Dear student, Hope you will be able to imagine a few things. Let us begin.

Imagine that you are walking through a forest full of mango trees. There are three rules here. **1)** Each tree produces **only** one particular-colored mango on them. Branches of each mango tree go between the branches of all the mango trees around them. So, we see different colored mangoes hanging down together all the time. It is difficult to know which mango belongs to which tree. But when we trace each colored mango, we will reach only one tree. **2)** Each mango has a stalk (pedicel). There is only one mango on one stalk. **3)** The distance between two mangoes on a tree branch is more than the size of a mango. These are funny mango trees. Aren't they?

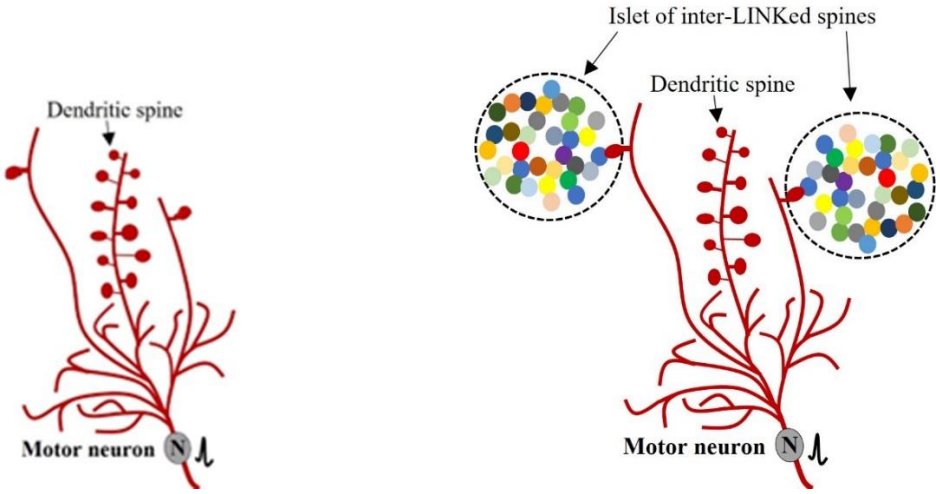
Also imagine **another forest of mango trees** hanging up in the air. Their roots are hanging in the air. Each one of the root tips comes down and touches one mango each that you are seeing.

Our brain is full of different layers of mango trees with mangoes on them and roots from the tree above them coming and touching on the mangoes of the lower layer. Now, we were thinking that memories are stored at the junction where the rootlet from the tree above touches mango. These junctions are called synapses and the change at this junction is called synaptic plasticity.

But I found a problem. To explain all the features of the brain, this type of connection alone is not sufficient. In addition to the above connection, there should be another connection. Remember, I told you that since tree branches overlap heavily, we can see mangoes of different colors (from different trees) touching each other. When we learn something, there must be some changes occurring at the location where the skins of mangoes of different colors (that belong to different trees) touch each other.

When we do electron microscopy of the brain sections, we can see these mango-like structures (dendritic spines) from different tree-like structures (neurons) touching each other. But we have not yet proven that there will be some changes occurring between the skins of these mango-like structures when we learn. When artificial intelligence (AI) scientists tried to use this concept of mango-like structures (spines) interacting with each other in mathematical terms (using linear algebra), they started getting good AI. By keeping more mangoes to touch each other in a group, and by keeping them touching firmly for more time, we are getting better AI. Now that we are getting good AI, we can assume that the brain must also be working in the same manner – like mangoes from different tree touch and interact, spines of different neurons touch and interact.

See the figure **on the left**. We removed one mango tree (neuron) from the forest. This is a tree with red mangoes on it. See them in the middle branch. We took out all the other mangoes from other branches; but we left one mango each on the left and right long branches. See the figure **on the right**. In the forest, the single mangoes on the long branches were touching many mangoes of different colors from different trees. This is a photo we took before removing this tree.



Now see the mathematics – linear algebra – matrix stuff. It will be difficult for you to understand. But see 4 groups of mangoes of different colors (drawn in 4 circles) correspond to 4 different entries (which are shaded in light violet) in a 4x4 matrix. I hope you can see the similarities. This is what we think GPT has done. We need more details of the "hidden layer" from GPT people!!