

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

- Ok to just skip, spend time with it if helpful and needed
- <https://arxiv.org/abs/1603.07285>
- Linear algebra
 - <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
Filter coefficients
Output x input x row x col
Contents
Random
Sequential

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 at the end of section 3.3 in the linear algebra lecture notes for output feature map memory address 13.