CMSC 491/691: Computer Vision **Spring 2024**

Lecture 9: 2024-03-04 Neural Networks for CV

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9.1 Recap of the Last Lecture

The last lecture focused on the different challenges in classifying images.

- View point variation
- illumination
- Background clutter
- Occlusion
- Pose deformation
- Inter Class Variance
- Illusions

The only way we can solve these problems is with machine learning and lots of data. This can be done buy using past experiences to guess future problems.

9.2 Matching old data to new data

9.2.1 Polynomial Regression

Polynomial Regression is a way to make a function out of past data that can be used to predict new problems. Polynomial regression is defined in figure 9.2.1. This allows us to convert classifying images into a matter of finding the parameters of the function.

Note 9.1 *We do not want to overfit our data because we want our final function to be as general as possible*

9.2.2 Computation in a Neural Network

A neural network performs computations by mapping input values to the output ones using weights see below.

The formula for this computation is:

$$y_j = \sum_i w_{ij} * x_{ij} + b$$

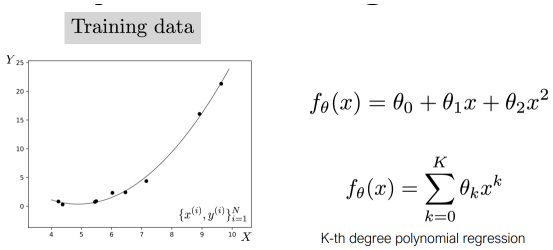

Figure 9.1: Polynomial Regression example

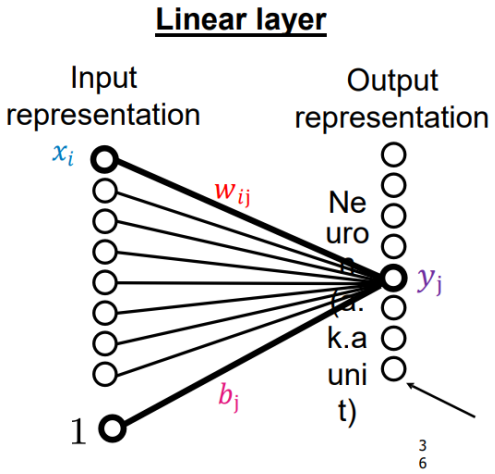

Figure 9.2: Neural Network

9.3 Simple non-linearity

The issue with this neural network approach is that it is still linear. What we need to do is add another layer to do point-wise non-linearity.