UDACITY

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DISCUSS ON STUDENT HUB

Data Scientist Capstone

REVIEW

CODE REVIEW

HISTORY

Meets Specifications

Dear student

Great job on your blog post! Allow me to be the first to congratulate you on completing the DSND. I feel that you've met or exceeded the specifications for this course and your deeper dive into computer vision has been quite successful. Again, congratulations on passing and I wish you all the best of luck with your future programming endeavors.

Cheers!

Suggested reading related to some more complex approaches to data augmentation:

https://towardsdatascience.com/advanced-data-augmentation-strategies-383226cd11ba

Project Definition

Student provides a high-level overview of the project. Background information such as the problem domain, the project origin, and related data sets or input data is provided.

> In the current project, we aim at constructing a dog breed classifier by deep learning techniques and developing a prototype of a dog identification app using the built classifier. This app is capable of reading any user-provided picture as app input. If the app detects a dog in the image, it will

> output its classification result, an estimation of the dog's breed. If the app detects a human in the image, it will indicate this human resembles what kind of dog. If the app detects neither a dog nor a human in the image, it will post a message that something else was detected.
> The data set of this project is provided by Udacity, comprising a dog dataset and a human dataset.
>
> In the following sections, we will see the details of these datasets and understand how this dataset could be applied to solve our main concern and be implemented in a dog breed identification app.

Nice overview of the problem domain! I love the focus on the real-world impact of the application. As I mentioned last time, it's a good idea to cite some of the studies where the machine learning techniques that you're using were pioneered. This shows that you really know the field and it gives credit to the inventors.

The problem which needs to be solved is clearly defined. A strategy for solving the problem, including discussion of the expected solution, has been made.

> The main problem/goal of this project, as mentioned, is building a dog breed classifier of dog images, which can tell, given an image, what dog breed is out of 133 dog breeds. Obviously, it is a classic image recognition multi-class classification problem. The main strategy for solving this problem is using convolutional neural networks (CNNs) techniques derived from deep learning/neural networks.
> Specifically, we will develop two approaches: One approach is training a self-defined CNN from scratch to build a from-scratch dog breed classifier; the other approach is adopting transfer learning that utilizes pre-trained models to build a transfer-learning dog breed classifier. Since the latter could have high-level accuracy, one can expect the transfer-learning dog breed classifier would be a better choice for tackling the problem. The details of these approaches, implementations and related experiments will be elaborated on in later sections.

You've done a great job restating the problem clearly!

Suggested:

- This is a good point to begin to justify why your solution is a good 'fit' for the problem. If you were submitting this to a journal for peer review, you'd want to keep the readers focused on what you want them to think about. If they get distracted, they can ask for random things in subsequent revisions (which can significantly drag out the process and lead to arguments).

Metrics used to measure the performance of a model or result are clearly defined. Metrics are justified based on the characteristics of the problem.

For example, explain why you want to use the accuracy score and/or F-score to measure your model performance in a classification problem,

> Such accuracy is calculated as the ratio that the number of correctly classified data to the total number of data. Here, we didn't take recall, precision, or F-score into consideration since our

> dataset is not significantly imbalanced (see next section) and we care more about the total accuracy that our model can perform rather than the performance on respective classes.

Great job explaining and justifying your choice of metric! I would note that you can definitely use metrics like precision, recall, or F-1 even if the dataset classes are balanced. However, accuracy will certainly work well

for this project too.

Analysis

Features and calculated statistics relevant to the problem have been reported and discussed related to the dataset, and a thorough description of the input space or input data has been made. Abnormalities or characteristics about the data or input that need to be addressed have been identified.

> The breed, Alaskan Malamute, has the most images (= 96) in our dataset, while the breed, Norwegian Buhund, has the least images (= 33) in our dataset. From the distribution of the counts of each breed, we can find the mean (sd) counts equals 62.78 (14.85) images and the range equals 63 images.

Great job noting how the dataset classes are balanced. I think that you've done a really good job explaining the scope and nature of the dataset.

Build data visualizations to further convey the information associated with your data exploration journey. Ensure that visualizations are appropriate for the data values you are plotting.

> It is worth noting that for the training set, validating set, and testing set, the distribution of counts of dog breed classes are similar (which is quite important and conducive to inferencing).

Nice job visualizing the class frequencies in the dataset!

Suggested:

- It's a good idea to title or name your figures. This will make the report look more polished and it makes it easier to refer to your data in the text (e.g. "see Figure 1...").

Methodology

All preprocessing steps have been clearly documented. Abnormalities or characteristics about the data or input that needed to be addressed have been corrected. If no data preprocessing is necessary, it has been clearly justified.

> In this part, before implementing our classifiers, we should do some common image data preprocessing including resizing and normalization. Regarding resizing, since most of the neural network models assume a square shape input image, we need to scale dog images from various shapes to a uniform 244 by 244 pixels. Regarding normalization, we normalize pixel values from the range of 0–255 to the range 0–1 preferred for neural network models. This step is crucial to deep-learning-based image tasks since it not only ensures that each input parameter/pixel has a similar data distribution but also makes convergence faster while training the network.

You've done a great job explaining the steps in your preprocessing. I'd also suggest adding some data augmentation into this part of the project. Random horizontal flips and rotations are especially useful here.

The process for which metrics, algorithms, and techniques were implemented with the given datasets or input data has been thoroughly documented. Complications that occurred during the coding process are discussed.

One of the goals for this project is to fully document everything in enough detail so that someone could (more or less) reproduce your results using only the blog post description. I think that you've definitely achieved that here. One other thing that I'd recommend adding would be to specifically note if there were any complications or difficulties that you encountered during the coding process.

The process of improving upon the algorithms and techniques used is clearly documented. Both the initial and final solutions are reported, along with intermediate solutions, if necessary.

Great job improving your implementation with transfer learning!

Results

If a model is used, the following should hold: The final model's qualities — such as parameters — are evaluated in detail.

Some type of analysis is used to validate the robustness of the model's solution. For example, you can use cross-validation to find the best parameters.

Show and compare the results using different models, parameters, or techniques in tabular forms or charts.

Alternatively, a student may choose to answer questions with data visualizations or other means that don't involve machine learning if a different approach best helps them address their question(s) of interest.

> The findings shown below corroborate our expectations. Overall, taking ResNet-50 as pre-trained advance the test accuracy to 80% and above. Among four experiments conducted in RestNet-50, the combination of adam and 64 batch-size reach even 83.8% test accuracy, which meets our

> prediction.

Another approach that you could take would be to demonstrate that your optimized model is robust would be to perform a k-fold cross validation. In this case, you'd document how the model performs across each

individual validation fold. If the validation performance is stable and doesn't fluctuate much, then you can argue that the model is robust against small perturbations in the training data.

The final results are discussed in detail. Explain the exploration as to why some techniques worked better than others, or how improvements were made are documented.

> The findings shown below corroborate our expectations. Overall, taking ResNet-50 as pre-trained advance the test accuracy to 80% and above. Among four experiments conducted in RestNet-50, the combination of adam and 64 batch-size reach even 83.8% test accuracy, which meets our prediction.

I think that you've addressed what the project rubric is asking for here. I'd also commend you for adding a discussion about how you've managed to answer the big picture questions that you set out to address.

Conclusion

Student adequately summarizes the end-to-end problem solution and discusses one or two particular aspects of the project they found interesting or difficult.

You have clearly summarized the project , the question at the start and what you've accomplished. This is also a great opportunity to brag a bit about anything exciting or innovative in your implementation.

Discussion is made as to how at least one aspect of the implementation could be improved. Potential solutions resulting from these improvements are considered and compared/contrasted to the current solution.

> Data augmentation or more training data
> Fine-tuning more hyperparameters
> Altering and trying different CNN structures

I'd definitely recommend data augmentation as the next step to take. Trying the Xception and InceptionV3 models could also be highly useful pre-trained models to try with your transfer learning implementation.

Deliverables

If the student chooses to provide a blog post the following must hold: Project report follows a well-organized structure and would be readily understood by a technical audience. Each section is written in

a clear, concise and specific manner. Few grammatical and spelling mistakes are present. All resources used to complete the project are cited and referenced.

If the student chooses to submit a web-application, the following holds: There is a web application that utilizes data to inform how the web application works. The application does not need to be hosted, but directions for how to run the application on a local machine should be documented.

Looks great! The blog post is well written and mostly follows the outline of the project rubric (thanks...this makes the review process much faster).

Student must have a Github repository of their project. The repository must have a README.md file that communicates the libraries used, the motivation for the project, the files in the repository with a small description of each, a summary of the results of the analysis, and necessary acknowledgements. If the student submits a web app rather than a blog post, then the Project Definition, Analysis, and Conclusion should be included in the README file, or in their Jupyter Notebook. Students should not use another student's code to complete the project, but they may use other references on the web including StackOverflow and Kaggle to complete the project.

The repository have a README.md file that communicates the libraries used, the motivation for the project, the files in the repository with a small description of each, a summary of the results of the analysis, and necessary acknowledgements.

Code is formatted neatly with comments and uses DRY principles. A README file is provided that provides. PEP8 is used as a guideline for best coding practices.

Best practices from software engineering and communication lessons are used to create a phenomenal end product that students can be proud to showcase!

Congratulations...you've passed!

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