**Example Submission: Investigating and Detecting AI-Generated Images**

**Step 1: Media Type Selection**

Chosen Media Type: **Images**  
Rationale: I selected images because the visual nature of AI-generated media often presents identifiable patterns or artifacts that distinguish it from human-generated images. Exploring these features will provide insights into how AI-generated images differ from real ones.

**Step 2: Collected Examples**

Images 1 – 3 are AI-generated images collected from the internet.

Images 4 – 6 are recent pictures of my 3 kids.

**Step 3: Brainstorm Specific Traits with AI**

**Prompt Used**

*"What traits can be analyzed to determine if an image is AI-generated? Consider artifacts, inconsistencies, or other distinguishing characteristics."*

**AI Response**

1. **Symmetry Issues:** AI-generated faces often exhibit unnatural symmetry or asymmetry.
2. **Edge Artifacts:** AI images may have blurry or jagged edges in objects or facial features.
3. **Lighting and Shadows:** Lighting in AI images may be inconsistent or unrealistic.
4. **Background Artifacts:** AI-generated images may include nonsensical or incomplete details in the background.
5. **Color Variance:** AI images sometimes display unnatural color gradients or inconsistencies.

**Traits Selected for Analysis**

1. Symmetry Issues
2. Eye alignment
3. Texture Artifacts

Rationale: These traits are visually observable and align with known limitations of AI-generated images. They also provide measurable criteria for programmatic analysis. These traits were selected after the initial traits I tried: symmetry, edge artifacts and background artifacts. However, the first set of traits failed to differentiate between AI and human images even when the differences were fairly obvious.

**Step 5: Program Testing**

| **Image** | **Prediction** | **Actual** | **Correct?** |
| --- | --- | --- | --- |
| Image 1 | AI-generated | AI-generated | Yes |
| Image 2 | AI-generated | AI-generated | Yes |
| Image 3 | AI-generated | AI-generated | Yes |
| Image 4 | Real human face | Real human face | Yes |
| Image 5 | Real human face | Real human face | Yes |
| Image 6 | Real human face | Real human face | Yes |

**Result:** The program correctly identified all six images. The detection based on symmetry, eye alignment and texture analysis worked effectively. Texture analysis seemed to be the feature that best distinguished between AI-generated images and real human faces.

**Step 6: Reflection Report**

1. **Program Performance:**  
   The program was able to distinguish between human and AI-generated faces. However, it took a lot of trial and error and back and forth messaging with the AI to get to this point. When I first began working on the program, I picked very unnatural AI images to make it easier for the model to detect differences. Once it was working fairly well, I fine-tuned it by changing the AI images to be more natural looking.

The AI first suggested looking for differences in symmetry, edge artifacts and background artifacts; however, in practice, the initial programs either labeled all of the images as AI or all of the images as human. After additional prompts to help distinguish between the two, the AI suggested using symmetry issues, eye alignment and texture artifacts. These features more accurately distinguished between the two types of images.

Finally, I experimented with the thresholds for the different features. Using trial and error, I found that lowering the threshold for unnatural symmetry and adjusting the weights used to calculate the AI likelihood to emphasize the texture score improved the model.

1. **Feature Analysis:**
   * **Symmetry Issues:** The greater the symmetry of the face, the more likely the image was to be AI generated. This ended up being up one of the less important features because most of the faces – even the AI ones – were not very symmetric.
   * **Eye Alignment:** Eyes that are unnaturally aligned or out of alignment are more likely to be AI generated. This ended up not being a particularly important feature either because none of the images had very unnatural-looking eyes.
   * **Texture artifacts:** Images with texture artifacts are more likely to be AI images. This ended up being the feature that was most important in detecting the difference in AI and human images including the AI-generated images that are pretty natural-looking.
2. **Limitations and Improvements:**
   * **Limitations:** The program was developed using only 6 images so it may not work to detect differences between other images, particularly high-quality AI images that are very natural-looking.
   * **Improvements:** Incorporating additional features like color variance or examining reflections and shadows could improve detection. Training the program on a larger dataset could enhance accuracy for subtle differences.

**Conclusion**

This project deepened my understanding of AI-generated images and detection methods. I was surprised how important texture artifacts were in detecting AI images and that the program was able to identify two fairly-natural looking images as being produced by AI. While the program performed well on these 6 images, future improvements could address its limitations in detecting more sophisticated AI-generated images.