CS583A: Course Project

Name 1, Name 2, and Name 3

January 2, 2019

1 Summary

[Problem descriptions:] We pariticipe an active (or inactive with late submission) competition of classifying cats and dogs based on photos. [Methodology:] The final model we choose is ResNet50, a deep convolutional neural network architecture, which takes 256×256 images as input and outputs the class labels. [Implementation:] We implement the convolutional neural network using Keras (or we directly use the ResNet50 provided by Keras) and run the code on a MacBook Pro with one Intel i7 CPU and 32 GB memory (or a workstation with 4 NVIDIA GeForce XXX GPUs.) [Evaluation metric:] Performance is evaluated on the classification accuracy. [Score and ranking:] In the public leaderboard, our score is 0.95123; we rank 79 among the 215 teams. In the private leaderboard, our score is 0.95234; we rank 82 among the 217 teams. (Or, the result on the public leaderboard is not available until Month Day Year.)

(Note: In your report, remove the words in brackets.)

2 Problem Description

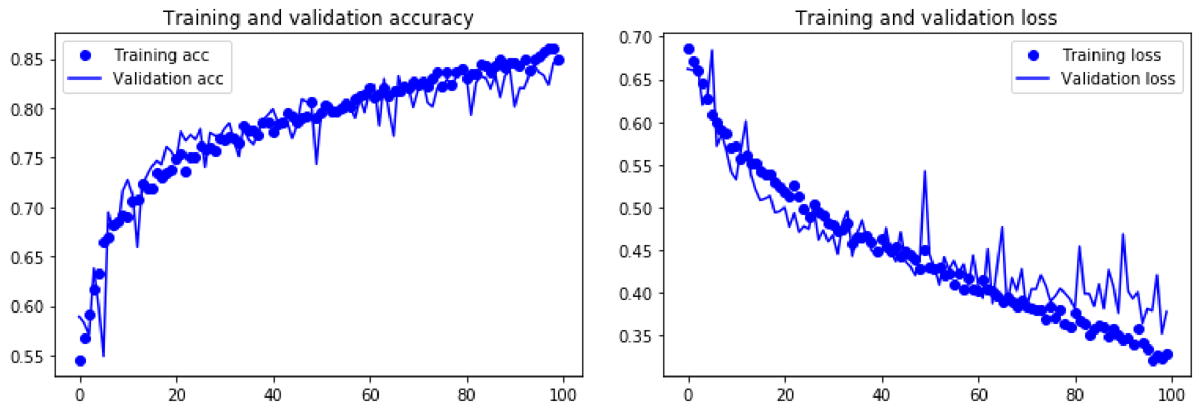
Problem. The problem is to classify cats and dogs based on photos. This is a binary classification and image recognition problem. The competition is at `https://www.kaggle.com/c/dogs-vs-cats`. [Use your own words to give a very short description. Do NOT copy the description on Kaggle.]

Data. The data are 256×256 JPEG images. The number of training samples is $n = 25,000$. The number of classes is 2. The training set is well-balanced: $n_{\text{dog}} = 12,500$ and $n_{\text{cat}} = 12,500$.

Challenges. [What makes the problem challenge? E.g., the training set is too small, the data is imbalanced, etc.]

3 Solution

Model. The model we finally choose is the ResNet50 [1], a standard deep convolutional neural network. A description of ResNet is online: `https://en.wikipedia.org/wiki/Residential_network`. [Describe your model only if it is non-standard.]



(a) The classification accuracy on the training set and validation set.

(b) The loss on the training set and validation set.

Figure 1: The convergence curves.

Implementation. We implement the ResNet50 model using Keras with TensorFlow as the backend. [Or, we directly use the ResNet model provided by Keras.] Our code is available at `https://github.com/wangshusen/CS583A-2019Spring/`. We run the code on a MacBook Pro with one Intel i7 CPU and 32 GB memory (or a workstation with 4 NVIDIA GeForce XXX GPUs.) It takes 2.2 hours to train the model.

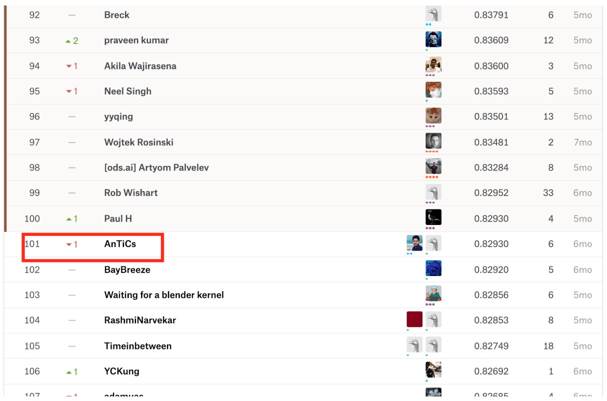
Settings. The loss function is categorical cross-entropy. The opitmizer is RMSprop. [Specify the other hyperparameters such as learning rate, regularization, epochs, batch size, etc.]

Advanced tricks. [If you used advanced tricks, e.g., pretrain the model on ImageNet and fine-tune it on the Dog-VS-Cat dataset, then write down your tricks and discuss their contribution to the performance, e.g., improve the validation error by 5.6%.]

Cross-validation. We tune the parameters using a 5-fold cross-validation. [If you do not have GPU, you can simply partition the training data to 80%-20% or 90%-10% for hyperparameter tuning.] [Just show the results of your final chosen model.] Figure 1 plots the the convergence curves on 80% training data and 20% validation data. [If you use 5-fold cross-validation, just plot one of the five folds.] [Analyze the convergence curves. E.g., if the training accuracy is much better than the validation accuracy, then the model is likely to overfit the data, and that is why you pretrain your model on ImageNet.]

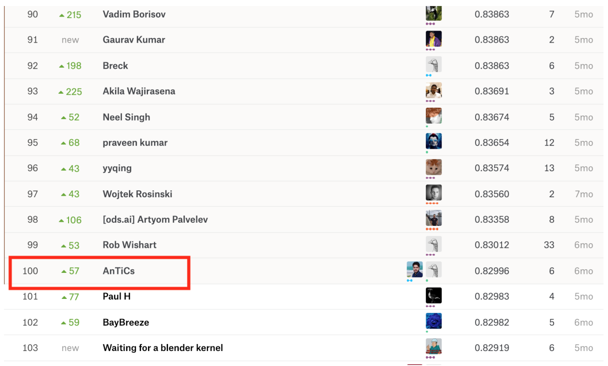
4 Compared Methods

[Try different methods (with brief descriptions) and report their performance.]



92	—	Breck	0.83791	6	5mo
93	▲ 2	praveen kumar	0.83609	12	5mo
94	▼ 1	Akila Wajirasena	0.83600	3	5mo
95	▼ 1	Neel Singh	0.83593	5	5mo
96	—	yyqing	0.83501	13	5mo
97	—	Wojtek Rosinski	0.83481	2	7mo
98	—	[ods.ai] Artyom Palvelev	0.83284	8	5mo
99	—	Rob Wishart	0.82952	33	6mo
100	▲ 1	Paul H	0.82930	4	5mo
101	▼ 1	AnTiCs	0.82930	6	6mo
102	—	BayBreeze	0.82920	5	6mo
103	—	Waiting for a blender kernel	0.82856	6	5mo
104	—	RashmiNarvekar	0.82853	8	5mo
105	—	Timeinbetween	0.82749	18	5mo
106	▲ 1	YCKung	0.82692	1	6mo

(a) Private leaderboard.



90	▲ 215	Vadim Borisov	0.83863	7	5mo
91	new	Gaurav Kumar	0.83863	2	5mo
92	▲ 198	Breck	0.83863	6	5mo
93	▲ 225	Akila Wajirasena	0.83691	3	5mo
94	▲ 52	Neel Singh	0.83674	5	5mo
95	▲ 68	praveen kumar	0.83654	12	5mo
96	▲ 43	yyqing	0.83574	13	5mo
97	▲ 43	Wojtek Rosinski	0.83560	2	7mo
98	▲ 106	[ods.ai] Artyom Palvelev	0.83358	8	5mo
99	▲ 53	Rob Wishart	0.83012	33	6mo
100	▲ 57	AnTiCs	0.82996	6	6mo
101	▲ 77	Paul H	0.82983	4	5mo
102	▲ 59	BayBreeze	0.82982	5	6mo
103	new	Waiting for a blender kernel	0.82919	6	5mo

(b) Public leaderboard.

Figure 2: Our rankings in the leaderboard.

5 Outcome

We participated in an active competition. Our score is 0.89311 in the public leaderboard and 0.90112 in the private leaderboard. We rank 100/312 in the public leaderboard and 101/312 in the private leaderboard. The screenshots are in Figure 2.

References

[1] Kaiming He, Xiangyu Zhang, Shaoqing Ren, and Jian Sun. Deep residual learning for image recognition. In *IEEE conference on computer vision and pattern recognition*, pages 770–778, 2016.