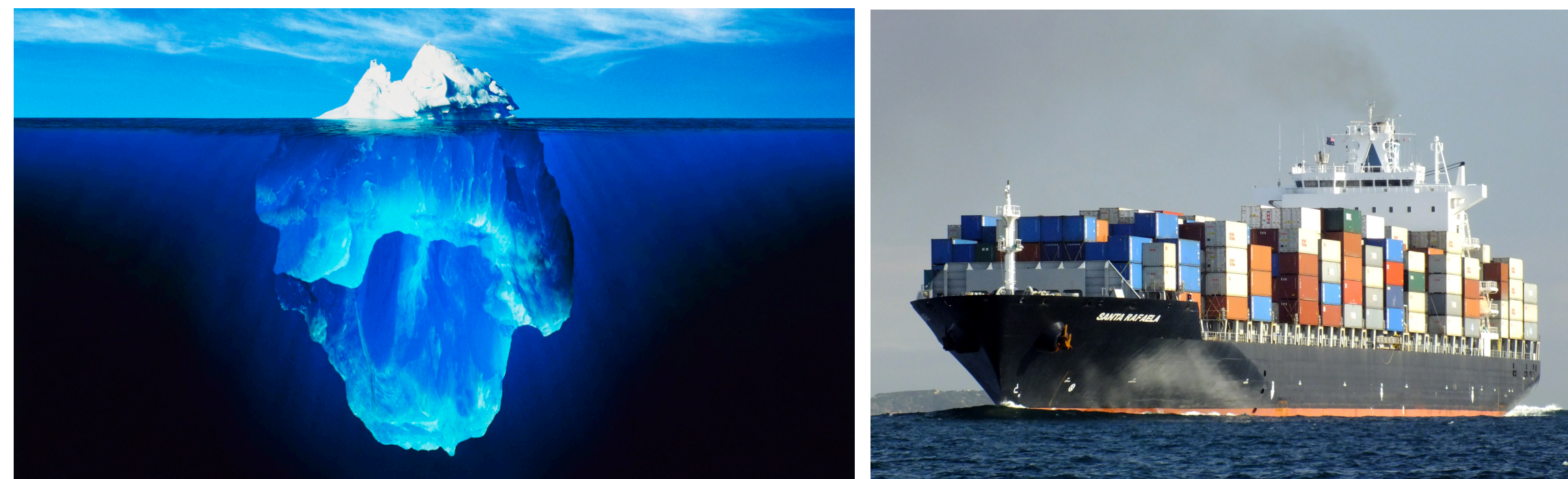# Kaggle Iceberg Classifier Challenge

[1]Technical University of Munich

Introduction

Drifting icebergs present a threat to navigation and activities in areas such as the offshore of the East Coast of Canada. Currently, many institutions and companies use aerial reconnaissance and shore-based support to monitor environmental conditions and assess risks from icebergs. However, in remote areas with particularly harsh weather, these methods are not feasible, and the only viable monitoring option is via satellite. Therefore an accurate method of classification of satelite images is of great need.

Evaluation Metric and Dataset

In this competition **log loss** is used as the evaluation metric.

The dataset is composed of 1604 training instances and around 8424 test instances. The inputs and output are the following:

- 75x75 pixel images with two bands. The pixel values are not integers, but float numbers with unit being dB. These are signals characterized by radar backscatter produced from different polarizations at a particular incidence angle. The polarizations correspond to HH (transmit/receive horizontally) and HV (transmit horizontally and receive vertically).
- Incidence angle from which the photo was taken. However, this input is somewhat challenging since it is composed of "NA" (Not Available) values. All of the "NA" values are in the training set.
- The output is a label that says if a given picture is an iceberg or a ship.

Models

- VGG 11-16-19 with Batch Normalization
- ResNet 18-34-50-101-152
- DenseNet 121

(Extra dropout layer before classification layer)

General Hyperparameter Tuning - 1

Preprocessing
- Normalization
  - Channelwise (✓)
  - Pixelwise (✗)
- Data Augmentation
  - Rotation 90° (✓)
  - Rotation 1°, 15°, 30°, 45°, 60° (✗)
  - Mirror (✓)
- Third Channel
  - Mean (✓)
  - Substract (✓)
  - Multiplication (✗)
  - None (✗)
- Gaussian smoothing (Kernel size: 5x5, σ: 0.7)
  - Only on 3rd channel (✓)
  - All channels (✗)

Model Hyperparameters
- Learning rate: 1e-1, 5e-2, 1e-2, 5e-3, 1e-3, 5e-4, 1e-4, 5e-5, 1e-5
- Weight decay: 0, 5e-4, 1e-4, 5e-5, 1e-5, 5e-6, 1e-6
- Dropout: 0, 0.2, 0.35, 0.5
- Hidden unit (VGG): 12, 64, 128, 256, 512, 1024, 2048, 4096

General Hyperparameter Tuning - 2

Transfer Learning
- Full backpropagation with pretrained weights (ImageNet) (✓)
- Freezing all convolutional layers (✗)
- Freezing the first few convolutional layers (✗)
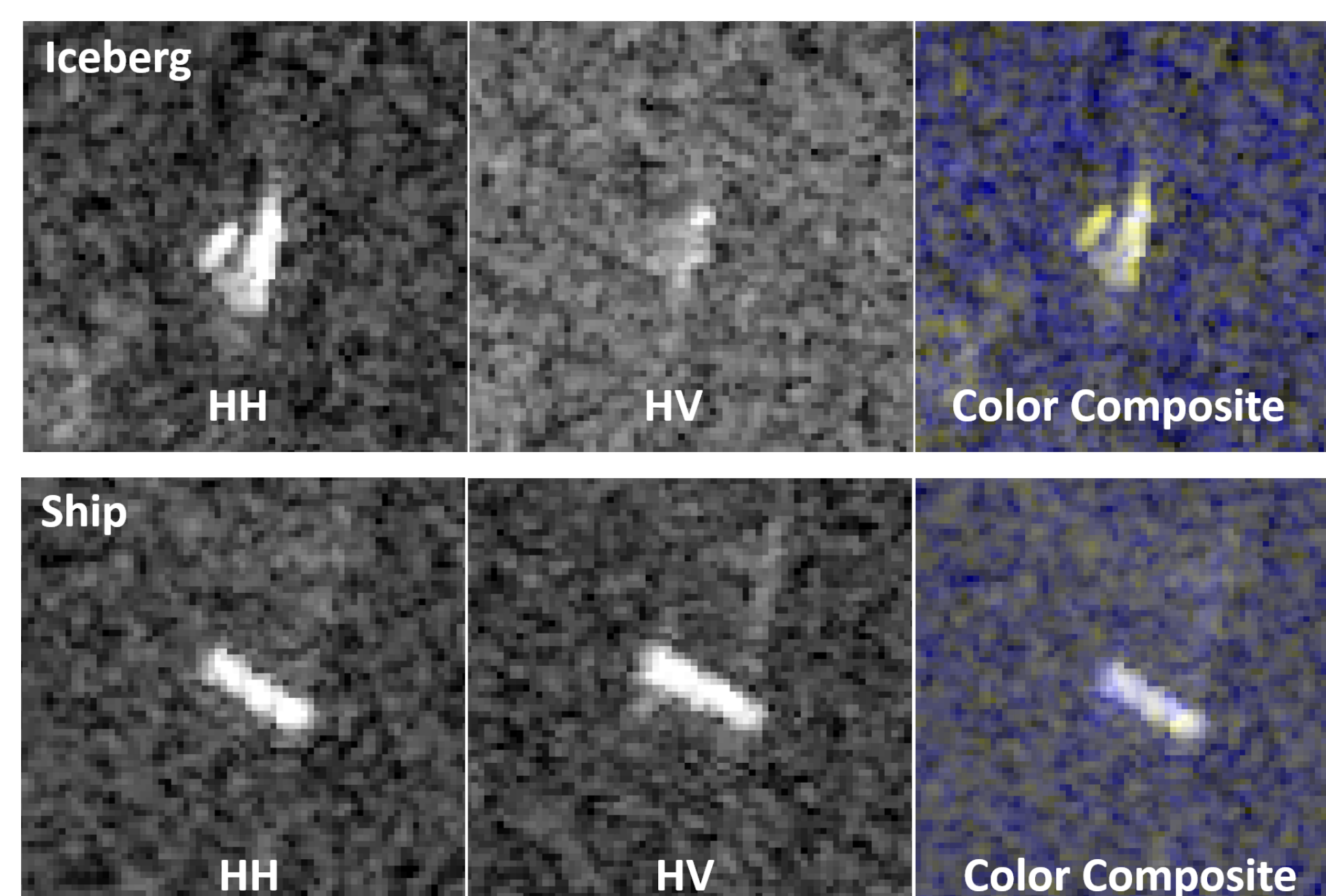- Full backpropagation with random weights (✗)

Ensembling (Stacking)
- Median (✓)
- Mean (✗)

Final Model and Result

Final Models
- 26 VGG-16 models
- 1 ResNet-34 model
- 1 VGG-19 model
- Models with validation score greater than 0.2 are discarded.
- No correlation between predictions of the models.
- Cutoff with the value of 0.9925

Submission and Description	Private Score	Public Score	Use for Final Score
Resnet34_Median.csv 10 days ago by BerkerKozan add submission details	0.1676	0.1673	☐
submissionMedianIncluding1st0.1650_0.9925_Cutoff.csv 11 days ago by BerkerKozan add submission details	0.1428	0.1490	☑
submissionMedianIncluding1st0.1650.csv 11 days ago by BerkerKozan add submission details	0.1402	0.1464	☑

Result (271st of 3343, Top 9%)

271	▲ 576	BerkerKozan		0.1402	12	10d

Further Work
- Incidence angle usage