

Due data: 12/9/2020, end of the day. **Please submit the following 2 files via Canvas:**

- 1) For question 1, please submit in a word file or a PDF file;
- 2) For question 2, please submit a **.ipynb** file (Python jupyter notebook file).

Question 1 (20 points):

- 1) Please explain the pros and cons of Instance-Based Learning and Model-Based Learning respectively. (4 points)
- 2) Please draw the diagram of Convolutional Neural Networks (CNN). Then explain the functionality of each layer of CNN. Name several latest algorithms of CNN (e.g., AlexNet etc.). (10 points)
- 3) When training deep networks using Backpropagation, one difficulty is so-called “diffusion of gradient”, i.e., the error will attenuate as it propagates to early layers. Please explain how to address this problem. (6 points)

Question 2 – Programming (30 points):

Design a genetic algorithm to solve the polynomial fitting problem that we did in Homework #1.

Lecture 10 page 35 gives the pseudo-code for a **mutation**-only algorithm. In this assignment you need to implement a genetic algorithm using BOTH **mutation** AND **crossover** operations. Please refer to pages 13-16 of Lecture 10 for arithmetic **crossover** operations. You need to decide a mutation rate and a crossover rate.

Plot 1) the original noisy data, 2) the polynomial you obtained in Homework #1, and 3) the polynomial obtained from this implementation in one figure for comparison.