Assignment P01 – Puzzle

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ITAI - 1371 Introduction to Machine Learning

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**Introduction**

This assignment asked us to connect an optical illusion video to the concepts of projection, ray tracing, and machine learning. The video, **“Two Lines Same Size? YES or NO? Optical Illusion Drawing,”** demonstrates how our vision can be tricked when viewing simple drawings. Exploring this illusion helped us understand how light, projection, and dimension interact, while also giving us insight into how computers face similar challenges in visual interpretation. The main objective was to show why projection geometry matters in both human and machine learning contexts.

**Connection Between the Video and the Puzzle**

In the video, two lines that are truly equal in length appear different depending on their arrangement. This is closely tied to the Puzzle because it demonstrates how projection and light can create the perception of depth or dimension where none actually exists.

The relevance is that optical illusions arise from the way light rays are projected onto a flat surface, which tricks the human brain into perceiving differences that are not there. An AI system can also struggle here: for instance, it may not recognize a painting correctly because it is only a 2D image, while a physical 3D object can be scanned and mapped much more reliably.

**How the Puzzle Relates to Machine Learning**

The Puzzle links directly to machine learning challenges, particularly in computer vision. Just like humans, AI models must interpret 2D projections of the 3D world, and they can easily be misled by distortions or unclear context.

Another important connection is that solid, well-defined shapes (such as straight lines) are easier for a machine learning model to process, since the pixel data is consistent and less noisy. On the other hand, paintings with many overlapping elements, heavy textures, or high color saturation are much harder for an AI to classify correctly because the features are complex and difficult to separate. This highlights how data quality and definition impact model training and accuracy.

**Activities Completed**

Our team carried out the following steps to complete the assignment:

1. Each member watched and analyzed the optical illusion video.
2. We discussed projection, ray tracing, and their role in the illusion.
3. Connected these findings to challenges faced in AI and machine learning.

**Results**

The illusion was purely a product of projection and context cues. We also observed that the video illustrates how light and visual tricks can create the sense of extra dimensions. This relates to AI because a system may misinterpret a 2D image, like a painting, while it can more reliably detect and define a 3D object through scanning or mapping. Additionally, we noted that structured data, like a clear line converted into pixels, is easier for AI to process, while complex and saturated images create much more difficulty for models to interpret.

**Conclusions**

From this assignment, we concluded that:

* Optical illusions are practical demonstrations of projection principles and how light influences perception.
* Ray tracing and projection explain why illusions occur, both in human vision and in digital imaging.
* Machine learning models face the same limitations as humans when dealing with ambiguous or saturated visual data.
* Clear, structured data makes AI training easier, while complex images (like paintings) present greater challenges.
* Understanding these issues helps bridge the gap between human perception errors and machine learning design.

**Key Takeaways**

Working on this puzzle helped us realize that:

* Optical illusions reveal how dimensions can be created or distorted by projection and lighting.
* Projection and ray tracing matter not just in graphics but also in real AI tasks like image recognition and 3D reconstruction.
* Machine learning models benefit from simple, well-defined training data but can struggle with overly complex visual patterns.
* Collaboration allowed us to test, measure, and reflect on the illusion from both visual and technical perspectives, which made our understanding more complete.

**References:**

**DK Drawings (June 23, 2018) Two Lines Same Size ? YES or NO ? Optical Illusion Drawing.** [**https://www.youtube.com/watch?v=uCDz9Bsi8Sk**](https://www.youtube.com/watch?v=uCDz9Bsi8Sk)