

Animal Image Classification with PyTorch

Objective

Build a system that can identify the animal in a given image using deep learning. The project explores neural networks and transfer learning for improved performance.

Dataset

- **Source:** 15 folders, each representing a class (animal type)
- **Image Size:** 224 x 224 x 3
- **Classes:**
 - Bear
 - Bird
 - Cat
 - Cow
 - Deer
 - Dog
 - Dolphin
 - Elephant
 - Giraffe
 - Horse
 - Kangaroo
 - Lion
 - Panda
 - Tiger
 - Zebra

Approach

- **Model:** ResNet50 (Transfer Learning)
- **Training:**
 - Initial training with frozen backbone
 - Fine-tuning last layers
- **Data Split:** 70% train, 15% validation, 15% test
- **Transforms:** Data augmentation for training, normalization for all

Training & Validation Logs

Epoch	Phase	Loss	Accuracy
1	Train	1.3757	0.7140
1	Validation	0.5237	0.9210
2	Train	0.3980	0.9463
2	Validation	0.2762	0.9519

Epoch	Phase	Loss	Accuracy
3	Train	0.2564	0.9581
3	Validation	0.2091	0.9553
4	Train	0.1877	0.9750
4	Validation	0.2096	0.9553
5	Train	0.1405	0.9816
5	Validation	0.1882	0.9519
6	Train	0.1198	0.9794
6	Validation	0.1673	0.9622
7	Train	0.1053	0.9838
7	Validation	0.1326	0.9656
8	Train	0.0828	0.9912
8	Validation	0.1335	0.9588
9	Train	0.0845	0.9904
9	Validation	0.1399	0.9691
10	Train	0.0770	0.9868
10	Validation	0.1380	0.9588
11	Fine-tune	0.0572	0.9912
11	Validation	0.1113	0.9622
12	Fine-tune	0.0270	0.9993
12	Validation	0.0974	0.9691
13	Fine-tune	0.0199	0.9978
13	Validation	0.0906	0.9725
14	Fine-tune	0.0129	1.0000
14	Validation	0.1023	0.9656
15	Fine-tune	0.0077	1.0000
15	Validation	0.0933	0.9691

Test Results

Metric	Value
Test Loss	0.0878
Test Acc.	0.9761

Conclusion

- The model achieved high accuracy on both validation and test sets, demonstrating effective transfer learning.
- Further improvements could include experimenting with different architectures, hyperparameters, or data augmentation techniques.