UVA | SCHOOL of DATA SCIENCE

Deep Learning Background

Reinforcement Learning
School of Data Science
University of Virginia

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Purpose

Quick motivation and overview of deep learning

For details on DL, see Deep Learning by Goodfellow et. al.

Function Approximation and Deep Learning

As the state space grows, it can work better to use a function to approximate the Q function, rather than learn a table

Many approaches have been used for this function

Modern techniques favor deep learning

What is Deep Learning

Deep Learning (DL) is a subset of machine learning

Uses a neural network with multiple hidden layers

Unlike traditional ML where predictors are selected by a human,
In DL, predictors are learned as part of model training

Deep Neural Network

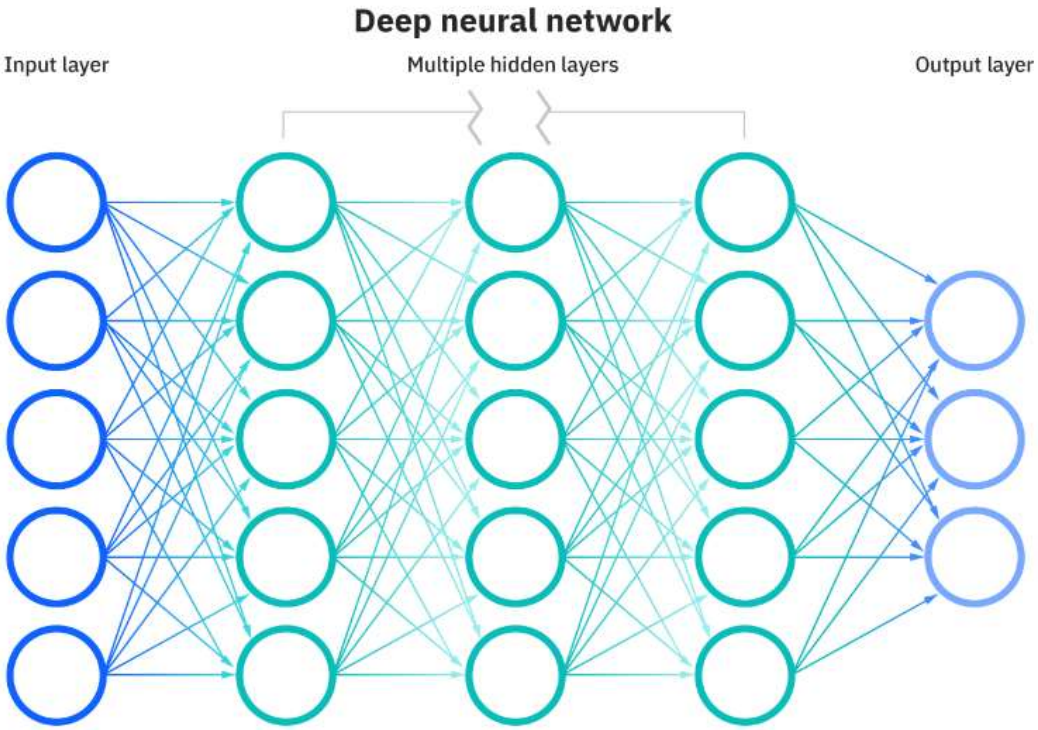
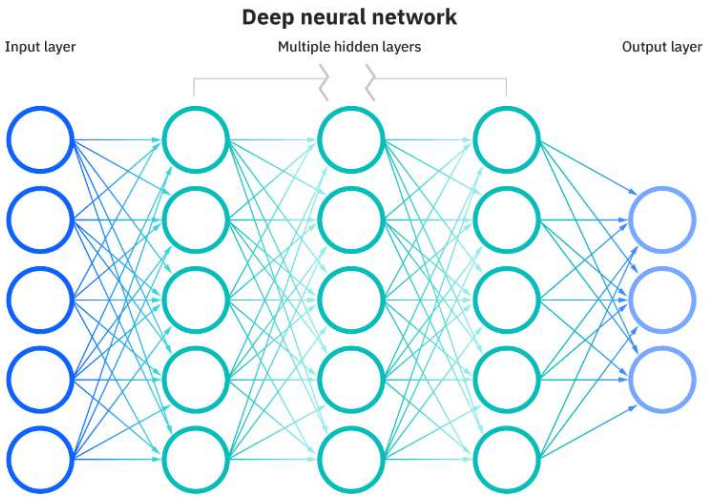


Illustration of fully-connected multi-layer perceptron (MLP)

Deep Q-Network

Output layer can consist of values Q(s,a)



Architectures

Some Deep RL approaches use conventional architectures like:

- MLP

- Recurrent neural network (LSTM, GRU)

There are also customized Deep RL architectures:

- Dueling Networks

Will study these later

References

Deep Learning. Goodfellow, I., Bengio, Y. , Courville, A.

What are neural networks?
https://www.ibm.com/topics/neural-networks