1. Purpose:
   1. The goal is to use Decision Tree to analyze deep neural network’s property. The focus property is implication. In other words, the program aims to answer under what input conditions will the output has certain properties. The type of output property for this project is which neurons having the highest value.
      1. E.g: Using the picture of model 1 graph in this folder, one property that we would like to infer is ((x0 – x1 > 0) and (x0 + x1 <= 0) => y0). Here, (x0, x1) are the input neurons, and y0 is the output neuron. This property can be read as if (x0 – x1 > 0) and (x0 + x1 <= 0) is true, then output neuron y0 is the largest among all output neurons.
   2. This type of property is prevalent in some classic ML problems like Fashion MNIST, cifar10, cifar100, etc. In those models, the ML models aim to find out which categories the input falls under. In most cases, the decision is made by which output neuron holds the highest value (probability).
2. Proposed method.
   1. Inspired by another paper, we are using Decision Tree (DT) to analyze such properties. The goal is to collect a large sample of inputs for the DT by randomly generating inputs. Then, those inputs will run through the model to obtain the output. After that, the DT will run and produce its result. In the end, the results will be extracted for analysis.
   2. The input is measured as True or False where True means the input value is greater than 0 while False means the input is smaller than or equal to 0.
3. Result:
   1. The DT result is really diverse. The model that we use come from sklearn and it keeps track of how many times a certain path is used and how many times it was right or wrong.
      1. Path is defined as a traversal route from the root of the true to its leaf node.
   2. The program is currently only using paths that have no incorrect case.
      1. It is important to note that we are planning to explore paths that are correct most of the time, yet it has some wrong cases. Those wrong cases could give insights into how the model works.