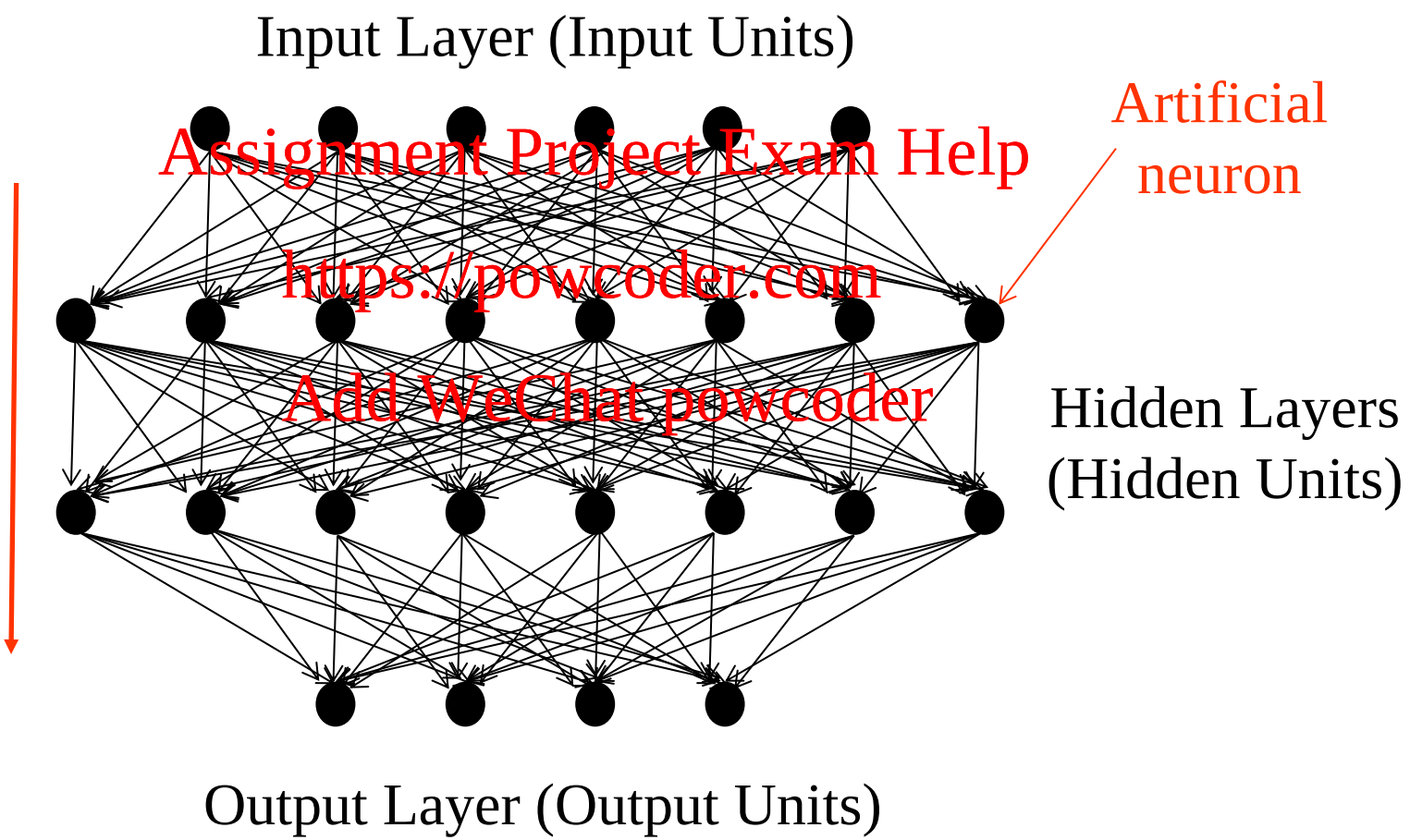
Data Mining and Machine Learning

Types of Multi-Layer Perceptron

Peter Jančovič

Feed-forward Neural Networks

Multi-Layer Perceptron - Feed-Forward Neural Network

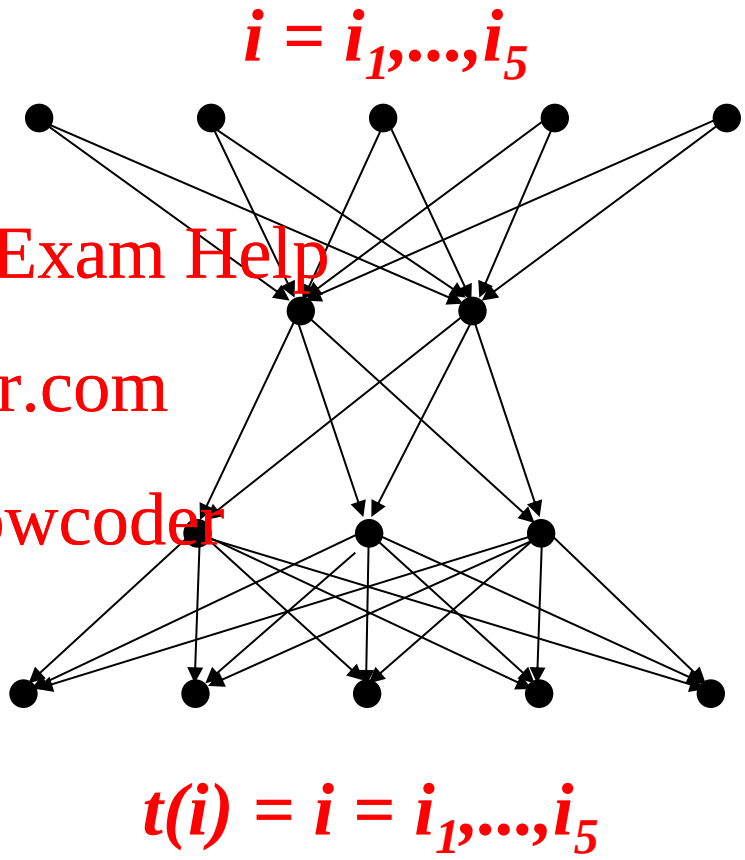


What can you do with a (D)NN?

- Approximate arbitrary non-linear mappings between the inputs and targets
- Learn low-dimensional representations of data (Auto-encoder networks)
- Learn to allocate data to classes (Classification networks)

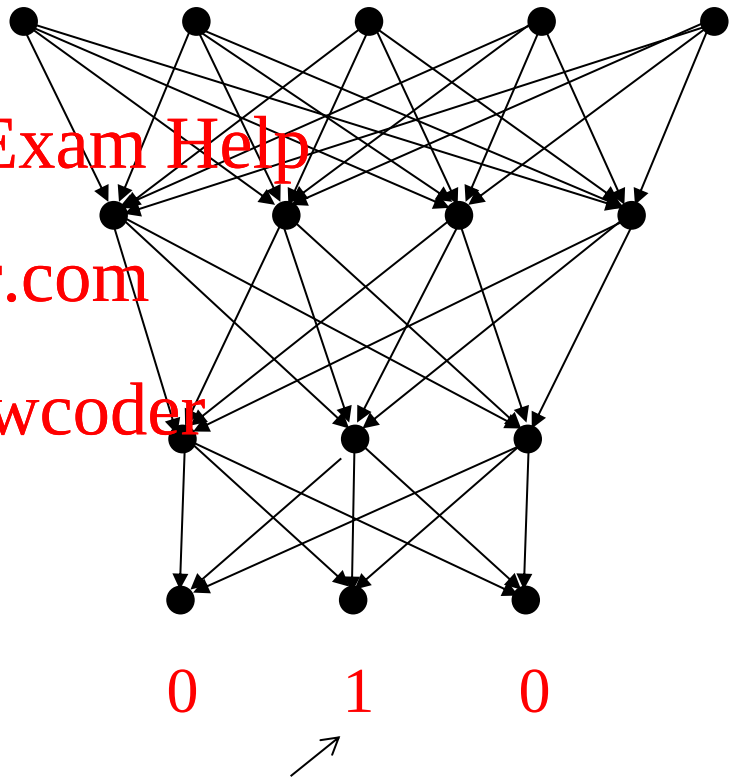
Auto-encoder (D)NNs

- During training, for each input pattern ***i***, ***t*(*i*)** = ***i***
- What's the point?
- By including one or more hidden layers with a small number of units (a "bottleneck") the network learns a low-dimensional representation of the data



"Classification" Networks

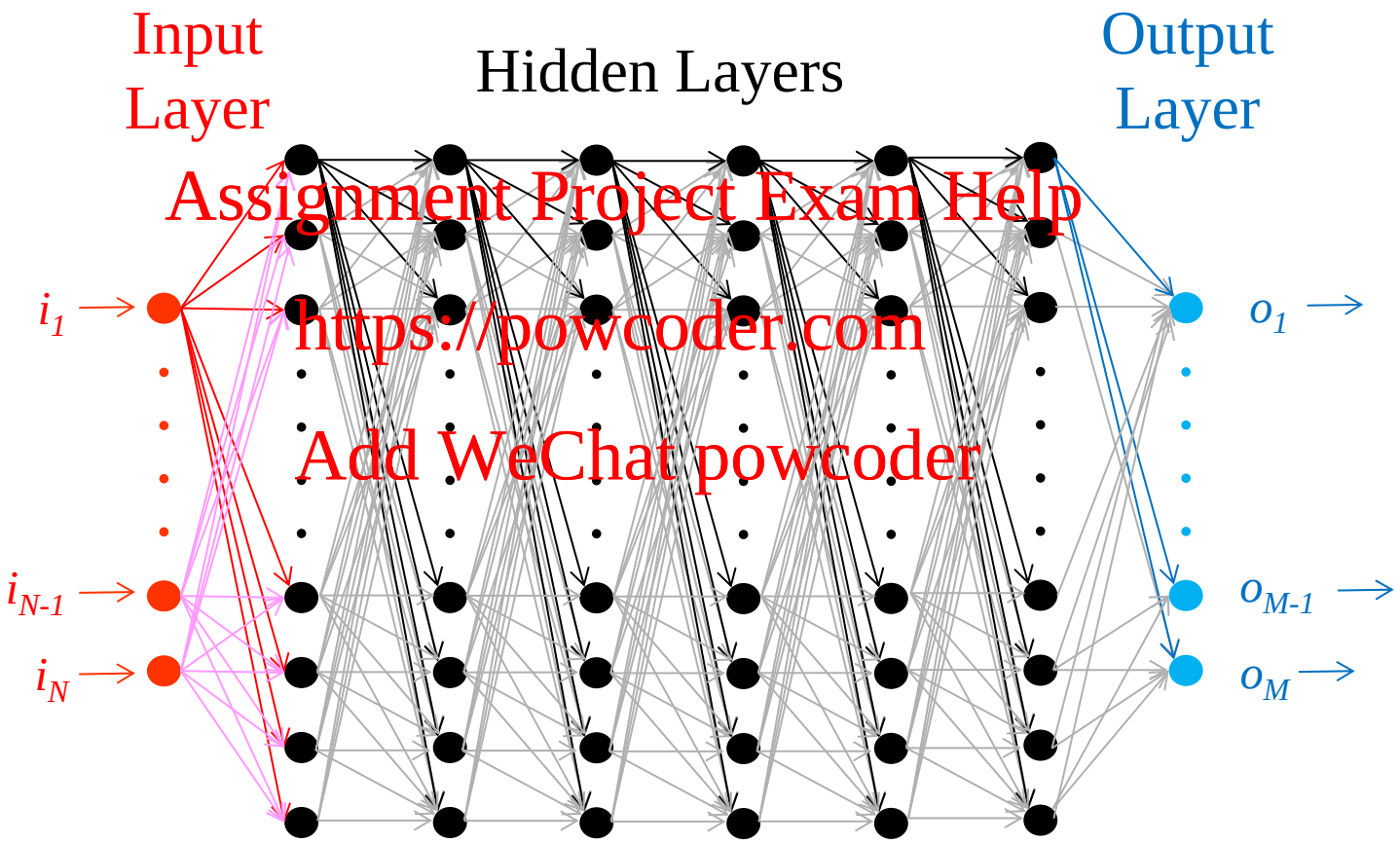
- Suppose each pattern belongs to one of *N* classes
- For each input pattern ***i***, let c_i be the class of ***i***
- Let ***t*(*i*)** be the *N* dimensional vector with whose c_i^{th} coordinate is 1 and all other coordinates are 0



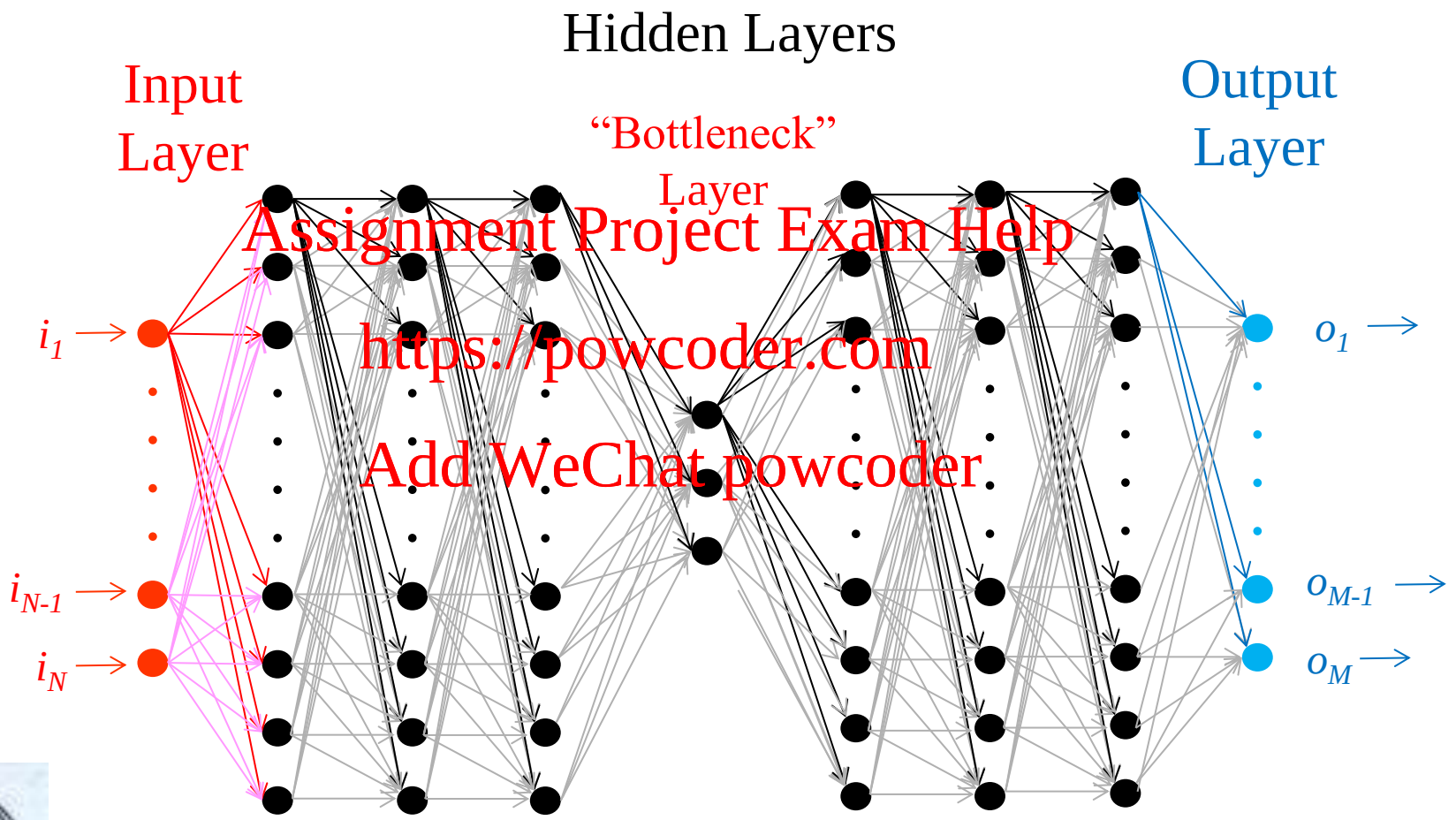
Deep neural networks (DNNs)

- "Deep" refers to the number of hidden layers
- In the past typically only NNs with few (1 or 2) hidden layers were considered:
  - Computational considerations
  - Difficulty of parameter estimation for multiple hidden layers
- Since ~2000
  - Faster computers (in particular GPUs)
  - Larger training data sets
  - Better parameter estimation algorithms

A “deep” neural network (DNN)



“Bottleneck” DNN



THE END

- ..of lectures..