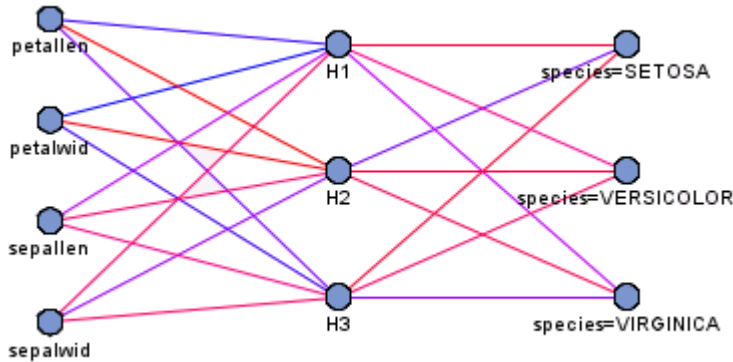Quiz 5

This neural network was trained on Fisher's famous iris data set, which contains four inputs: petallen, petalwid, sepallen, and sepalwid and one label variable named species with three levels: Setosa, Versicolor, and Virginica. Refer to the diagram of the neural network to answer questions when needed.

1. **(1 pt.)** What type (or architecture) of neural network is pictured in the diagram?

Multilayer Perceptron

2. **(1 pt.)** How many hidden layers does it have?

1

3. **(1 pt.)** How many hidden units does it have?

3

4. **(1 pt.)** Yes or no. From the diagram or any other information you can find about this network is it possible to dependably extract information about variable importance or make inferences about the relationships in the training data?

No

5. **(4 pts.)** Given the trained weights of the neural network in the code below, classify the following observation. Assume that the output level with the highest unnormalized posterior probability is the predicted class.

Petal Length (mm)	Petal Width (mm)	Sepal Length (mm)	Sepal Width (mm)
20	15	14	18

```
* STANDARDIZE INPUTS;
S_petallen = -2.13 + 0.05 * petallen;
S_petalwid = -1.57 + 0.13 * petalwid;
S_sepallen = -7.05 + 0.12 * sepallen;
S_sepalwid = -7.04 + 0.23 * sepalwid;

* APPLY HIDDEN LAYER WEIGHTS;
H11 = -1.49 * S_petallen + 7.94 * S_petalwid + 1.94 * S_sepallen + 1.11 * S_sepalwid;
H11 = -6.02 + H11;
H11 = TANH(H11);
H12 = 5.05 * S_petallen - 2.23 * S_petalwid + 8.34 * S_sepallen - 9.36 * S_sepalwid;
H12 = 0.64 + H12;
H12 = TANH(H12);
H13 = 24.18 * S_petallen + 5.00 * S_petalwid - 8.98 * S_sepallen + 0.79 * S_sepalwid;
H13 = -11.28 + H13;
H13 = TANH(H13);

* APPLY OUTPUT LAYER WEIGHTS;
P_speciesvirginica = 9.60 * H11 + 30.93 * H12 + 34.21 * H13;
P_speciesvirginica = -5.42 + P_speciesvirginica;
P_speciesversicolor = -8.71 * H11 + 15.72 * H12 + 14.00 * H13;
P_speciesversicolor = 10.28 + P_speciesversicolor;
P_speciessetosa = 0;
```
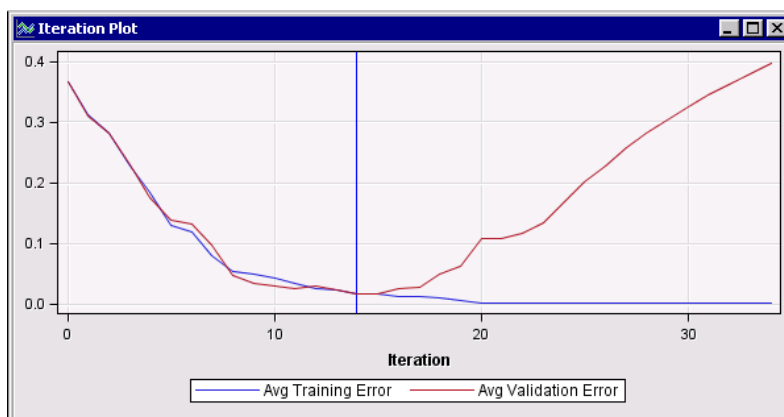
Hint, this code can be run in a SAS data step using SAS code like this:

```
data score;
      petallen = 20; petalwid = 15; sepallen = 14; sepalwid = 18;
/* insert code here */
run;
```

It will also run in python without the comments.

Versicolor

6. **(2 pts.)** Given the iteration plot below, what is an approximate best number of iterations to run this neural network to have the lowest validation error?

14 - 16