Assignment 4
Grad-CAM: Visual Explanations from Deep Networks via Gradient-based Localization (Due at 23:59 11/13/2023 Monday)

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q1. (30%) Reading

Please read the Grad-CAM paper (Grad-CAM: Visual Explanations from Deep Networks via Gradient-based Localization) and write the pseudocode of the visual explanations similar to the following format

Pseudocode Format Example:

Algorithm 1 Backpropagation Algorithm

procedure TRAIN
  $X \leftarrow$ Training Data Set of size mxn
  $y \leftarrow$ Labels for records in X
  $w \leftarrow$ The weights for respective layers
  $l \leftarrow$ The number of layers in the neural network, 1...L
  $D_{ij}^{(l)} \leftarrow$ The error for all l,i,j
  $t_{ij}^{(l)} \leftarrow 0$. For all l,i,j
  For $i = 1$ to m
    $a^l \leftarrow feedforward(x^{(i)}, w)$
    $d^l \leftarrow a(L) - y(i)$
    $t_{ij}^{(l)} \leftarrow t_{ij}^{(l)} + a_j^{(l)} \cdot t_i^{l+1}$
  if $j \neq 0$ **then**
    $D_{ij}^{(l)} \leftarrow \frac{1}{m} t_{ij}^{(l)} + \lambda w_{ij}^{(l)}$
  else
    $D_{ij}^{(l)} \leftarrow \frac{1}{m} t_{ij}^{(l)}$
    where $\frac{\partial}{\partial w_{ij}^{(l)}} J(w) = D_{ij}^{(l)}$

q2. (40%) Realizing the Grad-CAM visualization

1. Download the pre-trained NN model weights and model reading program form here
2. Download your test data from here
3. Visualize the model by the Grad-CA mentioned in the paper of **q1**

q3. (30%) Writing report

Write down your experiment setting in English. The setting should include but not be limited to

1. hardware specification;
2. package version;
3. Please explain how to use Grad-CAM for visualizing this model; please **illustrate your method and visualize the results in the report**;
4. Visually show the Grad-CAM map of the given testing images in the report,
5. a detailed description of the parameter settings and the implementation in q2;

The completeness of the description for your realization will largely impact the score.
The font size is **12**, and the page limit is **3** pages.

Submission Guideline

Please compress your files named {SID}_a4.zip (SID in upper case) to the COOL System, such as D111111_a4.zip, with the required files

1. **{SID}_a4.py:** please submit your source code to the COOL system. Please make sure the command, **python {SID}_a4.py,** can successfully run your code.

2. **The execution results of {SID}_a4.py:** The outputs of your code are the test data after Grad-CAM. For example,

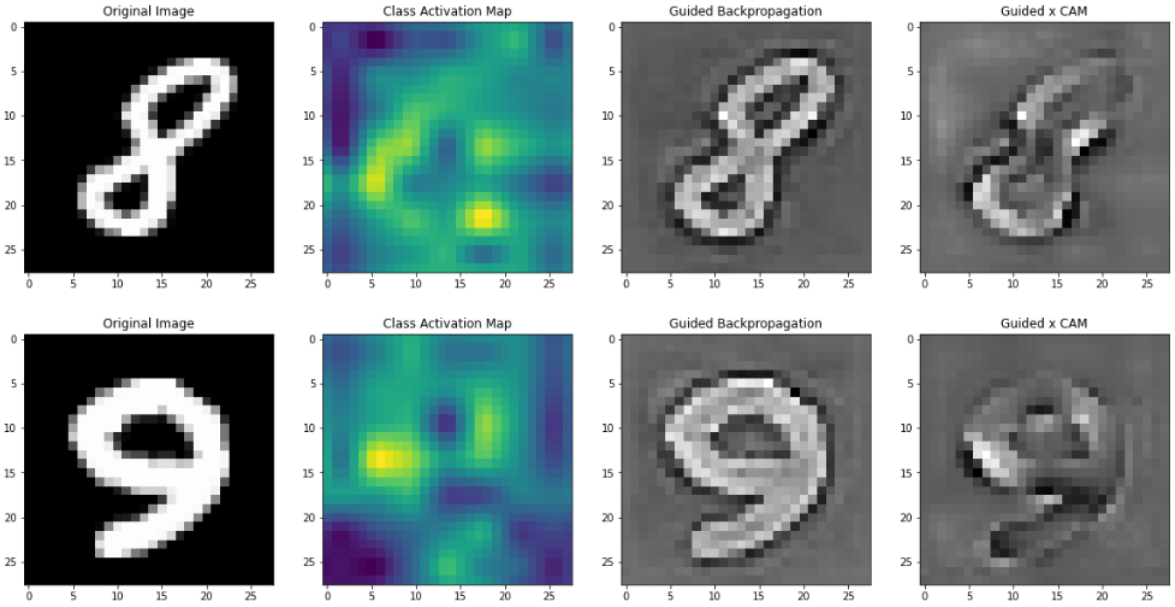

Figure 1. Examples of program output.

3. **{SID}_a4_report.pdf:** the assignment report. Please illustrate your model visualization results. with some figures similar to Figure 1

Supplementary Materials

1. PyTorch installation: https://pytorch.org/
2. Grad-CAM: Visual Explanations from Deep Networks via Gradient-based Localization, https://arxiv.org/pdf/1610.02391.pdf