**Day 41**

**What to do?**

Learn how human visual cortex works.

**Human visual cortex:**

The entire idea of CNN came from humans understanding an image. Usual process is, light from the image is stored in a region in our eyes called “retina”. The retina then sends the signal to our brain via receptors and interneurons. The final understanding of the image happens when lateral geniculate nucleus (LGN) prepares the signal to deliver the visual.

Usually when we see tutorials on CNN, they talk about understanding the low features, like edges, and then objects that make the image, like eyes, and then placing them altogether. That’s how even our eyes work, according to Hubel and Wiesel (who conducted the visual cortex experiment on cat in 1968: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1359523/pdf/jphysiol01247-0121.pdf>).

The experiment concludes that the primary visual cortex has a hierarchical structure: simple cells -> complex cells -> hypercomplex cells. The simple cells detect edges, complex cells detect 2D (approximately) shapes using multiple simple cells and hypercomplex cells utilize complex cells to classify the object/image.

As seen in the process above, it is the same process that a CNN goes through. It extracts features and classifies the image. As the number of layers increase in a CNN network, the number of complex features there are to learn from the image. Basically,

1. First layer (or maybe 2) are responsible for detecting lines and edges and other simpler features in an image
2. The output from 1st layer is then passed onto next few layers to detect shapes
3. More layers there are more high order features are detected
4. Last layer (of CNN) integrates the complex features to classify the object
5. The network then backpropagates to rectify its errors and change its parameters to give a more accurate prediction

What makes CNN unique is the way its selects specific features (simple cells) and increases its spatial invariance (complex cells).