DATASCI 207

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Announcements

- Projects update

HW Updates

HW5

- Q1: use n_classes instead of using hardcoding of 10
- Q2: trouser (not bag, ankle boots) has highest precision - 15% of submissions

HW6

- Q1: not checking for the two types of optimizers (Adam, SGD) - 13% of submissions
- Q2: number of parameters (11% of submissions)
  - digits[] (tanh/RELU)(SGD/Adam) – 7850 param's
- Activation in non hidden layers?

CNNs

- **What is a Convolutional layer?**
  - Convolution is a mathematical operation on two functions (f and g) that produces a third function (f*g) that expresses how the shape of one is modified by the other
  - Convolutional layers convolve the input and pass its result to the next layer (using a kernel function)
  - Visual example: https://www.youtube.com/watch?v=KuXjwB4LzSA&ab_channel=3Blue1Brown
- **What is a Pooling layer? Why use it after a Convolutional layer?**
  - Reduce the dimensions of data by combining the outputs of neuron clusters at layer l into a single neuron in layer l+1
  - Reduces the number of parameters, generalization

CNNs

(A) Class: Antiquity

(B) Class: Middle Ages

(C) Class: Modern Era

Figure 1: Example of images found in the dataset along with their classes

Give two benefits of using convolutional layers instead of fully connected ones for visual tasks?

- 1) Uses spatial context (by only assigning weights to nearby pixels); 2) Translation invariance: 3) Have lot less parameters, since CNN's share weights

CNNs

Before training your model, you want to decide the image resolution to be used. Why is the choice of image resolution important?

- Trade-off between accuracy and model complexity.

CNNs

If you had 1 hour to choose the resolution to be used, what would you do?

- Print pictures of images with different resolutions and ask friends if they can properly recognize images.

CNNs

After visually inspecting the dataset, you realize that the training set only contains pictures taken during the day, whereas the dev set only has pictures taken at night. Explain what is the issue and how you would correct it.

- It can cause a domain mismatch.
- The difference in the distribution of the images between training and dev might lead to faulty hyperparameter tuning on the dev set, resulting in poor performance on unseen data.
- Solution: randomly mix pictures taken at day and at night in the two sets and then re-split the data.

CNNs

As you train your model, you realize that you do not have enough data. Cite 3 data augmentation techniques that can be used to overcome the shortage of data.

- Many possibilities incl. Rotation, Cropping, Flipping, Luminosity/Contrast Changes

Further test your knowledge…

https://cs230.stanford.edu/files/cs230exam_win19_soln.pdf

Data Preprocessing, Augmentation & Annotation

- What is the difference between data preprocessing and augmentation?
- Data annotation: typically done using crowdsourcing

Example: Crowdsourcing for NLU (talk slides)

Crowdsourcing = outsourcing a job traditionally performed by an employee to an undefined, generally large group of people (not SMEs).

a. What platforms do we use? *Paid and Unpaid*
b. Who are the annotators? *Typically non experts*
c. Is the data high quality? *Varies, could be heavily* ***biased****, task specificity and complexity matters!*

Demo Exercise - CNNs for sentiment classification

https://github.com/MIDS-W207/nteneva/blob/main/live_sessions_current/week10/CNN1D.ipynb