텍스트이(가) 표시된 사진

자동 생성된 설명

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그림 목차 항목을 찾을 수 없습니다.

# Summary of task, goal, analysis of input data, and metrics

In order to collect marine debris, it is intended to conduct a design survey more quickly and efficiently. To this end, we intend to design an artificial intelligence model that can classify multi-labeled underwater photographed images.

Classifying models are going to be trained and validated by images taken underwatered. Trained models including VGGNet, ResNet, DenseNet, and DarkNet will be compared. The loss of each model is going to be analyzed by using LIME which is a kind of XAI(eXplainable Artificial Intelligence). By focusing on the result of LIME, the strengths of weaknesses of models can be compared. The analyzed result can be used for further research for constructing proper model for marine debris classification.

We will use ‘해양 침적 쓰레기 이미지’ dataset from AIHub. The dataset provides training data and validation data, and we intend to train the model using training data and test the model using validation data. In particular, only underwater photographed images, excluding sonar image data, will be used. The reason is that in the case of sonar images, it is not easy to classify them into models we implement because they are images taken using special equipment related to sound waves and are different from general images. In addition, since the data provided by the dataset is image data of different sizes, preprocessing such as adjusting the size is required. Images in 'root/data' and 'root/test\_data' of the submitted task are the results of preprocessing. The code used for preprocessing can be found in 'root/src/utils/AI\_preprocessing.py'.

We will use the accuracy of the model as the metrics for evaluating the model

# Data Source

We are using “해양 침적 쓰레기 이미지” [1] data from <https://aihub.or.kr/>. The exact address of the data is <https://aihub.or.kr/aidata/30754>.

# Explanation for our model

1. ResNet

ResNet is the model presented in "Deep Residual Learning for Image Recognition" [2]. It is characterized in that the feature of the image is extracted using only the convolution layer of size 3x3. In addition, the paper introduced the concept of residual block and designed short cuts of input values. However, in our project, the form of ResNet-18 was used among several forms introduced in the paper to use the most basic form of ResNet.

# Explanation of experiments

1. Training process

BCEWithLogits was used as a criterion in the process of training the model. It was judged to be the most suitable criterion for implementing the multi-label classification model. In addition, SGD was used as an optimizer and CosineAnnealingLR was used as a scheduler. The model is basically supposed to learn a total of 100 epochs, but early stopping is applied to terminate the learning if there is no improvement in the valuation loss during 10 epochs. In this case, the model recording the lowest validation loss is stored in the 'root/model' path.

1. Hyperparameters

ResNet: ResNet uses three hyperparameters (block, layers, num\_classes). Block determines which block ResNet will use, BasicBlock or Bottleneck. The layers determine how the layers of ResNet will be configured. In our project, we used [2, 2, 2, 2] to use the most basic form of ResNet. num\_classes must convey how many classes the dataset consists of.

VGGNet: VGGNet uses only one hyperparameter. You must deliver how many classes the dataset consists of through num\_classes.

DenseNet:

DarkNet:

1. Validation

We removed some of the train data and used it for validation. The important thing in the validation stage is that since it is multi-label classification, the method of simply selecting the largest value from the model output cannot be used to find the accuracy of the model. Instead, a method of selecting values greater than a certain threshold after taking sigmoid to the model output was used. The value of threshold seems to be the most appropriate at 0.4 for ResNet and 0.3 for the remaining models.

# Explanation for our test data

As mentioned above, the model will be tested using validation data provided by the "Marine Deposition Waste Image" dataset.

# Analysis of our outcome

The results of calculating the accuracy of our four models using the test data are as follows.

Table Test accuracies

|  |  |  |  |
| --- | --- | --- | --- |
| ResNet | DarkNet | VGGNet | DenseNet |
| 55% | 21% | 50% | 43% |

It can be seen that DenseNet, which has higher model complexity, is rather less accurate than VGGNet and ResNet. In particular, DarkNet, which has the highest model complexity, shows a sharp decline in accuracy to 21%. This is because our interpretation about the task was somewhat correct. We initially speculated that a high level of object detection model such as YOLO would not be required because this task is not so complex. Therefore, we approached this task as a multi-label classification problem using 4 models. We believe that the complexity of DenseNet and DarkNet are too high to perform this task, resulting in poor accuracy as overfitting occurs in training data.

However, it is regrettable that the highest accuracy among our models is 55%. I think the limitation of computing power in the development environment may have affected by a resize of 64\*64, and the fact that the size of the learning dataset is not so large.

# References

|  |  |
| --- | --- |
| [1] | 씨에스피아이, “해양 침적 쓰레기 이미지,” 씨에스피아이, 18 6 2021. [온라인]. Available: https://aihub.or.kr/aidata/30754. [액세스: 20 11 2021]. |
| [2] | X. Z. S. R. J. S. Kaiming He, “Deep Residual Learning for Image Recognition,” 10 Dec 2015. |