Machine Learning for

ANIMAL CONSERVATION

with Siamese Networks in PyTorch

by Enemy of Syntax, IM20

OUR TEAM: ENEMY OF SYNTAX!

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OUR TARGET HERE

ENDEMIC SPECIES PROTECTION

PROBLEM STATEMENT

- Preventing logging and oil companies from redeveloping vital areas like the Amazon rainforest
- Habitat loss could lead to the permanent loss of endemic species
- Difficulty in proving and cataloguing the existence of these species
- Central focus: Cataloging endemic species

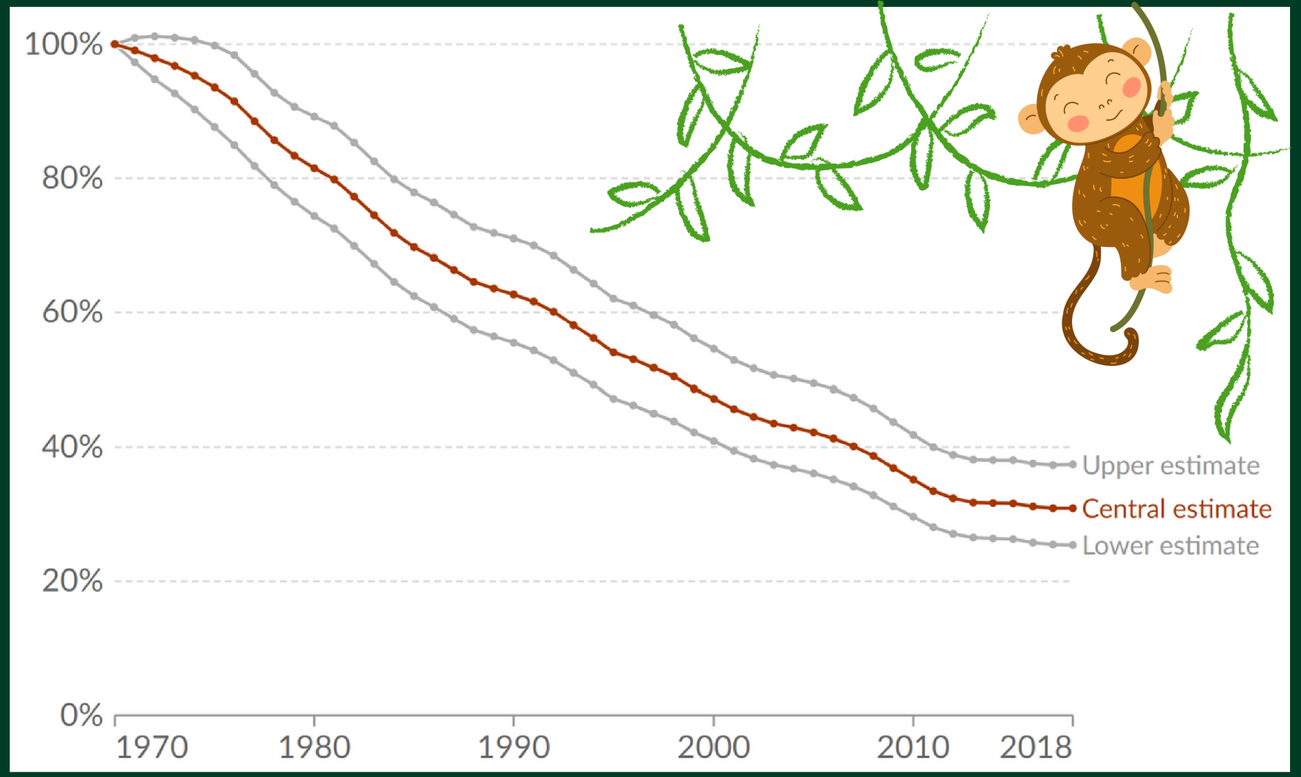


Fig.: Average decline in wildlife populations over the years

Wildlife Statistics: https://ourworldindata.org/biodiversity

SEE SHOCKING FACTS!

- Approximately 30,000 species per year (about three per hour) are being driven to extinction

– Harvard University

- Approximately 80% of the decline in global biological diversity is caused by habitat destruction.

– African Conservancy

- Global wildlife populations have plummeted by 69% on average since 1970.

- WWF

OUR VISION

Proposed Solution:

- Train an animal image recognition network to be able to quickly prove whether an animal only photographed a few times is in fact a new species or not.
- Fine-tune the network with a triplet loss function to act as a Siamese face recognition type network.
- Quickly add new species to the database as new species are discovered.
- Lead to cataloguing and differentiating between hundreds of species as they are being discovered.

TARGET **AUDIENCE**

- Governmental and nongovernmental organizations concerned about wildlife conservation.
- They can use the proposed solution to differentiate between different known and newly discovered species and take the right actions to protect them.

UNIQUENESS

Vision 1

Better at differentiating different classes than a classifier because it uses the triplet loss function

Vision 2

You can add new species to the database with a handful of photos and no extra training

Vision 3

The network can be run on a mobile phone without an internet connection

METHODOLOGY

01. Sample images from 25 animal classes in the CIFAR100 dataset

02. Convert classifier network pretrained on ImageNet1K to a recognition network using triplet loss

03. Fine-tune recognition network on CIFAR100 animal data

1. DATASET COLLECTION AND PREPROCESSING

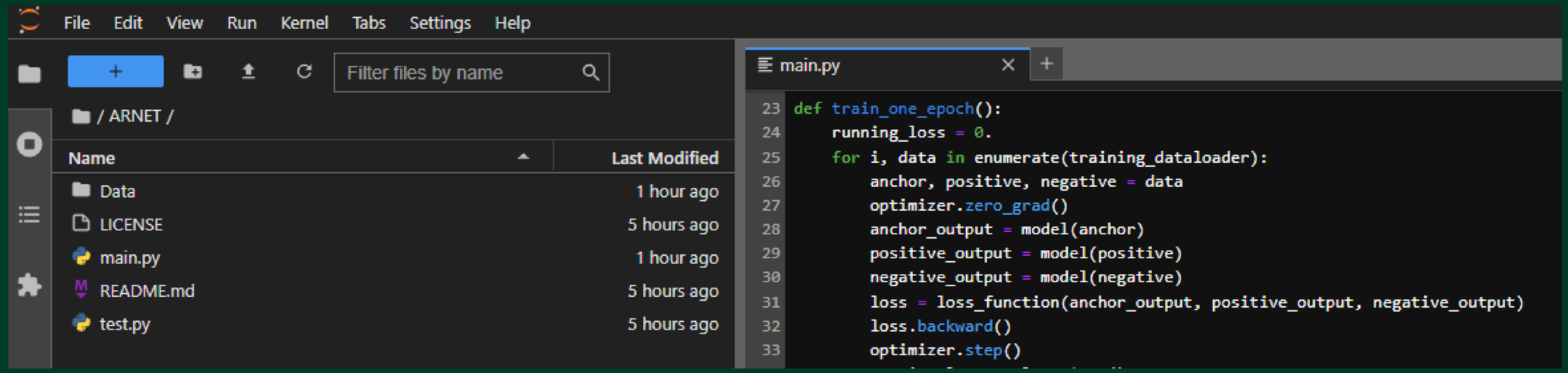
Custom Datasets and Data Loaders in PyTorch for training, validation, and testing.

- We created TrainingDataset for training data and a ValidationDataset for validation data
- The TestingDataset combines pre-trained data and new images for testing.
- The data loaders efficiently handle data batches for neural network training and evaluation.

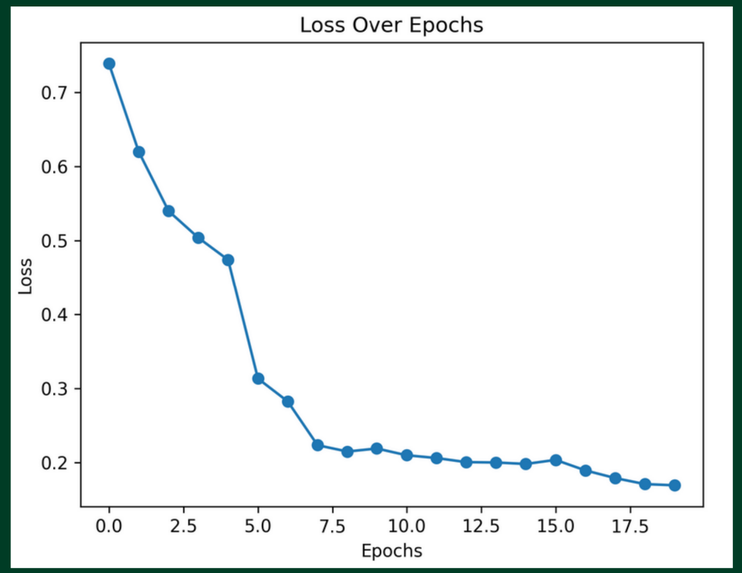
2. PRETRAINED IMAGENET1K CLASSIFIER TO TRIPLET LOSS

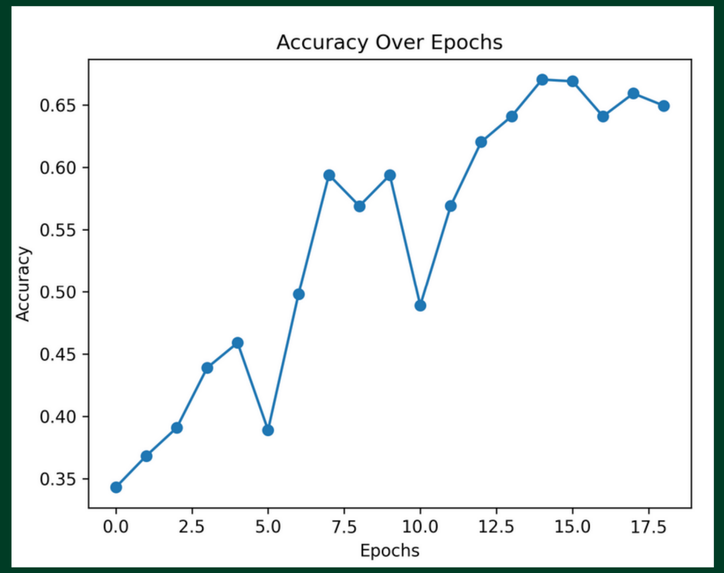
```
15 model = mobilenet_v3_small(weights='IMAGENET1K_V1')
16
17 for name, param in model.named_parameters():
18     if 'classifier' not in name:
19         param.requires_grad = False
20
21 model.classifier[-1].out_features = 128
22
23 loss_function = torch.nn.TripletMarginLoss()
```

3. FINE-TUNING RECOGNITION NETWORK ON CIFAR100 ANIMAL DATA

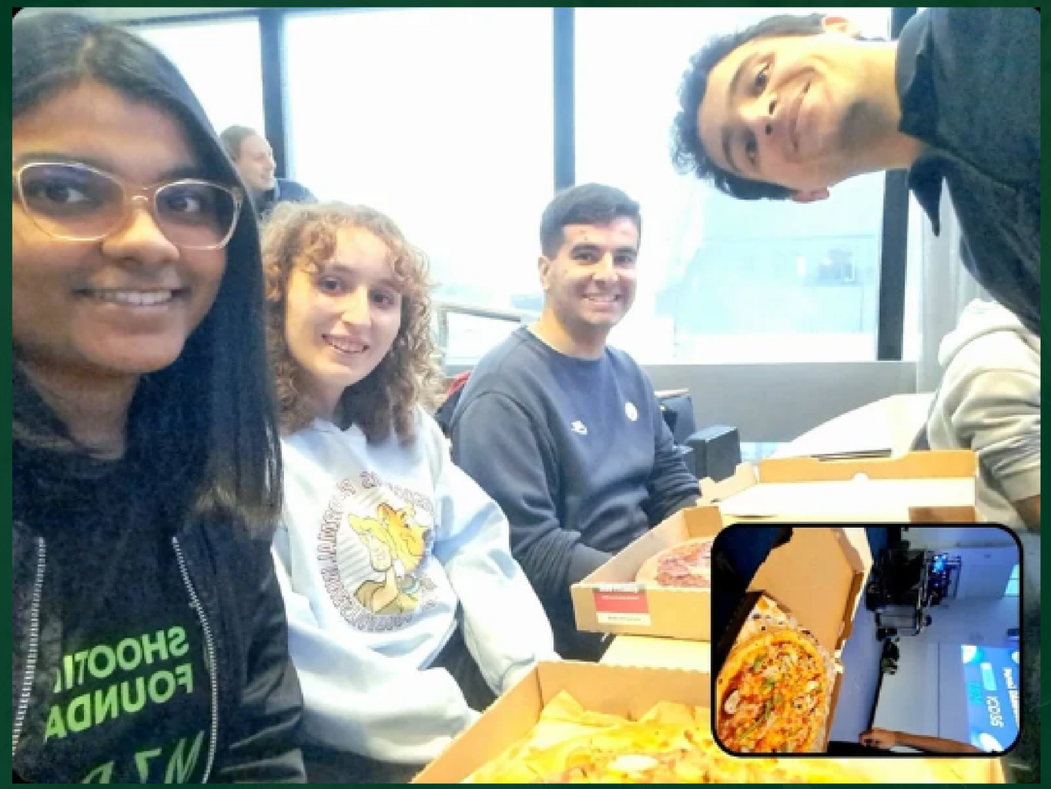


OUR RESULTS
AND INSIGHTS





Link To Repository: https://github.com/derinak21/ARNET.git



THANK YOU FOR WATCHING