

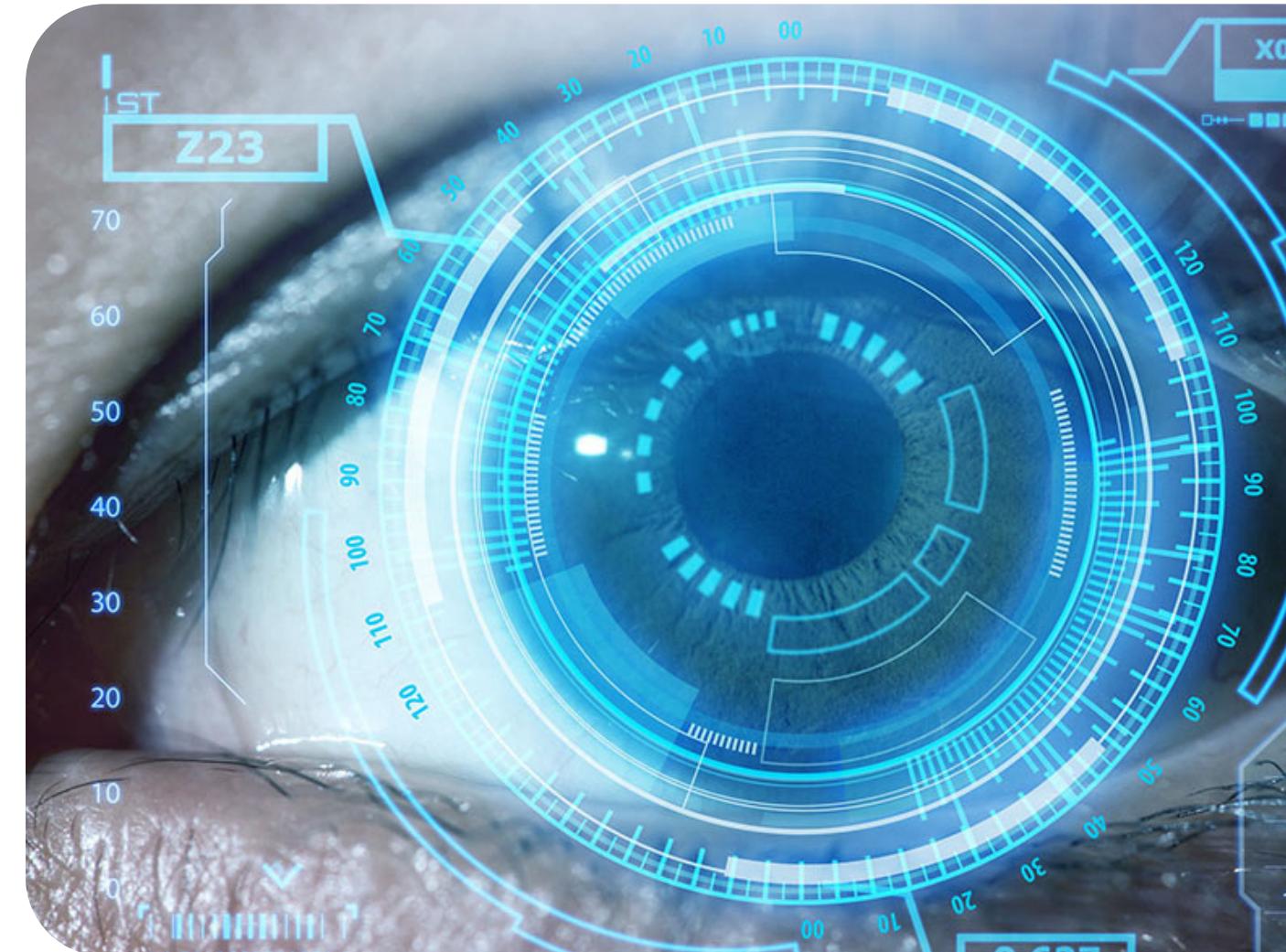


Class 6917:
Guided research
methodologies

Comparative Analysis of Image Classification Models for Efficient and Accurate Classification across Noisy Vegetable Images

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Project objective

01

Primary objective: Noisy image classification without denoising techniques

02

2.1 Direct classification of images takes less time and efficiency.

2.2 In real world scenarios some images cannot be perfectly denoised.

2.3 Preservation of information.

2.4 Transferability.

03

Finding out the best model for the noisy image classification

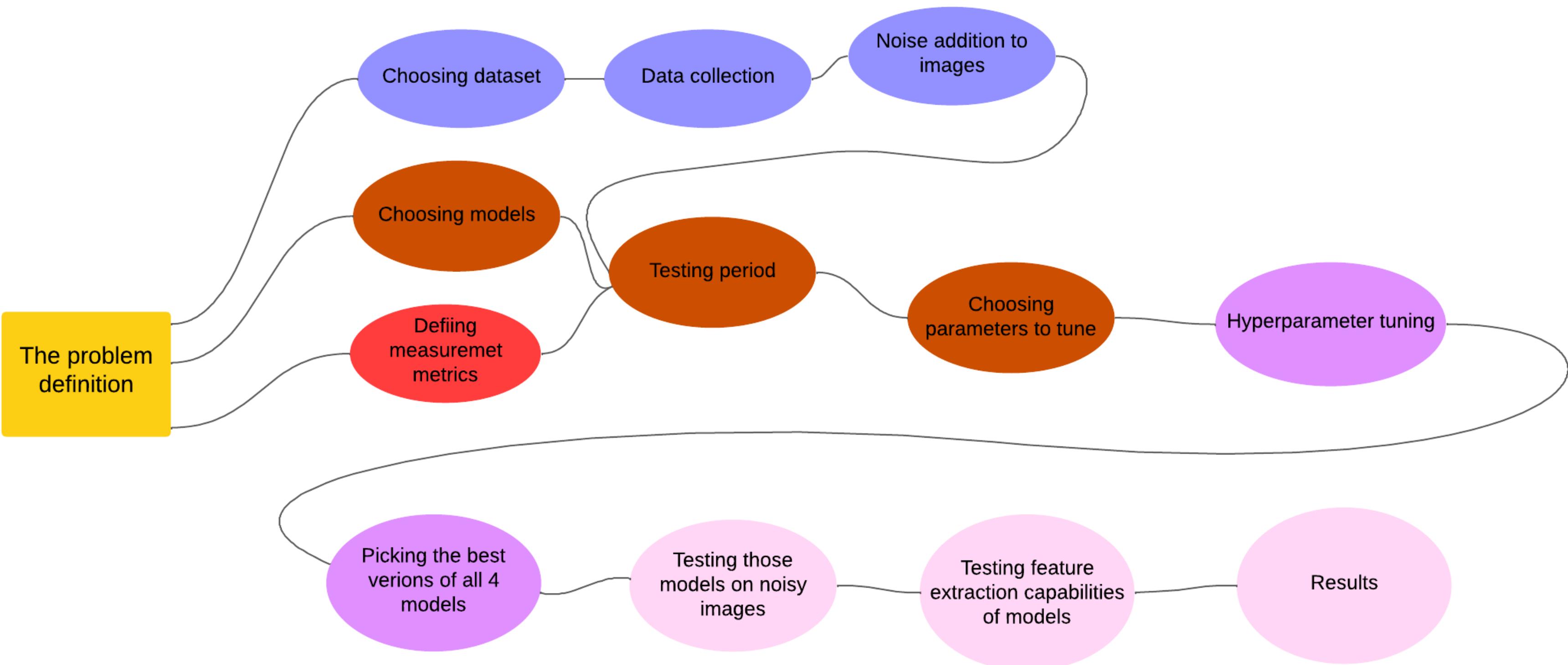
Problems

- Lack of Real-world Data
- Computational power
- Threshold

Solutions

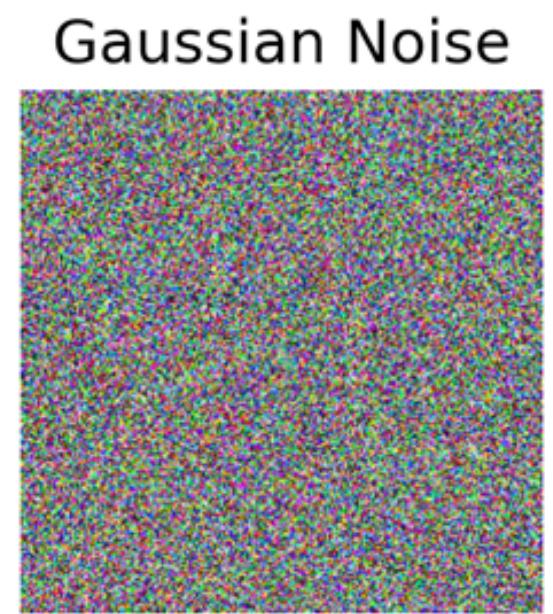
- Artificially generated noise
- Pretrained models
- Limited number of parameters

Architecture diagram

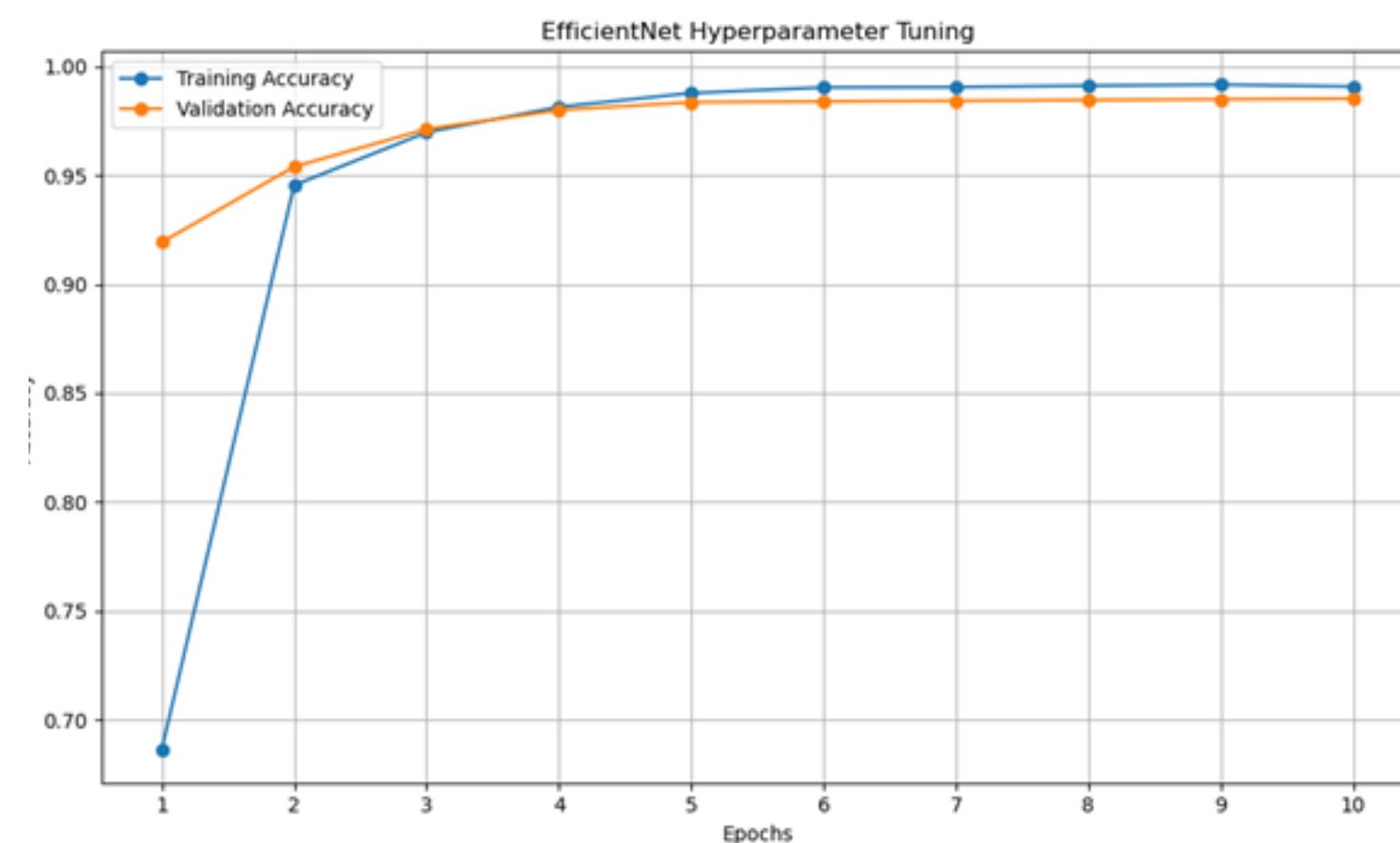
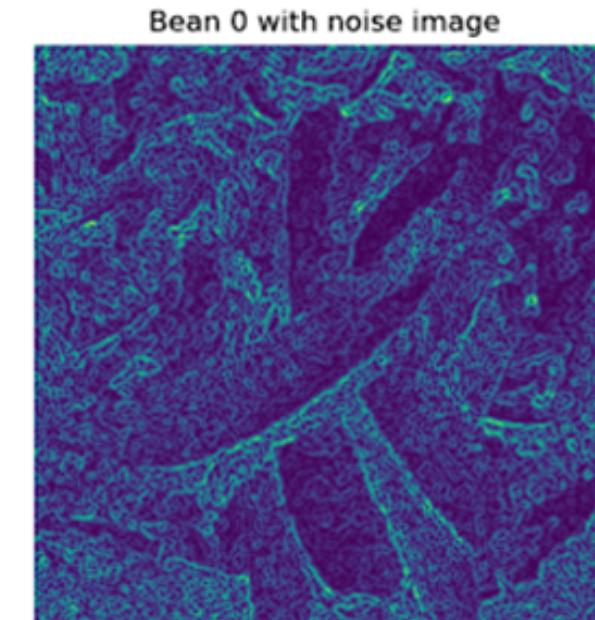
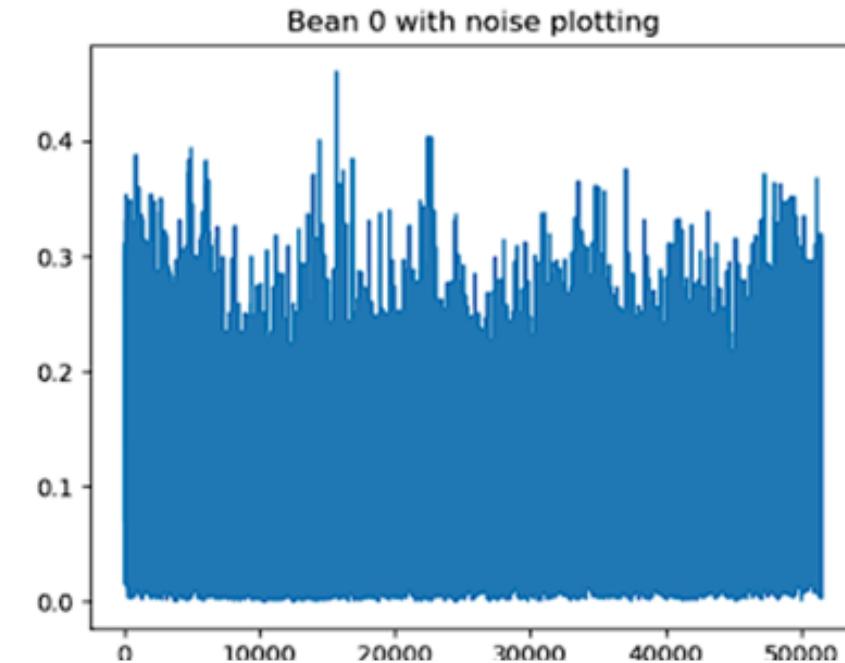
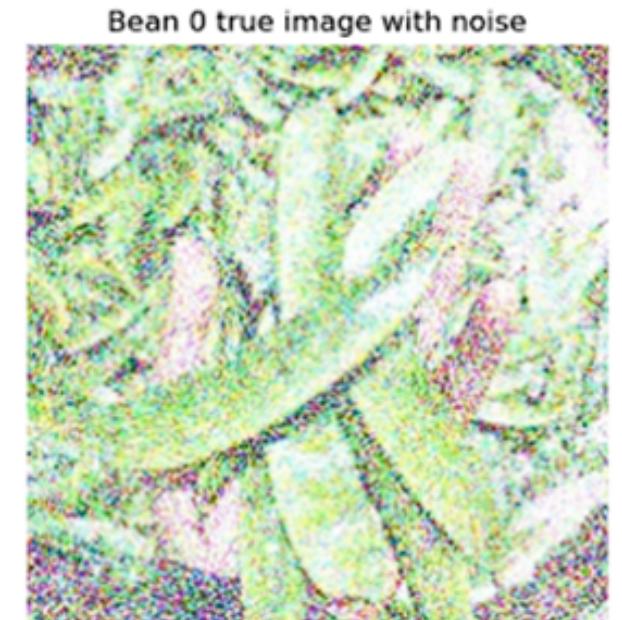


Steps

- 1 Models. AlexNet, VGG16, EfficientNet, and ResNet.
- 2 Dataset. Vegetable image dataset.
- 3 Noise. Gaussian Noise.
- 4 Hyperparameters tuning. Learning rate scheduler gamma and step size, momentum.
- 5 Testing on metrics. Accuracy, precision, recall and time.
- 6 Result and feature extraction analysis.



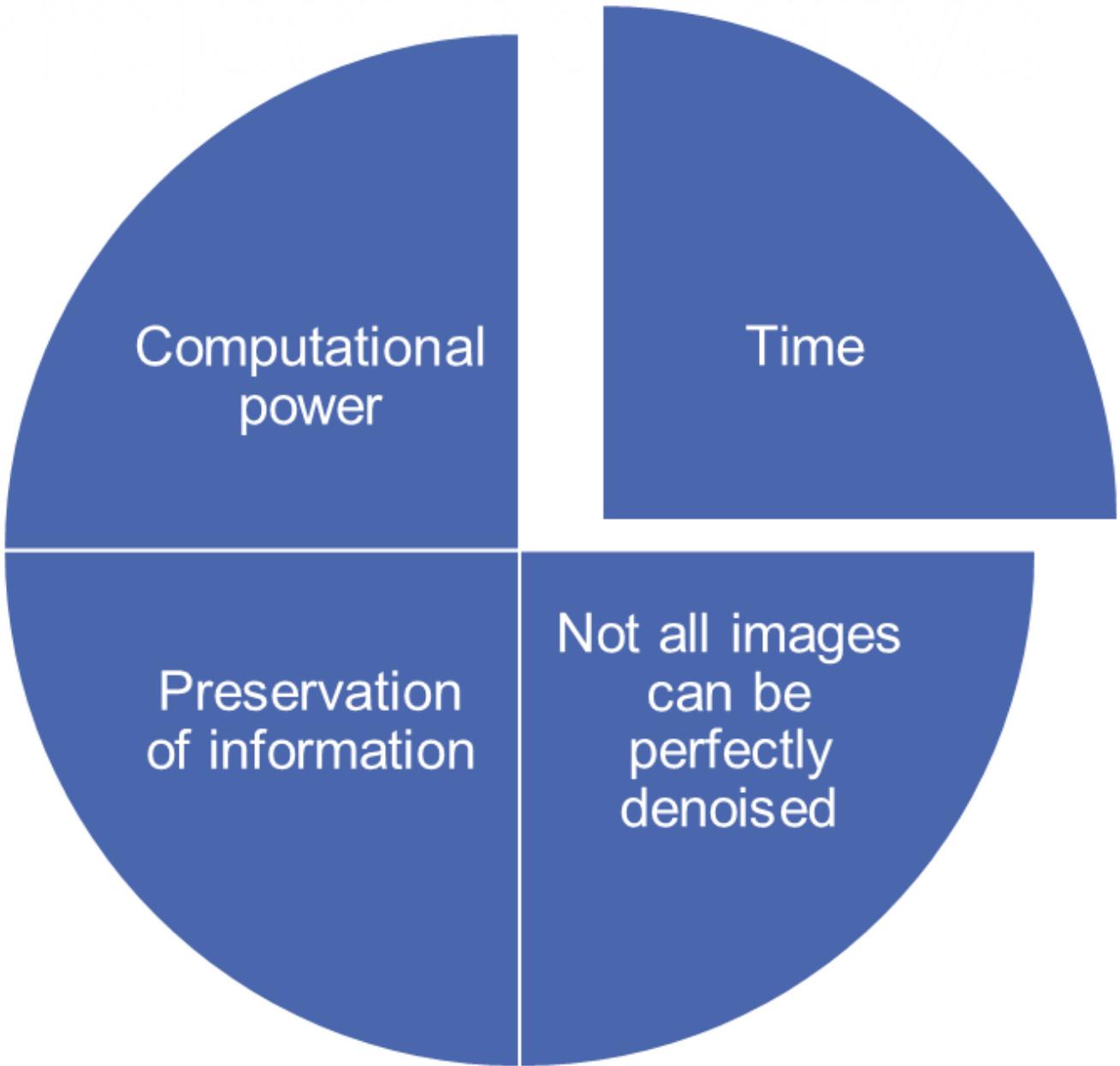
3. Adding noise



4. Training procedure

6. Feature extraction analyses

Why is it needed if there are denoising techniques? Uniqueness of the project



Hyperparameter tuning

model	n	lr	m	s	g	a
alexnet	10	0.005	0	3	0.5	0.990
alexnet	10	0.005	0.1	3	0.1	0.989
alexnet	10	0.005	0	3	0.1	0.988

model	n	lr	m	s	g	a
vgg16	10	0.005	0.1	3	0.1	0.986
vgg16	10	0.005	0	3	0.5	0.984
vgg16	10	0.005	0	3	0.1	0.982

model	n	lr	m	s	g	a
effNet	10	0.005	0.1	3	0.1	0.988
effNet	10	0.005	0	3	0.1	0.987
effNet	10	0.005	0.1	4	0.1	0.987

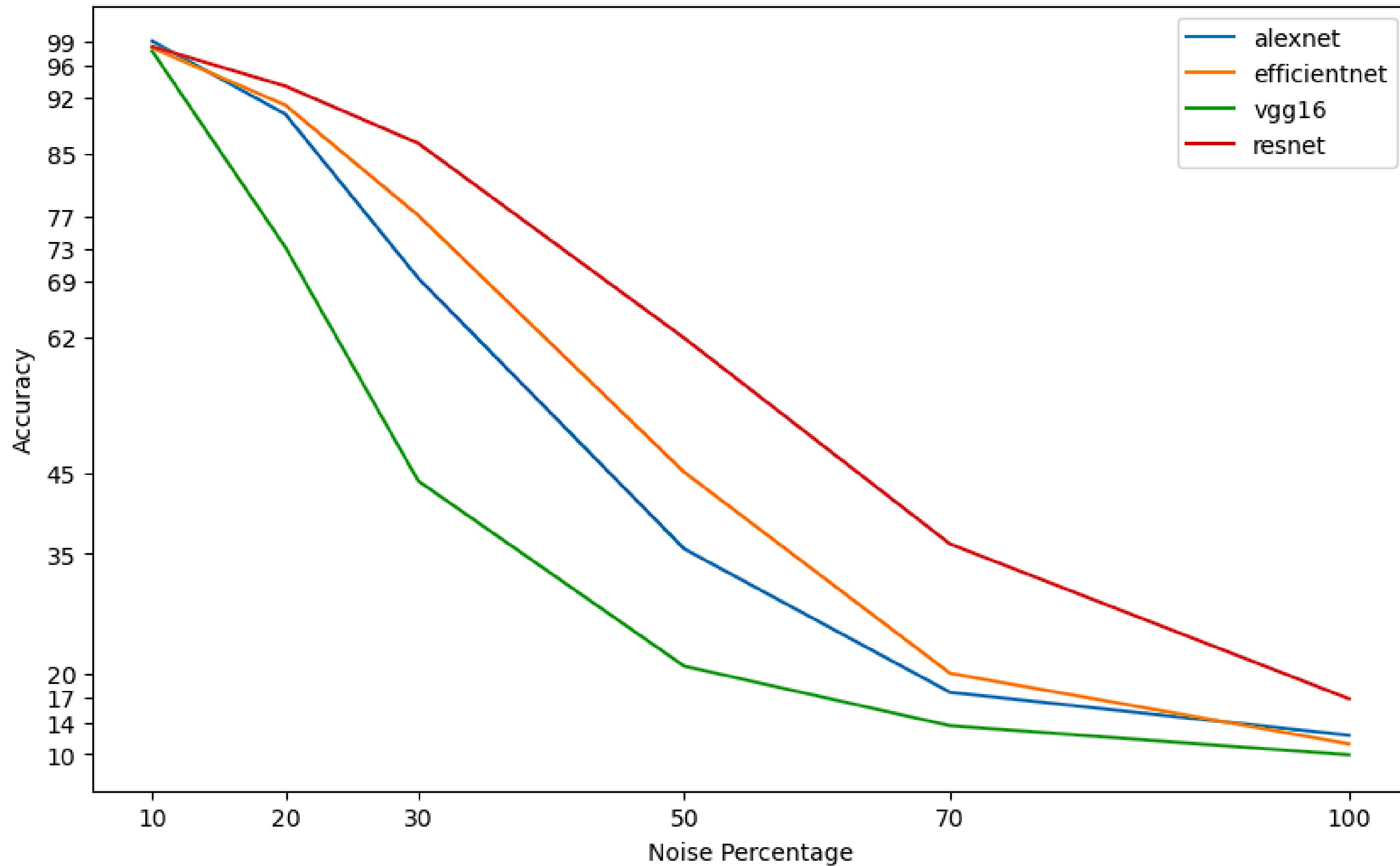
model	n	lr	m	s	g	a
resnet	10	0.005	0.1	4	0.1	0.995
resnet	10	0.005	0.1	3	0.1	0.994
resnet	10	0.005	0.1	4	0.5	0.994

Testing results

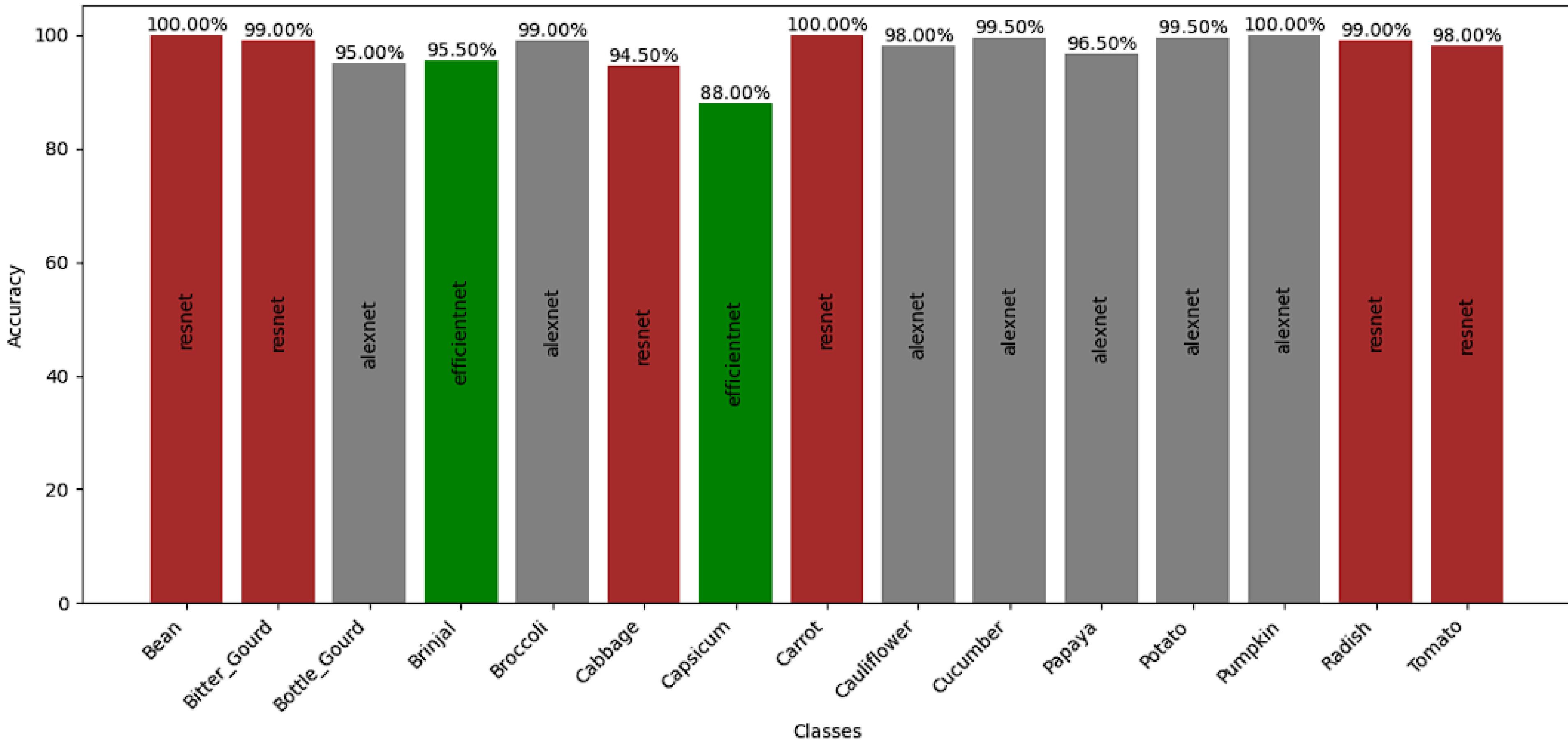
model	noise_percentage	accuracy	precision	f	time
alexnet	10	98.97	0.99	0.99	0.065
resnet	10	98.3	0.98	0.98	0.721
efficientnet	10	98.13	0.98	0.98	0.583
vgg16	10	97.7	0.98	0.97	12.194

model	noise_percentage	accuracy	precision	f	time
resnet	20	93.37	0.94	0.93	0.667
efficientnet	20	91	0.93	0.91	0.497
alexnet	20	89.87	0.92	0.89	0.067
vgg16	20	73.27	0.82	0.71	12.227

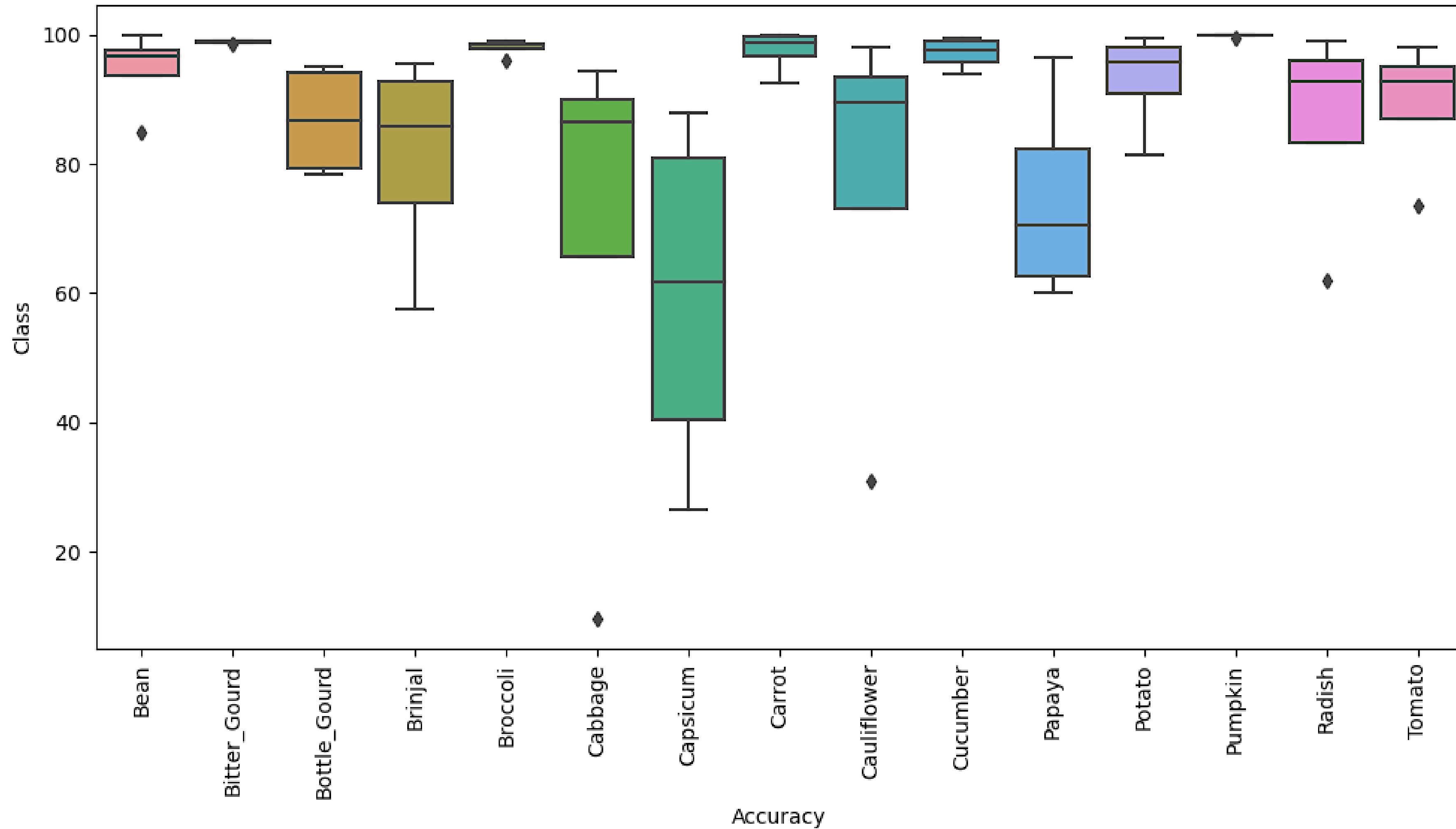
Model Accuracy vs. Noise Percentage



Accuracy for each Class



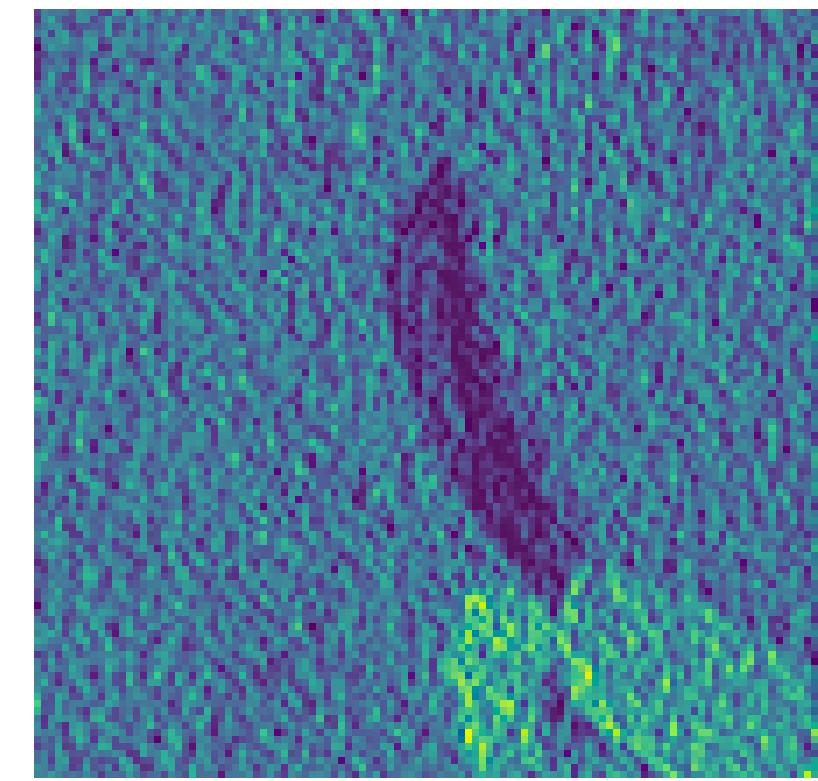
Class vs Accuracy



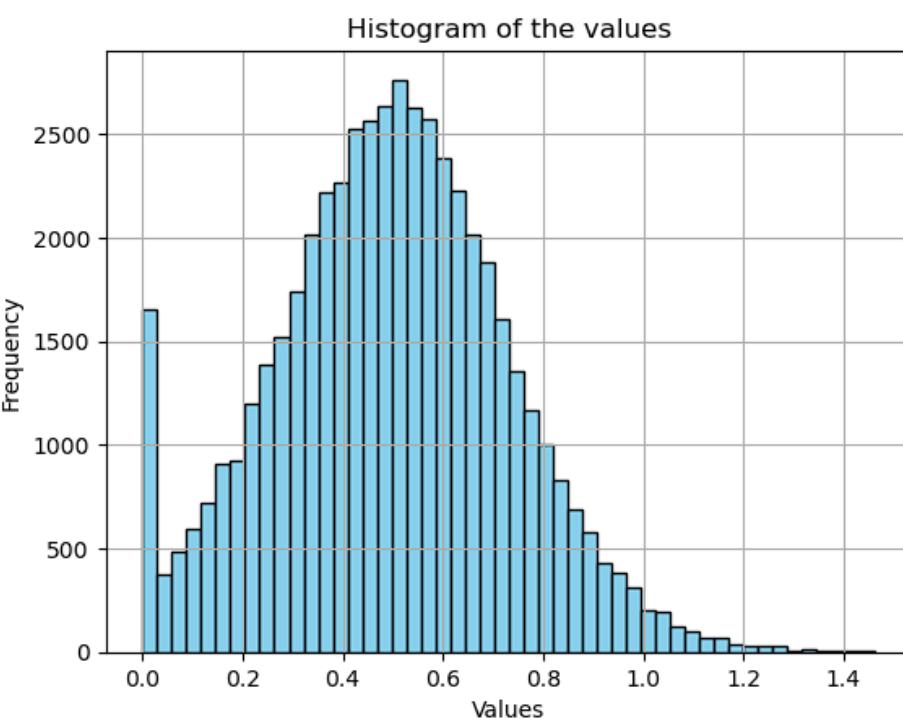
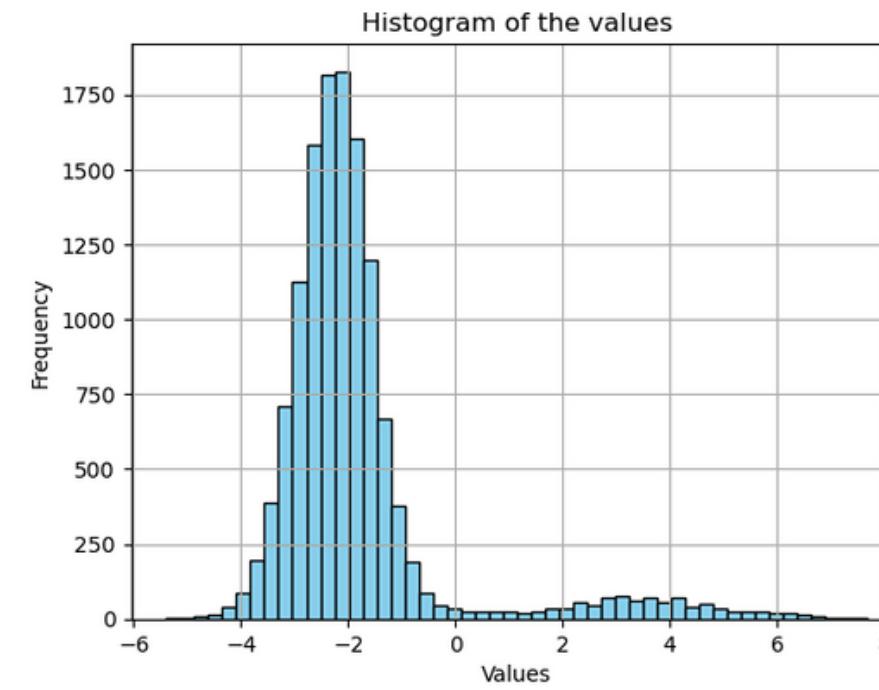
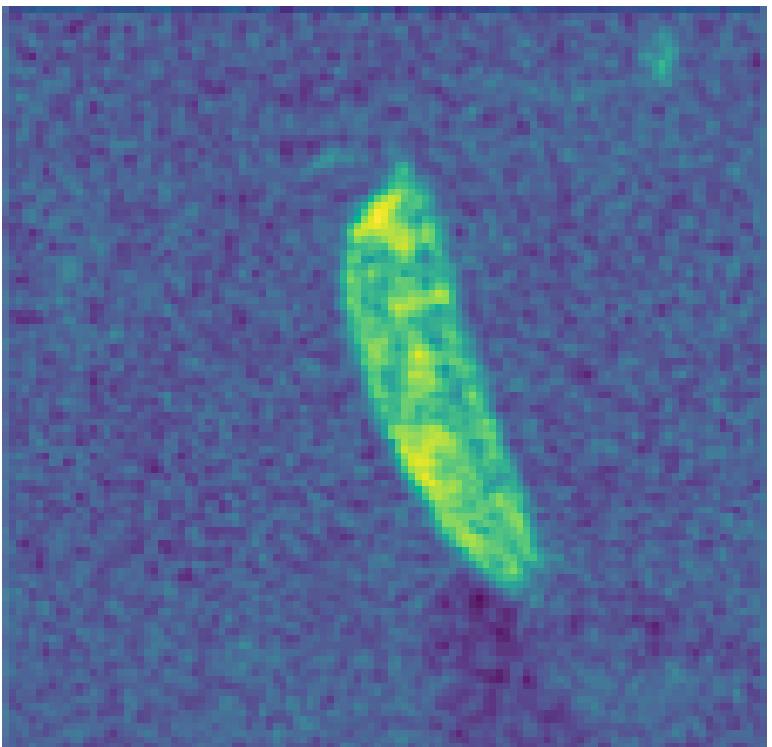
Original



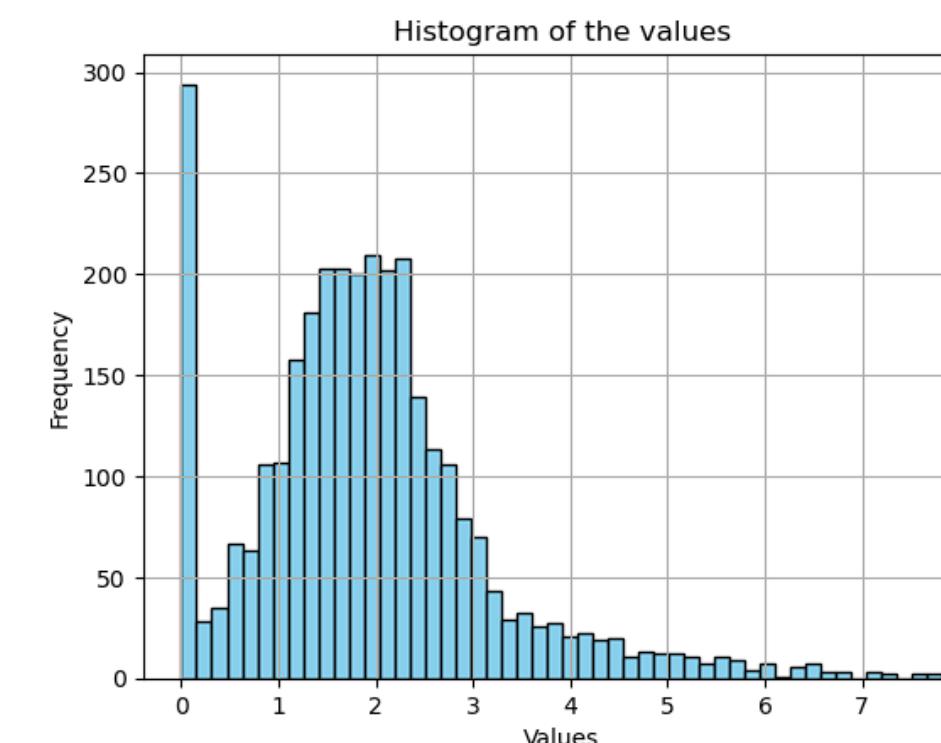
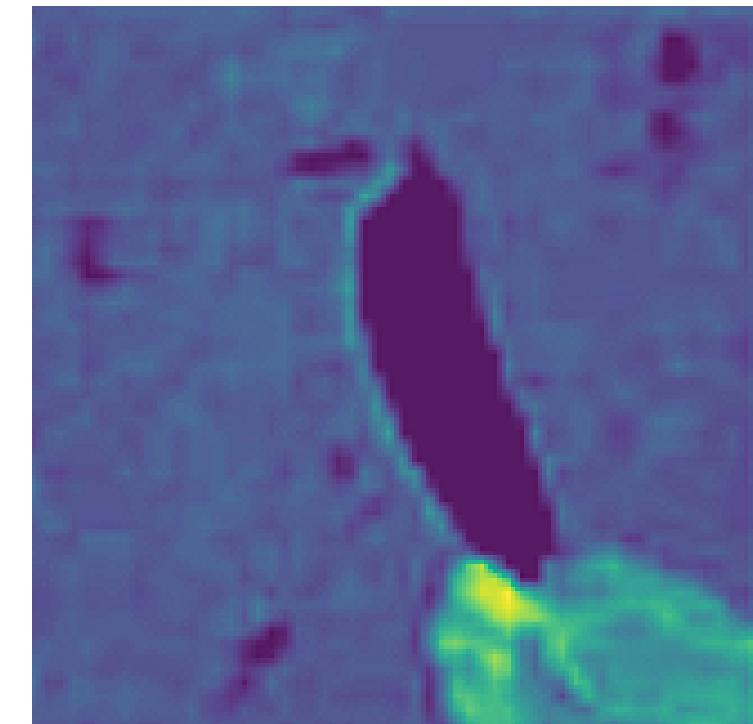
Vgg16



EfficientNet



AlexNet



Results

- Accuracies of 4 models for 15 classes on 7 datasets
- Hyperparameter tuning results for 4 models testing 8 parameters
- Feature extraction analyses of 4 models on 7 datasets

Future work

- Customized neural network
- Naturally produced noisy images
- Defining threshold
- Transferring to other domains