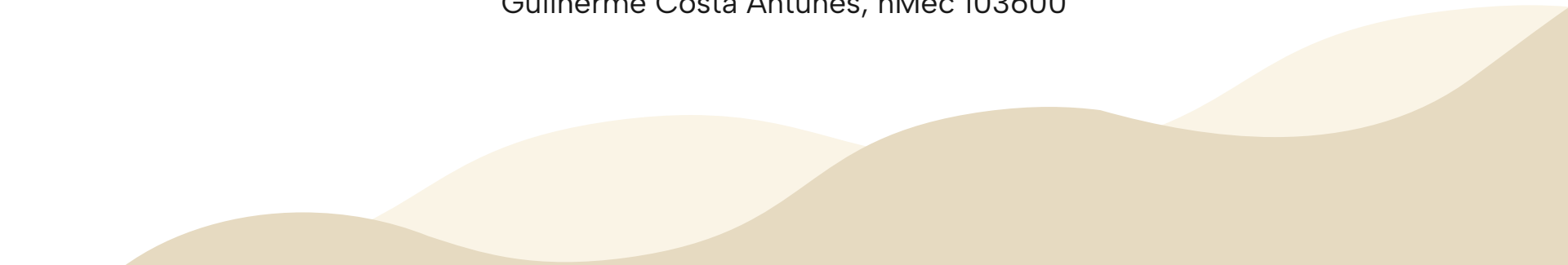




# Visual Computation

## Mid-Evaluation

Daniela Dias, nMec 98039  
Gonçalo Rodrigues Silva, nMec 103668  
Guilherme Costa Antunes, nMec 103600



# Project Idea

## Context

The project applies the theoretical knowledge obtained in the course “Visual Computation”, focusing on **geometry manipulation**, **illumination**, and **texture mapping**.

The project will also include other advanced computer graphic concepts, with shadow rendering, environment effects, and more.

In this context, we’re developing:

## Puzzle Game with Shadows

A puzzle game where the player can **create and cast dynamic shadows** on surfaces to reveal or construct hidden messages, paths, or items by manipulating:

- Objects (e.g., moving objects).
- Light sources (e.g., adjusting light sources).
- Mirrors (e.g., rotating mirrors to redirect light).

# Inspiration

## Uncharted The Lost Legacy

- Shadow Theater Puzzle

[https://youtu.be/wTezSk5\\_bVE?  
si=gGkQ8QauPPzOYYD8](https://youtu.be/wTezSk5_bVE?si=gGkQ8QauPPzOYYD8)



# Computer Graphics Topics

## Transformations, Projections and Physics

### 01

## Transformations

The player can manipulate objects in the 3D space by moving or rotating them.

- General Objects
- Light Sources
- Mirrors

### 02

## Projections

The player can change between projections:

- Perspective mode
- Orthographic mode

### 03

## Physics

The game involves simulating world physics, such as:

- Object Collisions
- Character Control

# Computer Graphics Topics

## Illumination, Shading and Materials

04

### Light Sources

The player can adjust different types of light sources – e.g. directional, point, spot.

05

### Illumination Models

The player can change between illumination models (e.g., to reveal hidden messages).

06

### Materials

The game includes objects with different material properties (e.g., emissive materials).

# Computer Graphics Topics

## Shadow Rendering, Texturing and Effects

### 07

#### Shadow Rendering

The game involves generating realistic shadows for puzzles.

- Shadow Mapping

### 08

#### Texture Mapping

The game involves applying textures to objects for more realistic and detailed surfaces.

- Bump Mapping
- Normal Mapping

### 09

#### Visual Effects

The game involves simulating atmospheric conditions and environment elements.

- Rain, fog, lightning
- Fire, smoke, water

Class 08 - Textures

# Unity

Unity is a cross-platform game engine with:

- **World Building** – Terrains, Trees
- **Built-in 3D Physics** – Character control, Collision
- **Lightning** – Light Sources, Light Mapping, Light Probes, Shadow Mapping
- **Textures** – Importing Textures
- **Shaders** – Built-in Shaders, Writing Shaders, Importing Normal Maps, Importing Bump Maps
- **Visual effects** – Particle Systems

