

Graphical Interactive Systems
Technische Universität Darmstadt



Animal Biometrics

Visual Computing Praktikum – SS 2018

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1. Introduction and Motivation
2. Problem 1: Classification of Individuals
 - Data Set
 - Architecture
 - Results
 - Alternative Approach
3. Problem 2: Classification of Species
 - Data Set
4. Results



Outline



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Introduction and Motivation



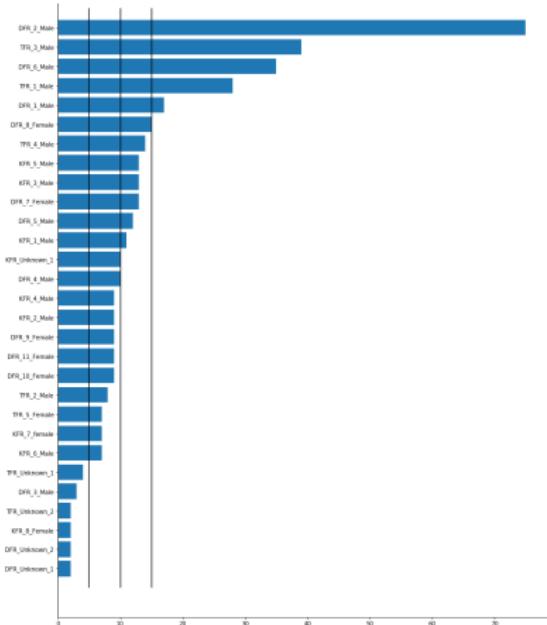
Figure 1: Animal Biometrics Example



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Data Set



- ▶ Unbalanced data distribution (3 to 99 images per class)
- ▶ 29 Classes/Individuals
- ▶ Low quality image from camera traps

Figure 2: ResNet Architecture



Good Example Images

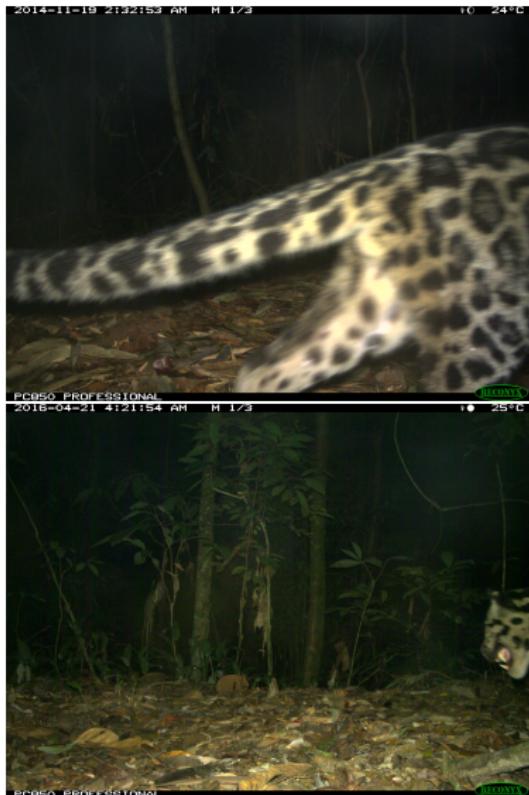


Figure 3: DFR 2 Male



Figure 4: DFR 5 male

Bad Example Images



Architecture

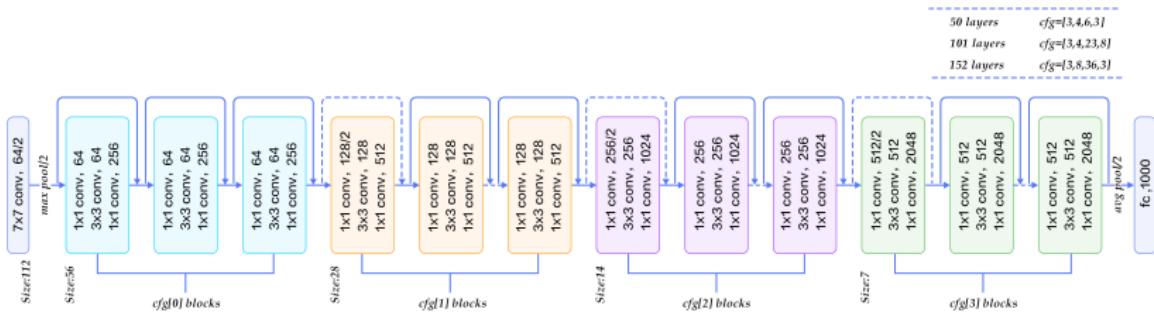


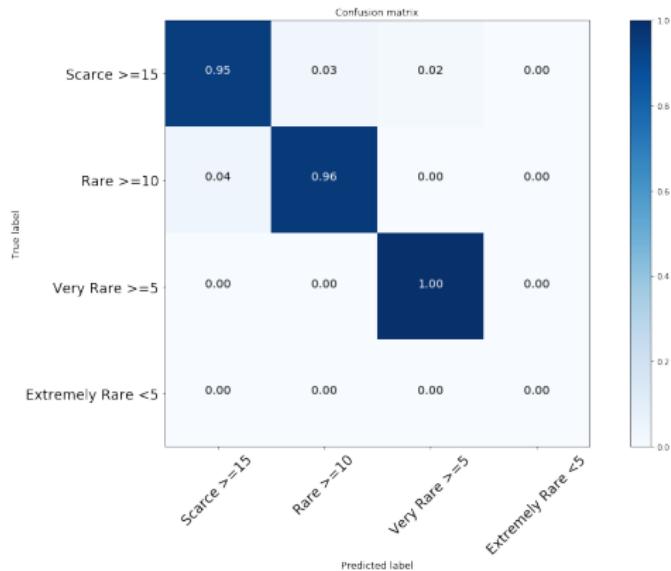
Figure 5: ResNet Architecture

- ResNet-18, ResNet-34 from scratch
- ResNet-50 finetuning

Scores



9



- ▶ Test Accuracy: 0.91
- ▶ Avg. Precision: 0.91
- ▶ Avg. Recall: 0.91
- ▶ Avg. F1-Score: 0.90

Figure 6: Network Attention



Results



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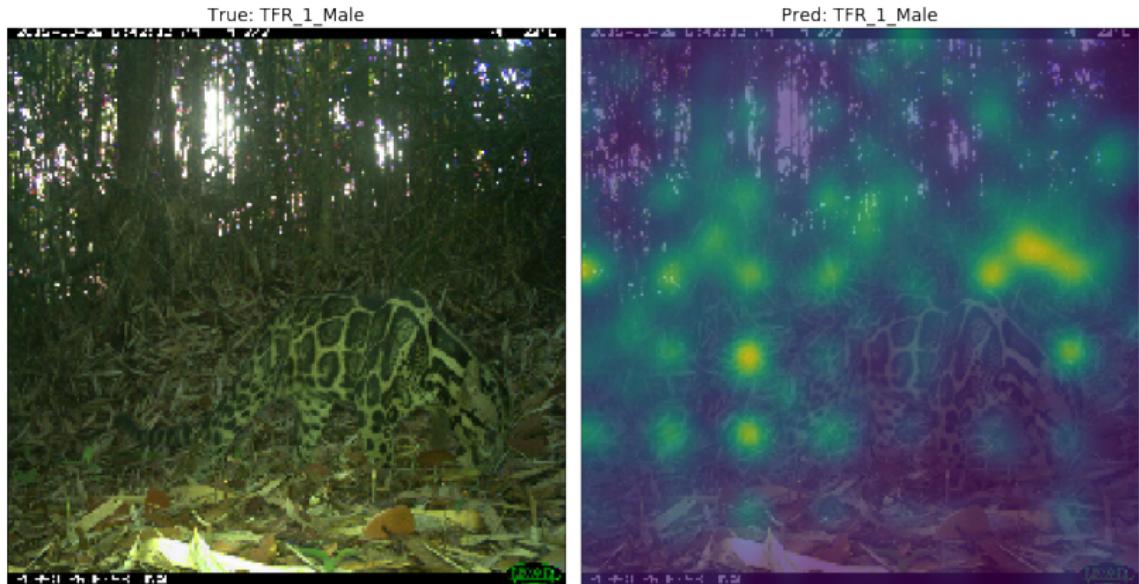


Figure 7: Network Attention



Results



11



Figure 8: Network Attention

Training Process



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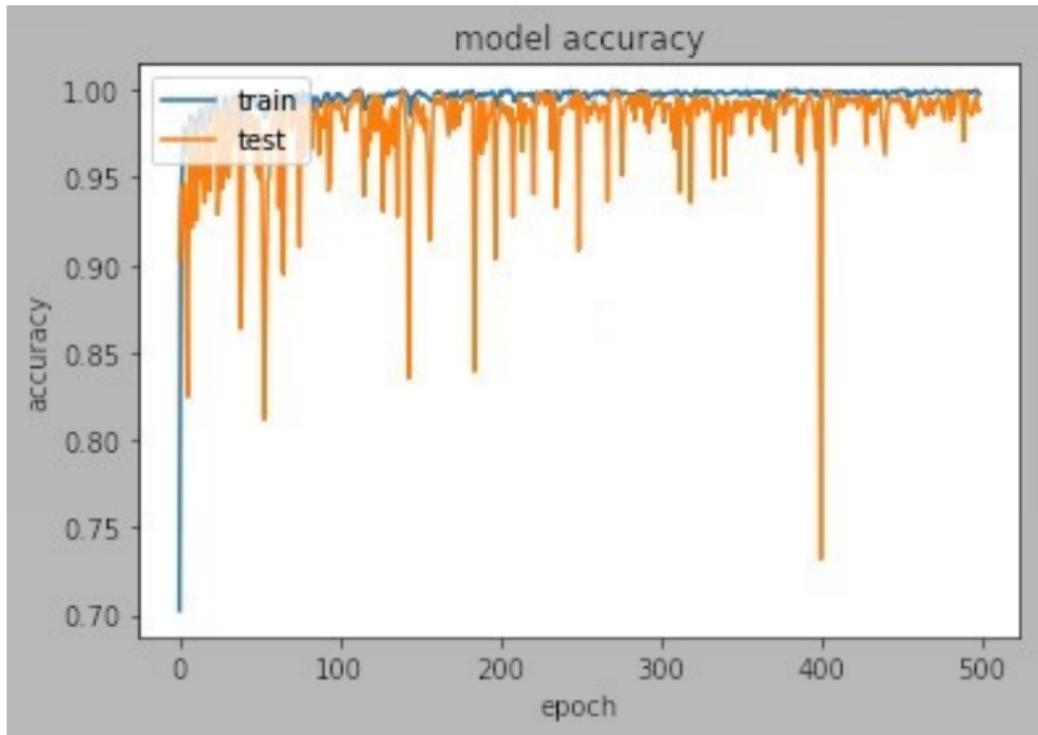


Figure 9: Accuracy development

Results



13

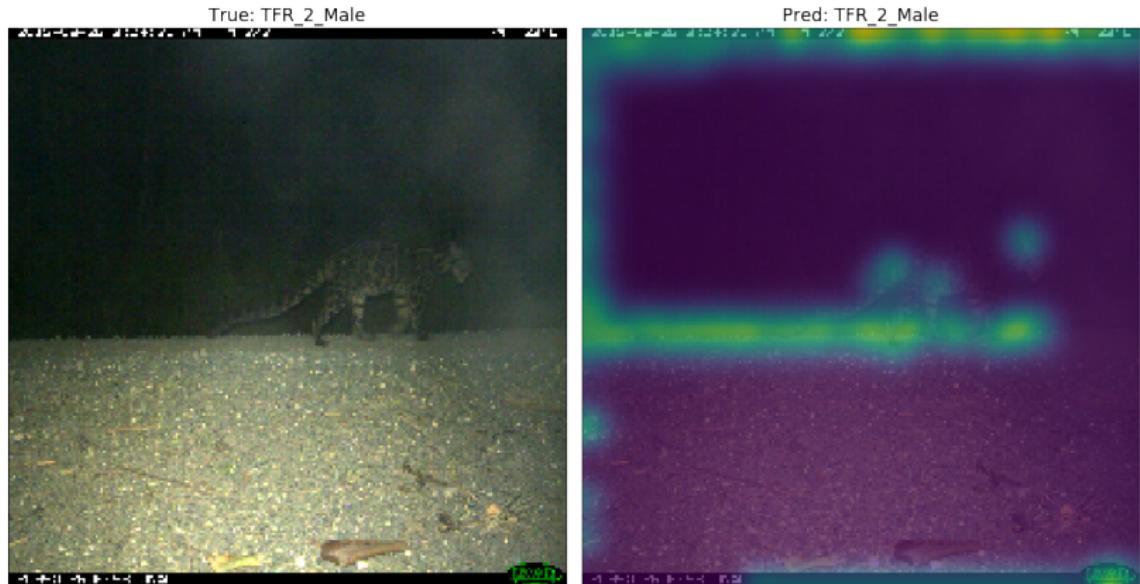


Figure 10: Network attention on logo and time stamp



Using Bounding Boxes



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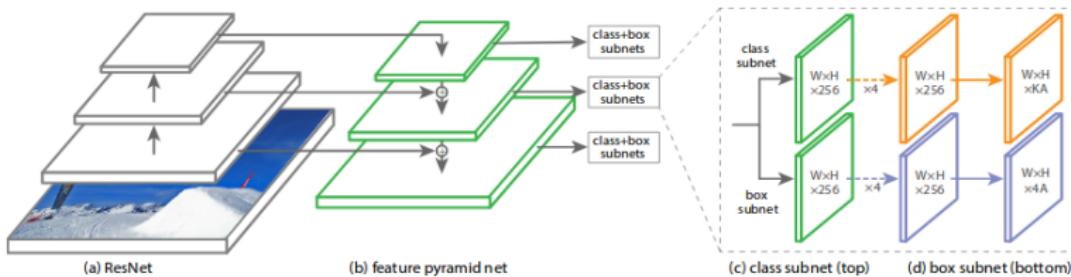


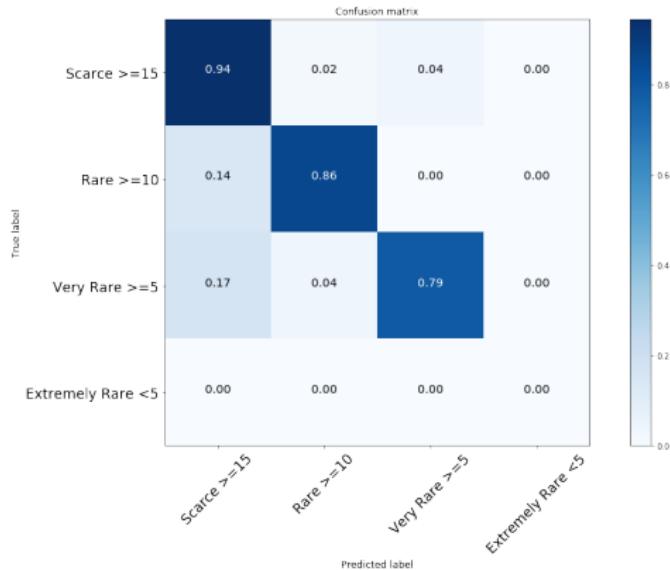
Figure 11: ResNet Architecure

- ▶ losses semantic information an detect small objects RPN
- ▶ used preferred backbone
- ▶ extract after each pooling layer feature maps – Feature pyramid network based on resnet
- ▶ Manual annotation of images

Scores



15



- ▶ Test Accuracy: 0.86
- ▶ Avg. Precision: 0.87
- ▶ Avg. Recall: 0.86
- ▶ Avg. F1-Score: 0.85

Figure 12: Network Attention

Positive Examples



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Figure 13: Network attention on logo and time stamp

Negative Examples



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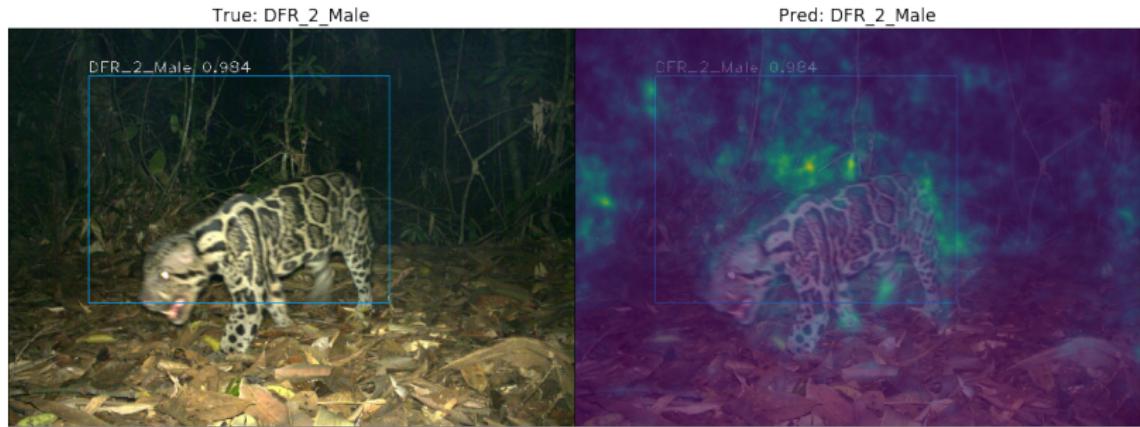


Figure 14: Network attention on logo and time stamp

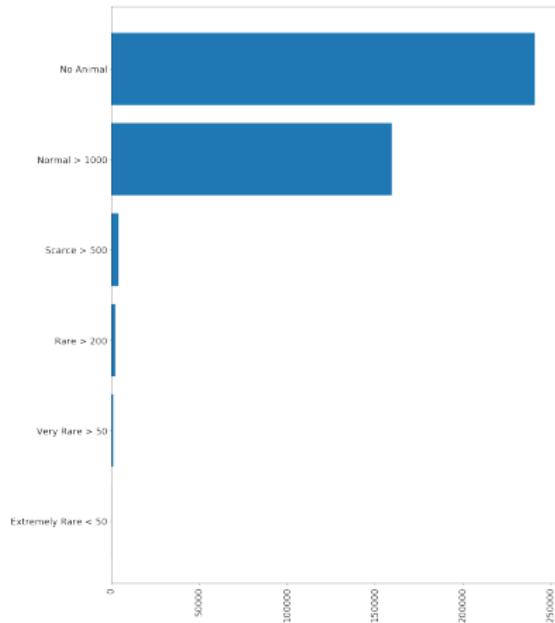
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Data Set



- ▶ Unbalanced data distribution (3 to 190k+ images per class)
- ▶ 87 Classes/Species

Figure 15: Reduced Data distribution of Species data set



Good Example Images



Figure 16: Marbled Cat



Figure 17: Mouse Deer



Outline



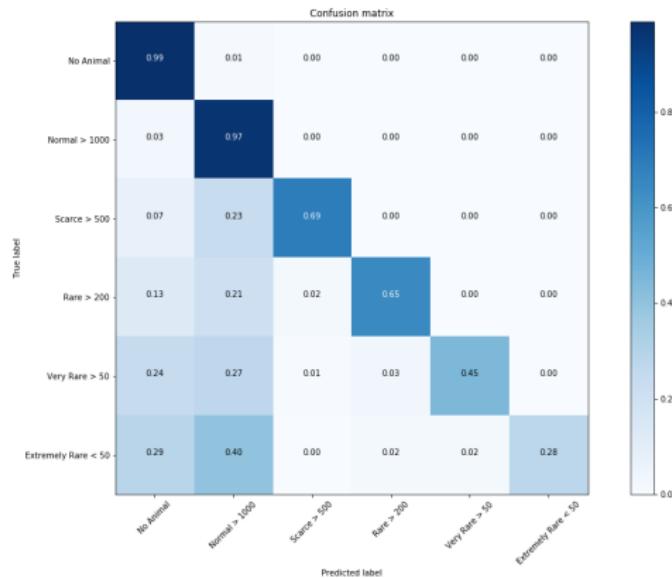
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Scores



22



- ▶ Test Accuracy: 0.95
- ▶ Avg. Precision: 0.95
- ▶ Avg. Recall: 0.95
- ▶ Avg. F1-Score: 0.95

Figure 18: Reduced confusion matrix

Positive Examples



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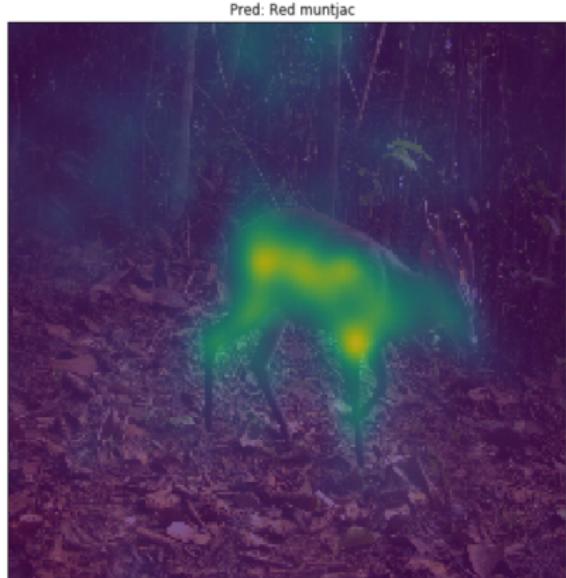
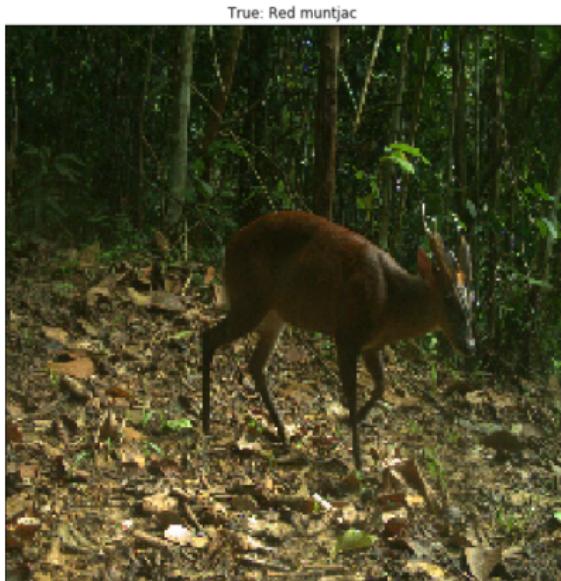


Figure 19: Correct attention and classification

Positive Examples



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True: Clouded leopard



Pred: Clouded leopard

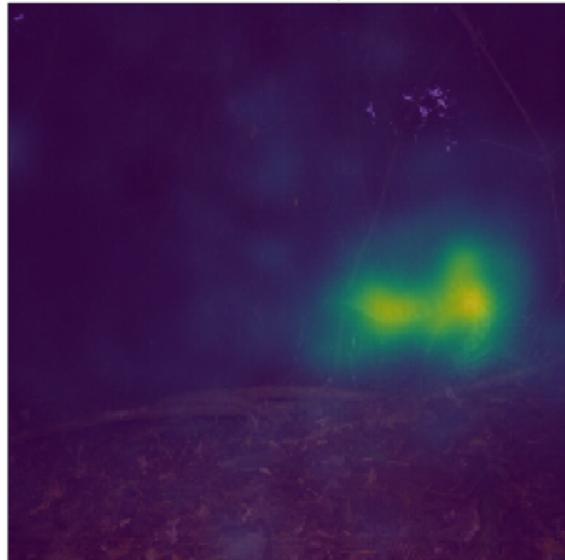


Figure 20: Correct attention and classification



Negative Examples



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True: Crested fireback



Pred: Mousedeer



Figure 21: Noisy labels

Negative Examples



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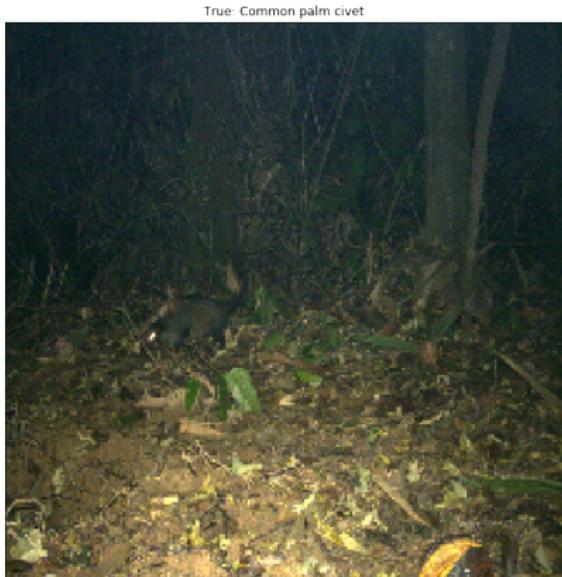


Figure 22: Correct Attention, wrong label



Negative Examples



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Figure 23: Mismatch because of class similarity

Thank you for listening



Questions?