

## Assignment: Enhancing Character Expressions through Color Manipulation

### Scenario

Imagine you are part of a game design studio working on a character model depicted in the image `ambiguous.png`. The player initially understands the character's expression of happiness. However, as the player learns more about the character, the same expression is perceived as reserved sadness.

A colleague is tasked with altering the mood of the image by manipulating its colors. Their approach involves defining a subspace  $U$  characterized by a single “mood” color, while the remaining color space is spanned by another subspace  $W$ . For each pixel in the image, they expand it into a  $2 \times 2$  block, where the diagonal pixels are shades of the “mood” color, and the off-diagonal pixels are shades that span the rest of the color space.

### Problem Statement

The results of their current implementation, found in `test.ipynb`, are not meeting expectations. Recognizing your expertise in linear algebra, particularly in bases and subspaces, your colleague asks for your help with this. Your task is to analyze their approach and then provide the following:

1. **Identify Issues & Propose an Improvement:** Provide a written description of what you believe is going wrong with their current method. Consider both the mathematical and visual aspects of their implementation. Propose how to improve their method. Provide a theoretical explanation (as best you can) of why your proposed changes should yield better results.
2. **Propose Improvements:** Make your proposed changes to the file.

You have until **Friday** to submit your answer and code. You need to submit both.

### Resources

- Image: `ambiguous.png`
- Code: `test.ipynb`