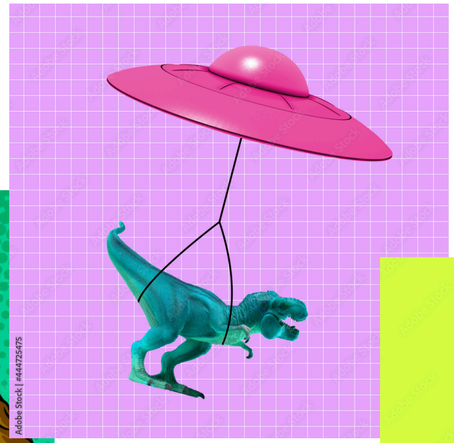


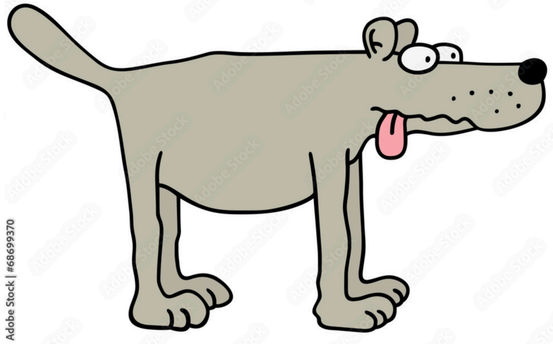
rendering pipeline from 601.457/657

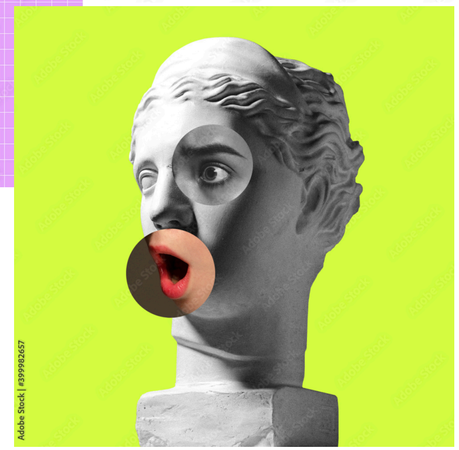
That's not the same pipeline we are talking about in this course!

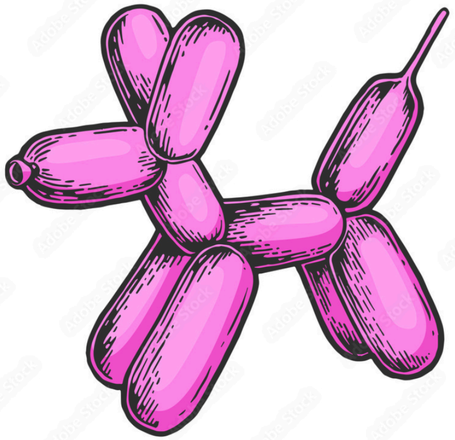
What is Computer Graphics

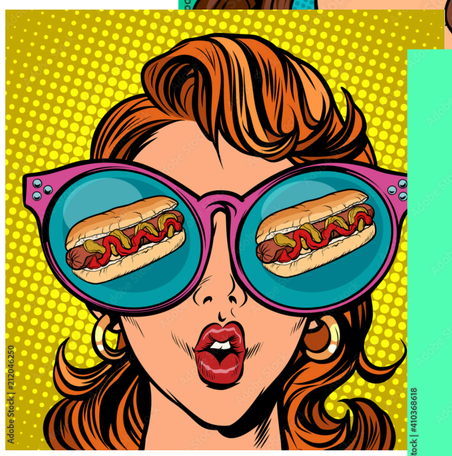












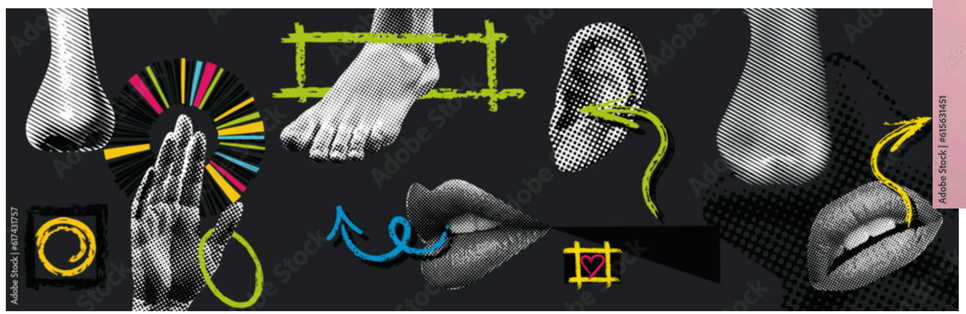


image credits: Adobe Stock

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What is Computer Graphics

How do you follow-up the most recent progress in computer graphics research, and even be a part of the community, and push the boundary of these research?

- Attend/keep an eye on ACM SIGGRAPH conference
- You might need a Ph.D.

ACMSIGGRAPH

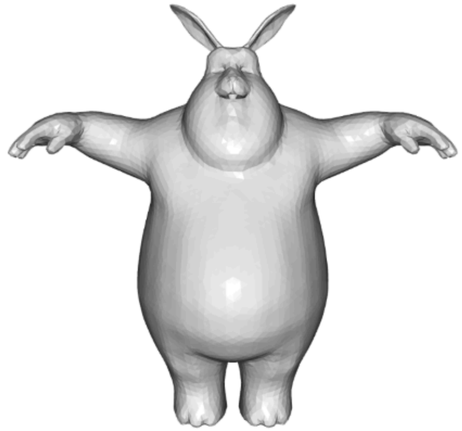
What is Computer Graphics

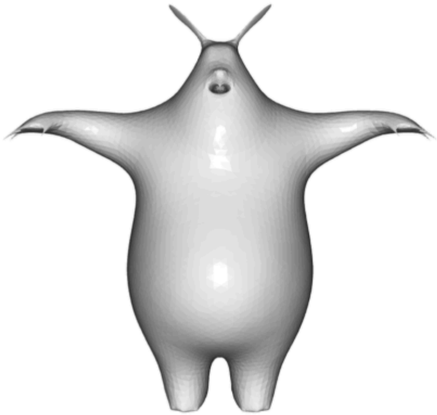
To give you a non-biased and thorough impression about graphics research, let's watch the trailer of SIGGRAPH 2023 together.

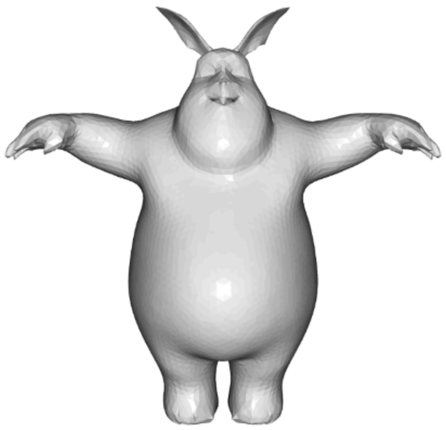
Why do we care about “the Laplacian”?

We want to color the bunny with total curvature……

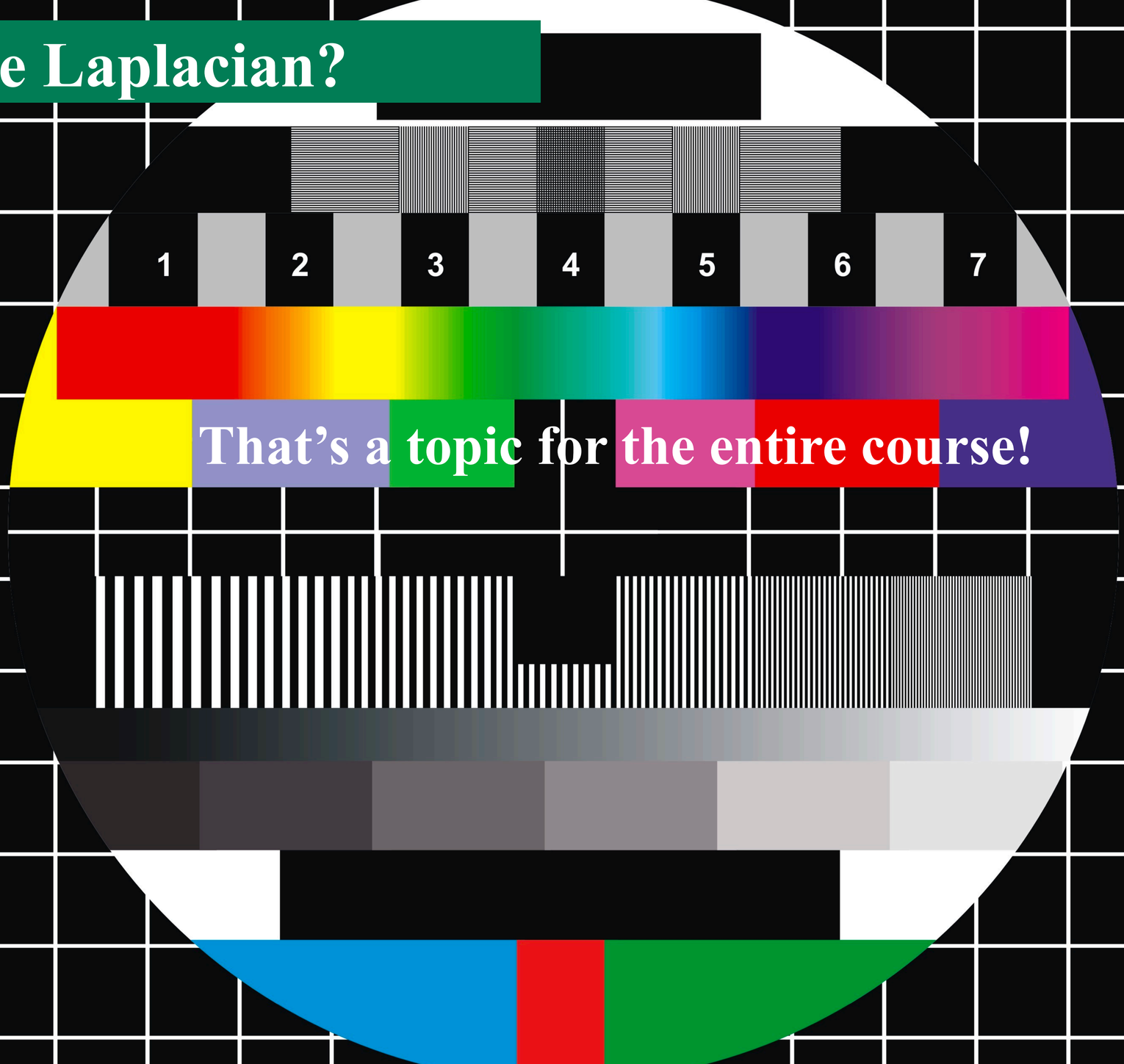
We want to deform the bunny……







What is the Laplacian?



That’s a topic for the entire course!

Take-aways from Today's Lecture

- Computer graphics is about how human interact with computers visually
- Most movies today are produced by Pixar's OpenUSD framework
- This course focuses on applying "the Laplacian" for geometry and rigging, which is the step where you create the model that OpenUSD takes as an input
- The more advanced course teaches a pipeline that can be concatenated after OpenUSD, where you conduct "rendering" to get pictures from the 3D scene.

Bye for now!