Homework

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0 Logistics

Dates

  Assigned: Mon Aug 27, 2018
  Due: Wed Sep 5, 2018

Format

  Email me

    Email subject: CS6301 Homework 1
    Attach a zip file containing your source code and a pdf named Answers.pdf
  In the Answers.pdf include the following
    1. Done (if you did the reading) / not done (if you didn't)
    2. Done / skip (indicating not needed)
    3. Programming language used
    4. Answer to question 4
    5. Optional: any visualization results you'd like to show off

1 Assignment

1. Read

- Linear algebra lecture notes on Github
- Convolutional neural networks: theory, implementation and application
  - Chapter 3 linear algebra
  - https://github.com/arthurredfern/UT-Dallas-CS-6301-CNNs/blob/master/References/ConvolutionalNeuralNetworks.pdf

2. Read this as necessary for background understanding (skip if not needed)

- A guide to convolution arithmetic for deep learning

- o Ok to just skip, spend time with it if helpful and needed
- o https://arxiv.org/abs/1603.07285
- Linear algebra
  - o https://www.math.ucdavis.edu/~linear/linear-guest.pdf

3. Write a program (any language) with separate functions to do CNN style 2D convolution

Input parameters
    Input feature map data type {random, sequential}
    Input feature map size N_i input channels, L_r rows, L_c cols
    Input feature map zero padding P_l left, P_r right, P_t top, P_b bottom
    Input feature map up sampling factor U_r rows, U_c cols
    Filter coefficient data type {random, sequential}
    Filter coefficient size N_o output channels, N_i input channels, F_r rows, F_c cols
    Filter coefficient up sampling factor D_r rows, D_c cols
    Output feature map channels N_o output channels
    Output feature map down sampling factor S_r rows, S_c cols

Function: data generation
    Input feature maps
        Channel x row x column
        Contents
            Random
            Sequential (0, 1, 2, …)
    Filter coefficients
        Output x input x row x col
        Contents
            Random
            Sequential (0, 1, 2, …)

Function: pre processing
    Up sampling
        Input feature maps
        Filters
    Zero padding
        Top, bottom, left, right

Function: matrix creation
    Input feature map filtering matrix
    Filter coefficient matrix
    Output feature map matrix (empty)

Function: matrix multiplication

Function: post processing
      Down sampling
            Output feature maps

Function: visualization
      Input feature maps
      Filter coefficients
      Output feature maps

4. Write the result of the above program applied with parameters to match the example on slide 59 / 60 in the linear algebra lecture notes for output feature map memory address 13.