Effects of Image quality on Deep Nueral Network

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Contrast Variation:

Contrast reduction is obtained by blending the input image with a gray image .

The blending factor indicates the level of contrast. We vary the blending factor from 0 to 1 in steps of 0.1.

Neural Network :VGG 16

VGG16 has been used for the following experiment .

It is used with pretrained weights of imagenet dataset.

DATASET:

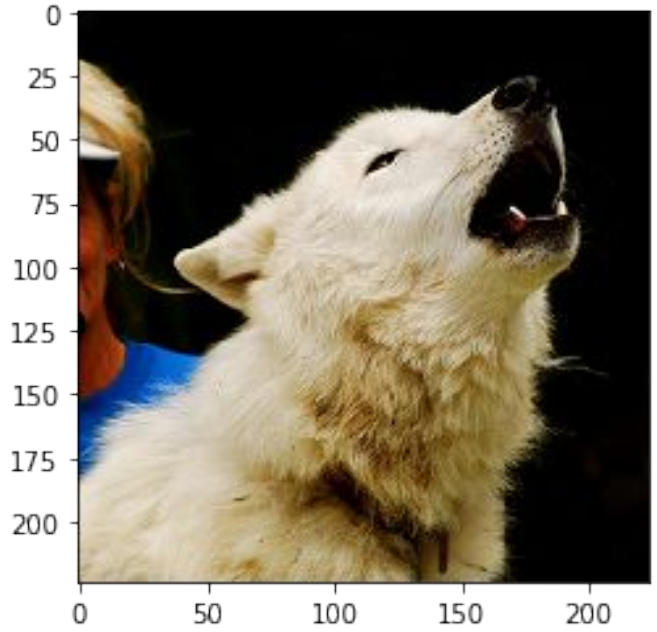
1% of Validation set of Imagenet Dataset has been used for the implementation.

Original Image

- The original image is first preprocessed and cropped to obtain(224,224,3) image.
- This needs to be done in order to obtain the image focussed on the dog only.

Preprocessed Image

white wolf, Arctic wolf, Canis lupus tundrarum



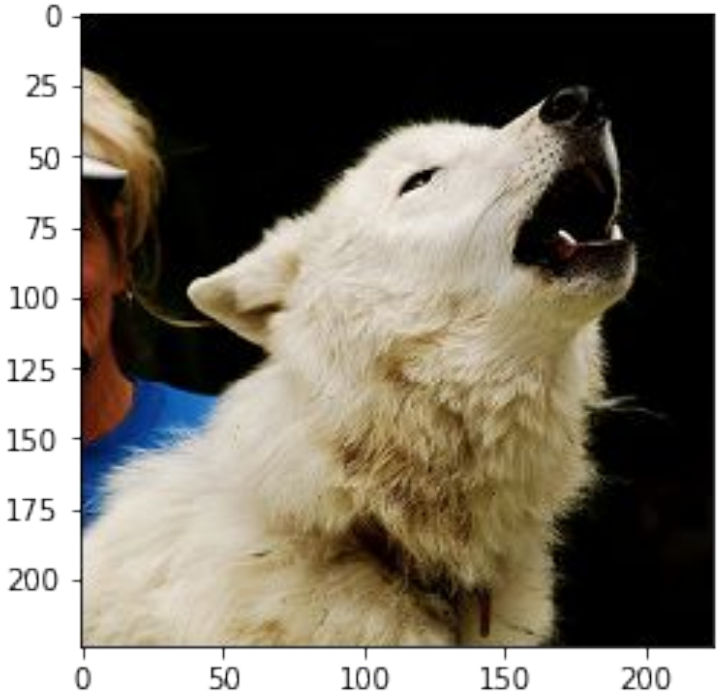
The preprocessed image is obtained along with its labels (mentioned on top of the image)

Predicted: [[('n02114548', 'white_wolf', 0.7407995), ('n02134084', 'ice_bear', 0.07656124), ('n02104029', 'kuvasz', 0.06675256), ('n02111500', 'Great_Pyrenees', 0.057337455), ('n02111889', 'Samoyed', 0.030293772)]]

top_one_percent_accuracy_blending_one: 35.199999999999996 %

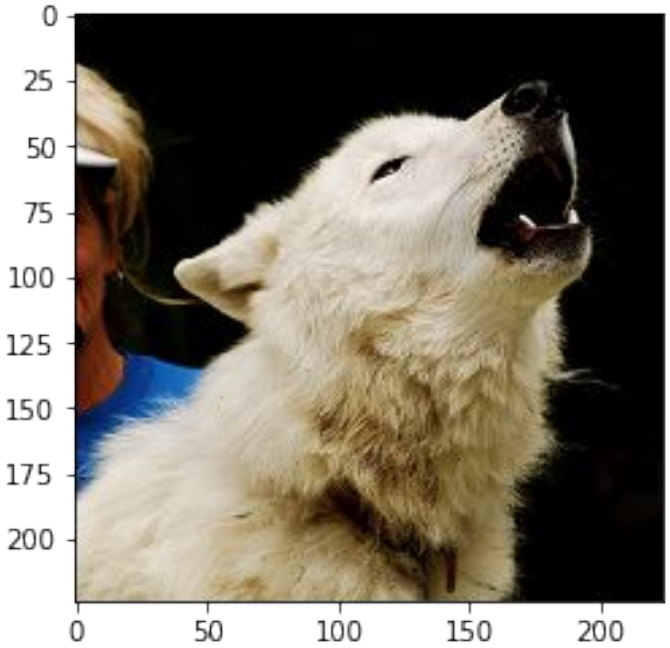
top five percent accuracy_blending_one: 45.4 %

Contrast: blending ratio=0.9



- Predicted: [[('n02114548', 'white_wolf', 0.7486237), ('n02104029', 'kuvasz', 0.07087195), ('n02111500', 'Great_Pyrenees', 0.065018706), ('n02134084', 'ice_bear', 0.053765167), ('n02111889', 'Samoyed', 0.035152715)]]
- top_one_percent_accuracy_blending_point_nine: 34.8 %
- top five percent accuracy_blending_point_nine: 45.4 %

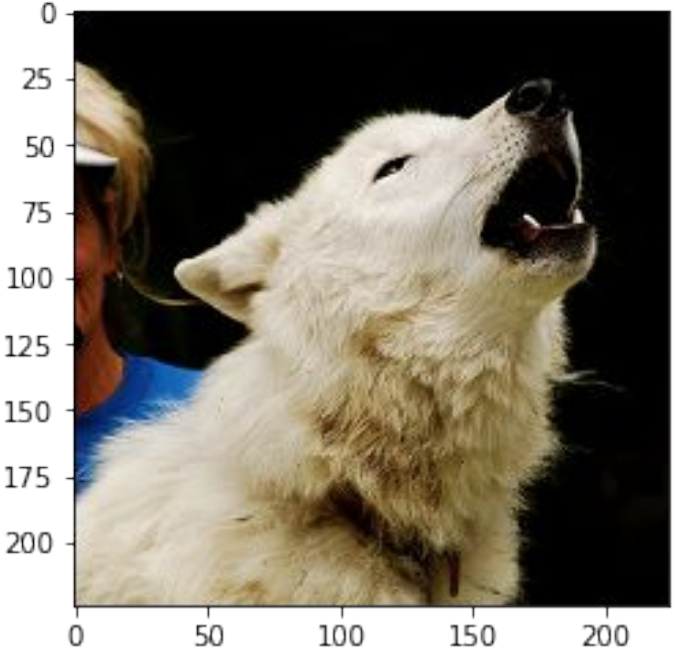
Blending ratio=0.8



- Predicted: [[('n02114548', 'white_wolf', 0.7536356), ('n02111500', 'Great_Pyrenees', 0.07059952), ('n02104029', 'kuvasz', 0.06919538), ('n02111889', 'Samoyed', 0.044795614), ('n02134084', 'ice_bear', 0.037871026)]]

- top_one_percent_accuracy_blending_point_eight: 34.599999999999994 %
- top five percent accuracy_blending_point_eight: 45.4 %

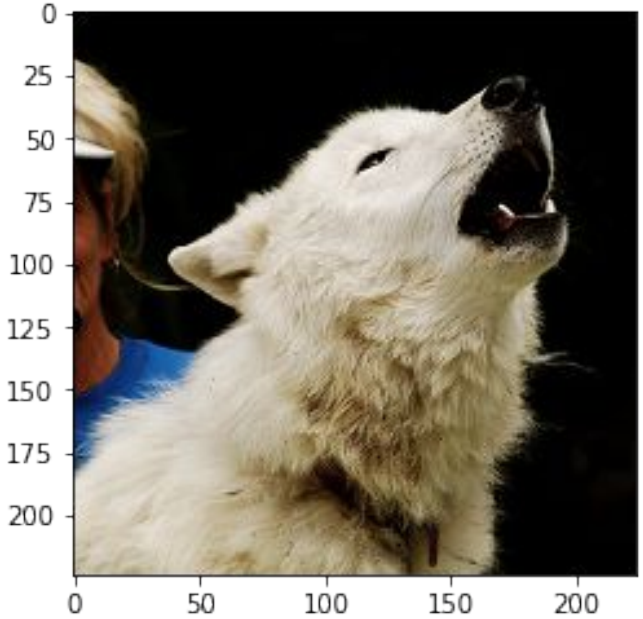
Blending ratio=0.7



- Predicted: [[('n02114548', 'white_wolf', 0.732475), ('n02111500', 'Great_Pyrenees', 0.08327505), ('n02104029', 'kuvasz', 0.07413209), ('n02111889', 'Samoyed', 0.059690546), ('n02134084', 'ice_bear', 0.027568493)]]

- top_one_percent_accuracy_blending_point_seven: 34.4 %
- top five percent accuracy_blending_point_seven: 45.4 %

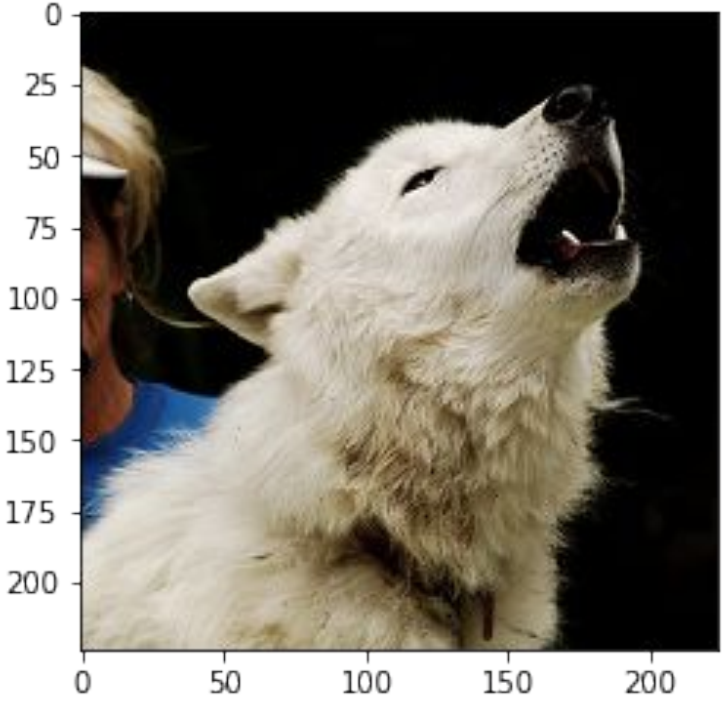
Blending ratio=0.6



- Predicted: [[('n02114548', 'white_wolf', 0.6818876), ('n02111500', 'Great_Pyrenees', 0.10656146), ('n02104029', 'kuvasz', 0.08621293), ('n02111889', 'Samoyed', 0.08118156), ('n02134084', 'ice_bear', 0.02077809)]]

- top_one_percent_accuracy_blending_point_six: 33.6 %
- top five percent accuracy_blending_point_six: 45.6 %

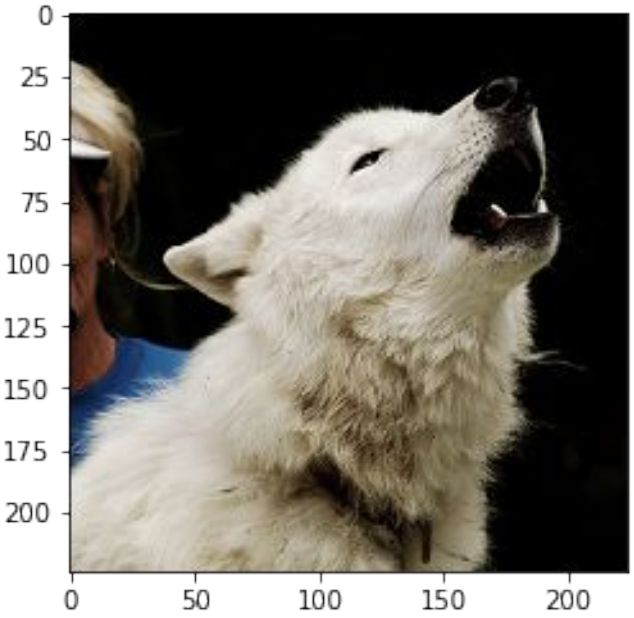
Blending ratio=0.5



- Predicted:
  [[('n02114548', 'white_wolf', 0.60956895),
  ('n02111500', 'Great_Pyrenees', 0.14285867),
  ('n02111889', 'Samoyed', 0.10912566),
  ('n02104029', 'kuvasz', 0.100760765),
  ('n02134084', 'ice_bear', 0.01442366)]]

- top_one_percent_accuracy_blending_point_five:
  33.800000000000004 %
- top five percent accuracy_blending_point_five:
  45.0 %

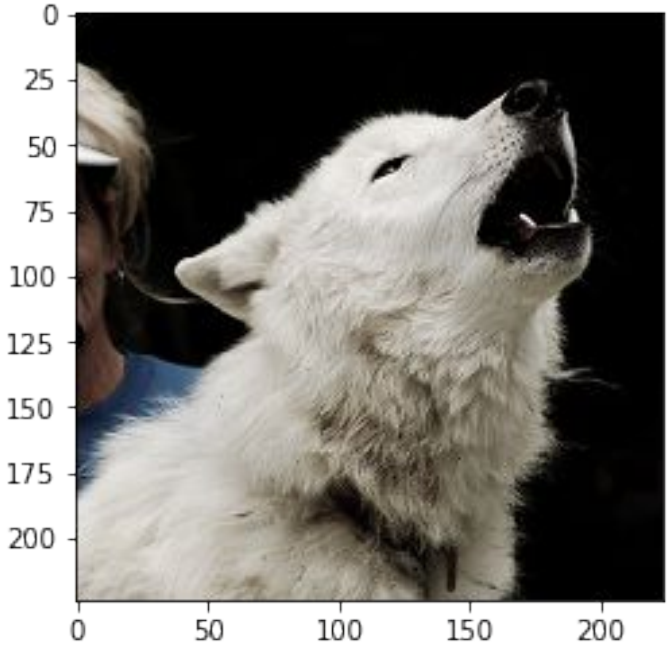
Blending ratio=0.4



- Predicted: [[('n02114548', 'white_wolf', 0.45930898), ('n02111500', 'Great_Pyrenees', 0.21356633), ('n02111889', 'Samoyed', 0.15883575), ('n02104029', 'kuvasz', 0.1359521), ('n02134084', 'ice_bear', 0.009599516)]

- top_one_percent_accuracy_blending_point_four: 32.800000000000004 %
- top five percent accuracy_blending_point_four: 44.0 %

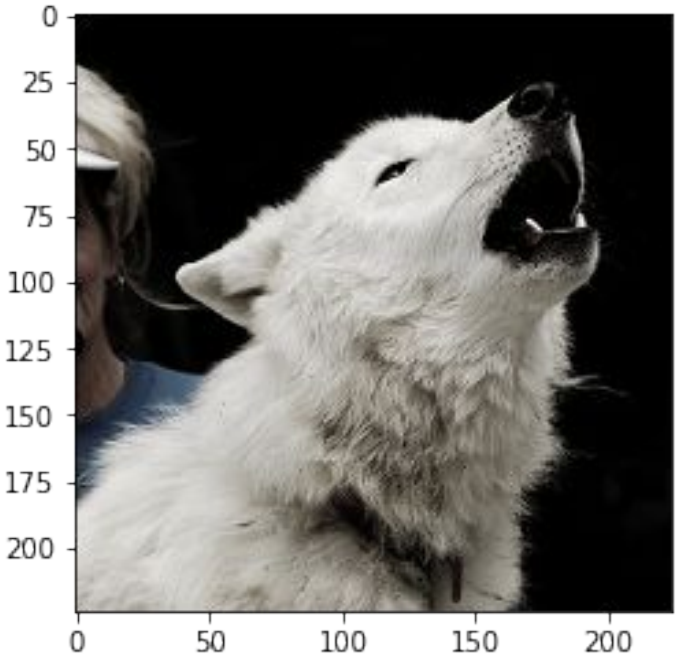
Blending ratio=0.3



- Predicted: [[('n02111500', 'Great_Pyrenees', 0.31735697), ('n02114548', 'white_wolf', 0.26060474), ('n02111889', 'Samoyed', 0.20197923), ('n02104029', 'kuvasz', 0.19497165), ('n02134084', 'ice_bear', 0.005765569)]]

- top_one_percent_accuracy_blending_point_three: 32.2 %
- top five percent accuracy_blending_point_three: 43.0 %

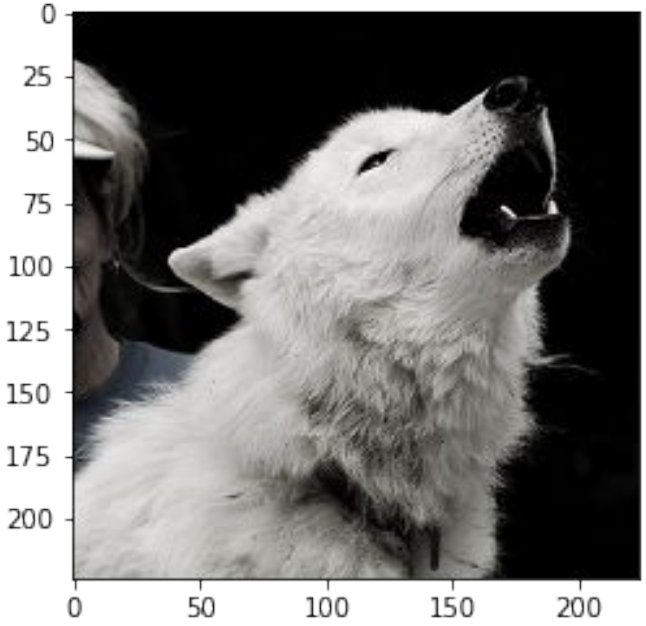
Blending ratio=0.2



- Predicted: [[('n02111500', 'Great_Pyrenees', 0.45772505), ('n02104029', 'kuvasz', 0.27181092), ('n02111889', 'Samoyed', 0.15675364), ('n02114548', 'white_wolf', 0.0982828), ('n02134084', 'ice_bear', 0.003193096)]]

- top_one_percent_accuracy_blending_point_two: 29.799999999999997 %
- top five percent accuracy_blending_point_two: 42.0 %

Blending ratio=0.1

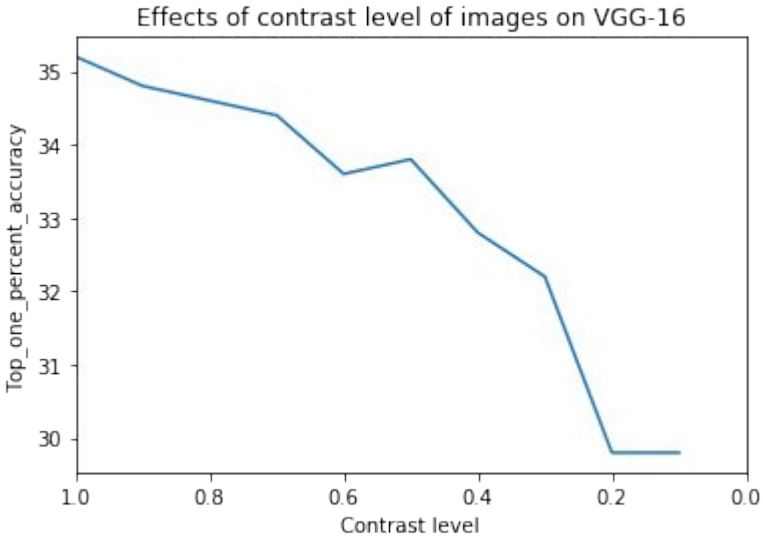


- Predicted: [[('n02111500', 'Great_Pyrenees', 0.5317887), ('n02104029', 'kuvasz', 0.3299628), ('n02111889', 'Samoyed', 0.086108536), ('n02114548', 'white_wolf', 0.04183313), ('n02134084', 'ice_bear', 0.0020256988)]]

- top_one_percent_accuracy_blending_point_one: 29.799999999999997 %
- top five percent accuracy_blending_point_one: 41.4 %

RESULTS

Top 1% accuracy metric plotted for different contrast levels



Results:

Top 5% accuracy metric plotted over different contrast levels