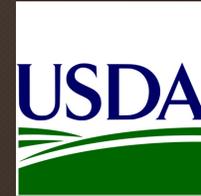




MISSISSIPPI STATE UNIVERSITY™
GEOSYSTEMS RESEARCH INSTITUTE



MISSISSIPPI STATE UNIVERSITY™
DEPARTMENT OF WILDLIFE,
FISHERIES AND AQUACULTURE



Aerial Wildlife Image Repository (AWIR)

Sathish Samiappan, Jared Elmore, Meilun Zhou, Ray Iglay, Kristine Evans
Mississippi State University

Brad Blackwell, Morgan Pfeiffer
USDA-NWRC, Ohio Field Station

AGENDA

- 1 What is an image repository?
- 2 Popular image repositories & their impact
- 3 Why do we need one for wildlife monitoring?
- 4 Current work - Mini AWIR
- 5 Ongoing and Future Work

What is an image repository?

is a collection of large labeled or hand annotated images designed for use in visual object recognition software research.



Label = Fox



Label = Owl



Label = Coyote



Label = Reptile

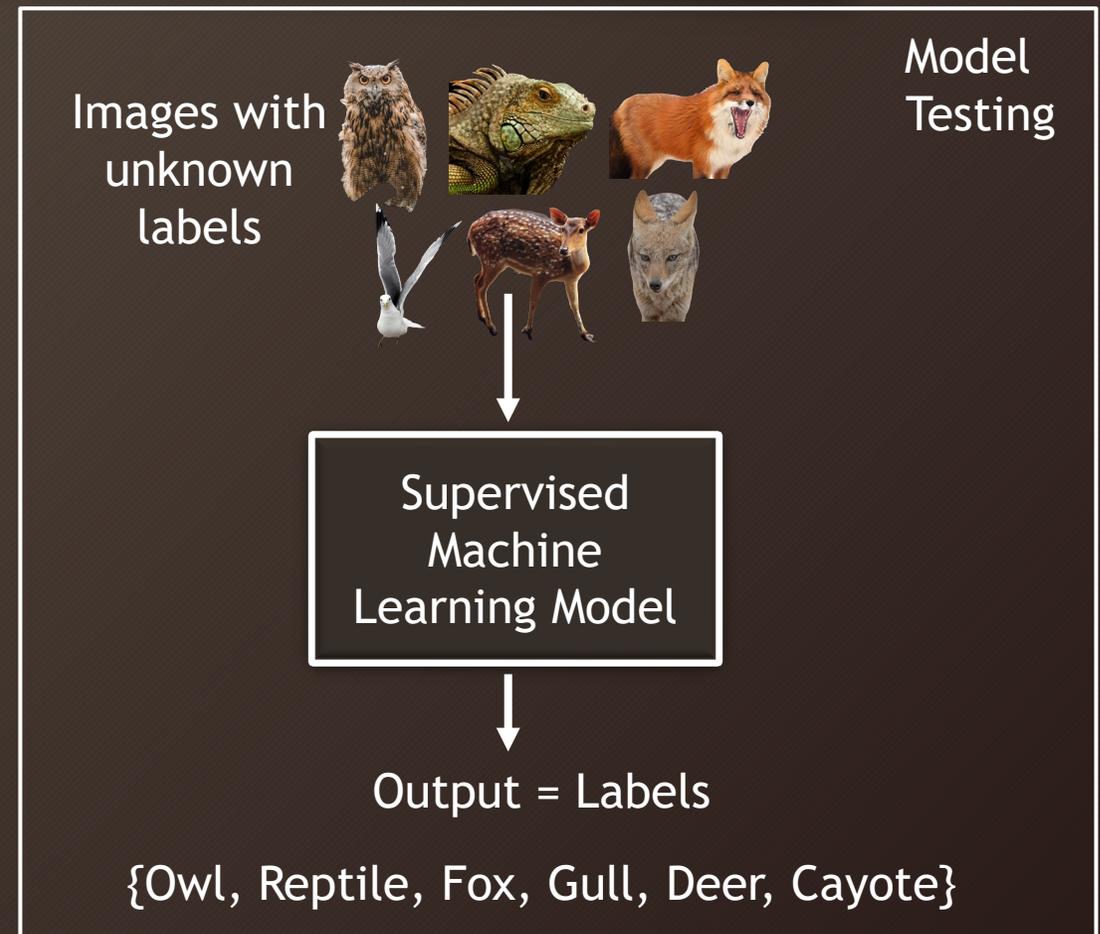
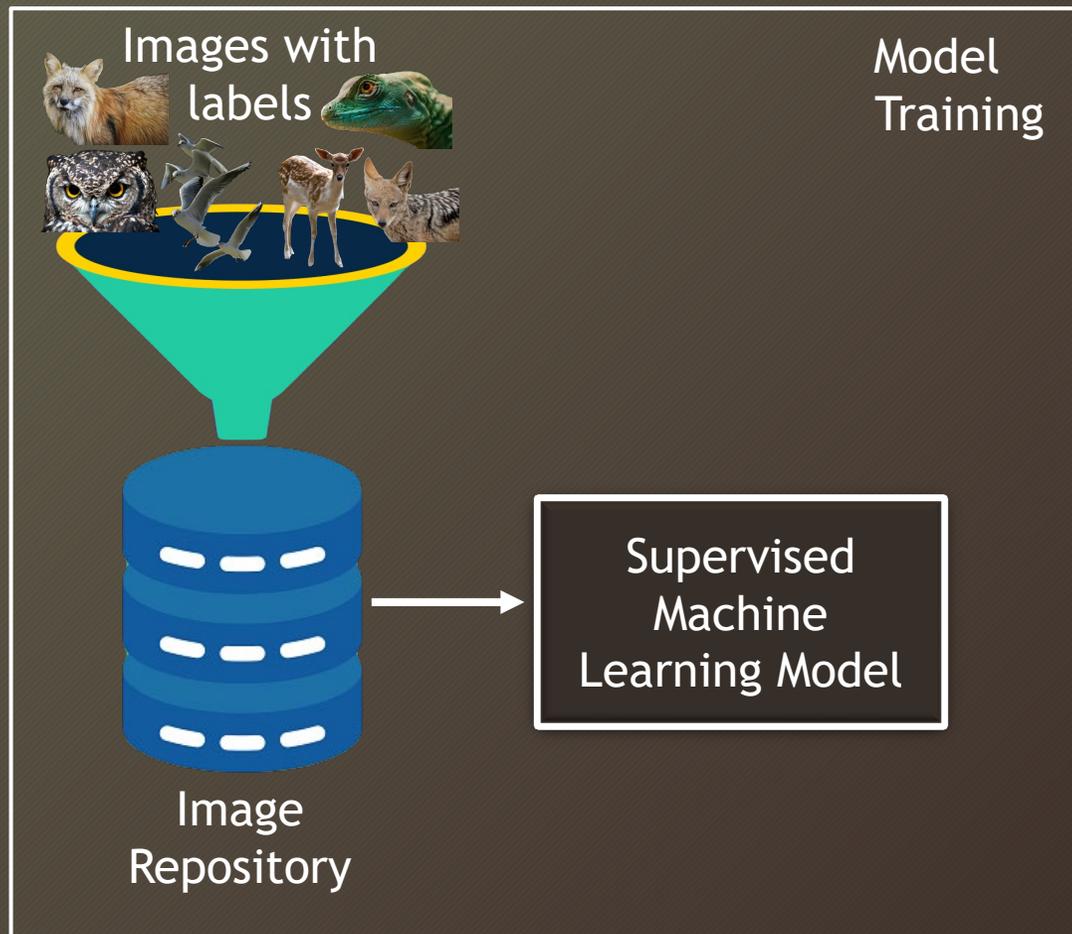


Label = Gulls



Label = Deer

Object Recognition by Supervised Learning



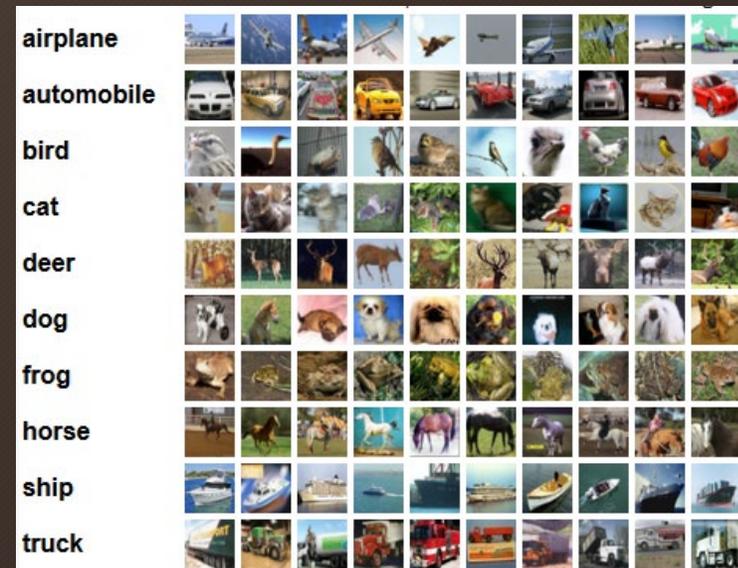
Popular Image Repositories



Popular Image Repositories

CIFAR
10

CIFAR-10 Image Data Set
60,000 images
10 classes



Popular Image Repositories

CIFAR-10 Image Data Set
60,000 images
10 classes

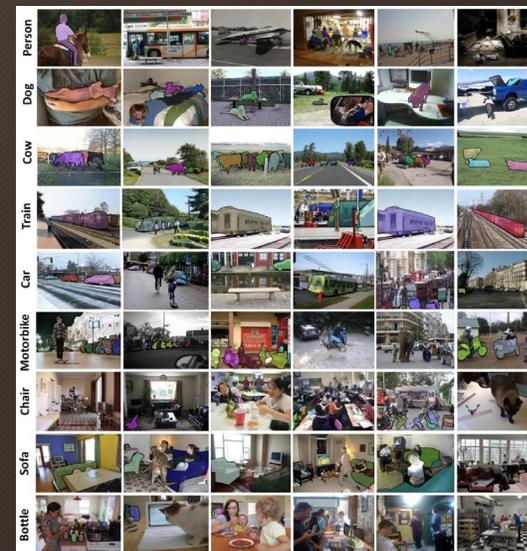


Popular Image Repositories

COCO

COCO Image Data Set
330,000 images
80 classes

PASCAL



CIFAR
10

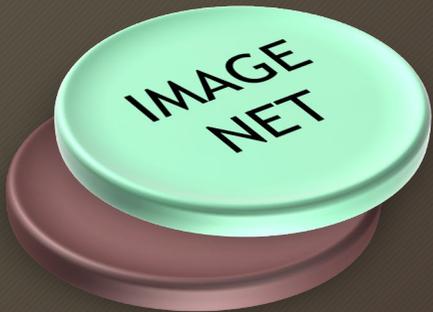
Popular Image Repositories

COCO Image Data Set
330,000 images
80 classes



Popular Image Repositories

PASCAL Visual Object Class Data Set
2900 images
20 classes



Popular Image Repositories

IMAGE
NET

IMAGENET Data Set
>14 million images
Many things under the sun

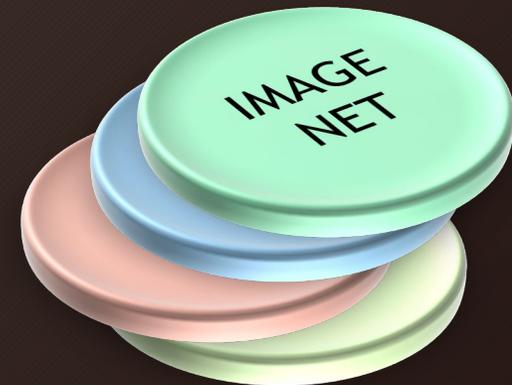


YACVID
527 Data
Sets

PASCAL

Popular Image Repositories

IMAGENET Data Set
>14 million images
Many things under the sun

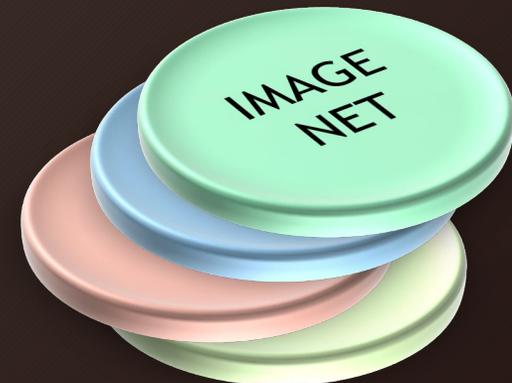


Popular Image Repositories



YACVID
527 Data
Sets

Yet Another Computer Vision Index To Datasets
527 datasets
Including videos, medical images, real world things

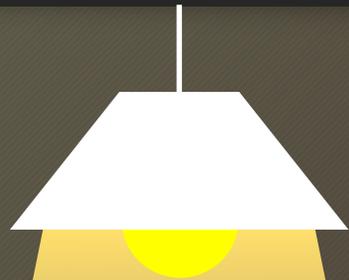
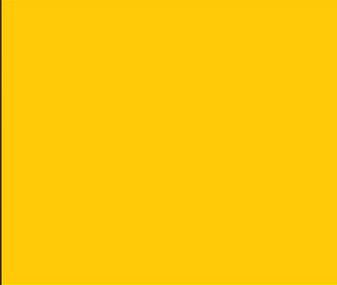


Popular Image Repositories

Yet Another Computer Vision Index To Datasets
527 datasets
Including videos, medical images, real world things



Impact of Image Repositories



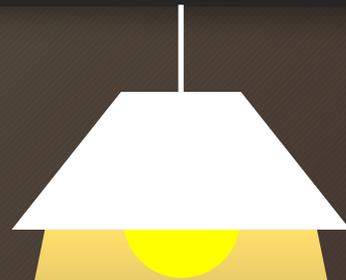
CIFAR - 10

Introduced in 2009
28,200 articles on
Google Scholar



COCO

Introduced in 2014
17,900 articles on
Google Scholar



PASCAL VOC

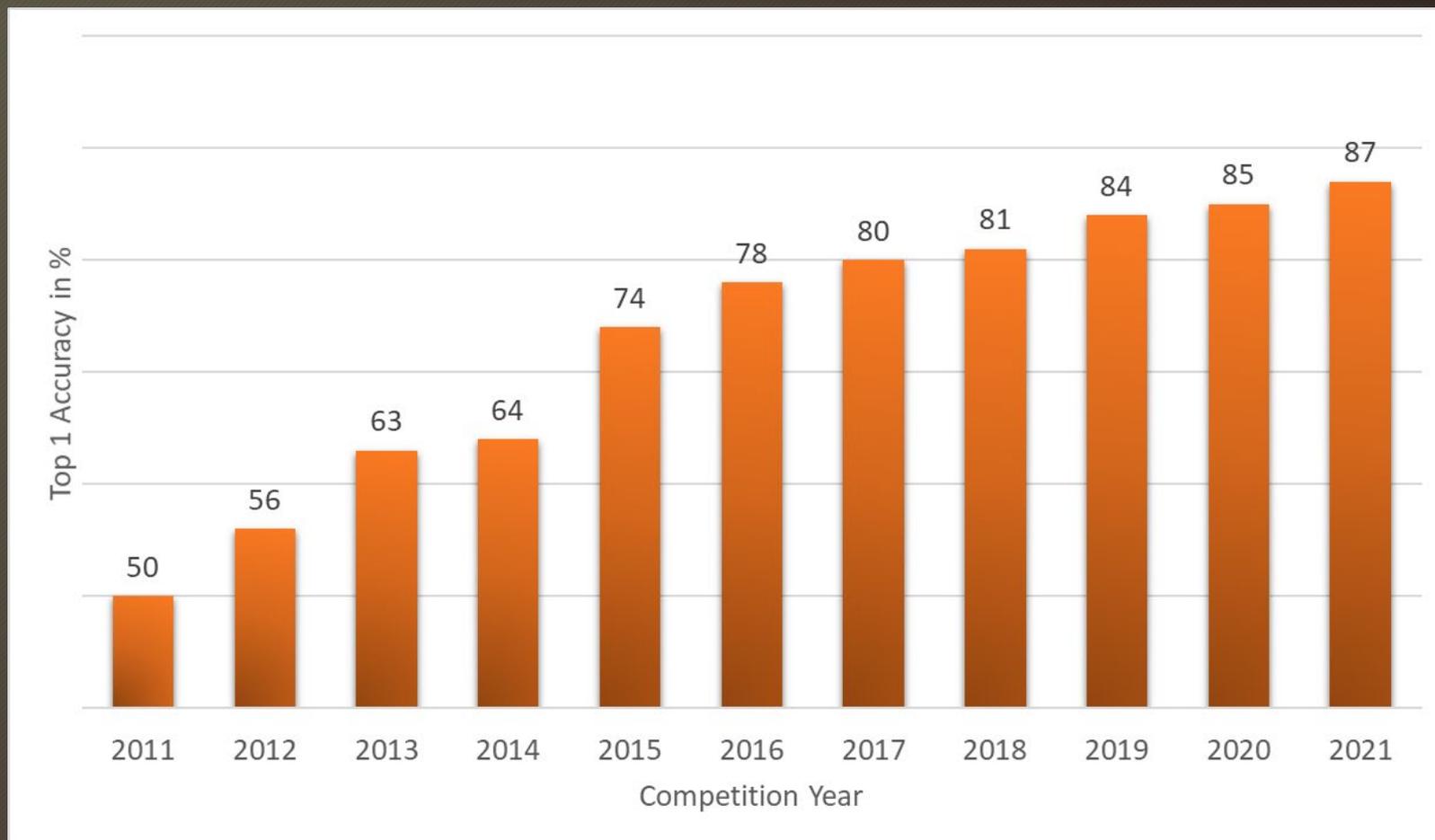
Introduced in 2005
17,700 articles on
Google Scholar



IMAGENET

Introduced in 2010
112,000 articles on
Google Scholar

Image Classification on ImageNet

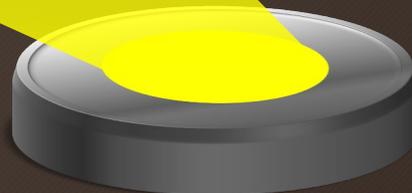


Why do we need an aerial image repository for wildlife?

Out of 530 datasets
Only one set contain
'Wildlife'

Only one dataset
Contain birds
< 3 bird species

None of the datasets look at
Wildlife from aerial perspective
Satellite, crewed aircraft or uncrewed aircraft

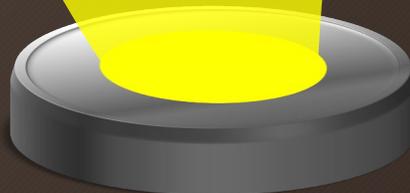


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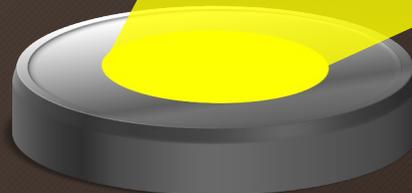


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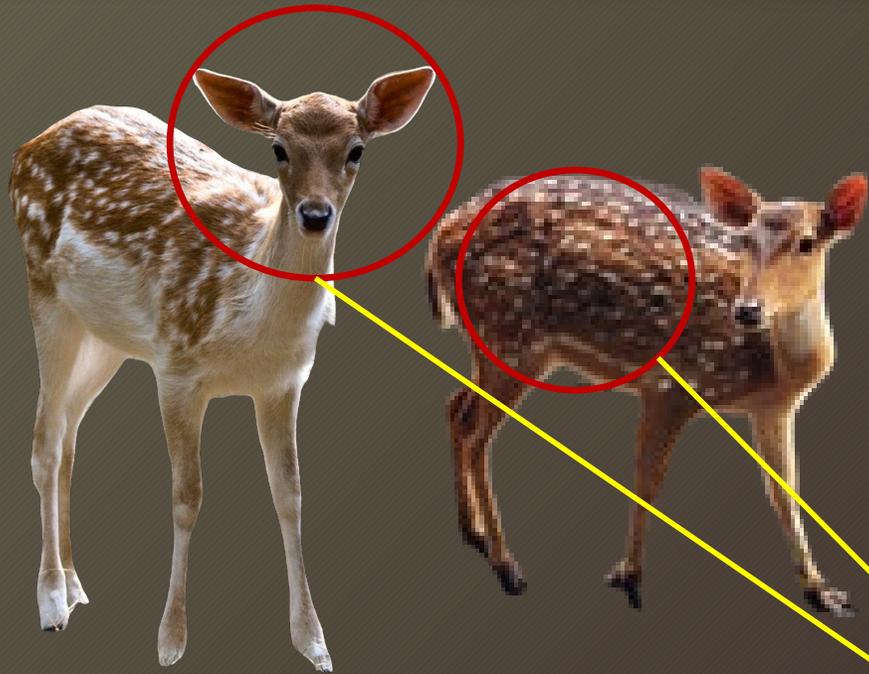
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More on Why AWIR



Pictures of deer available on the internet and ImageNet database

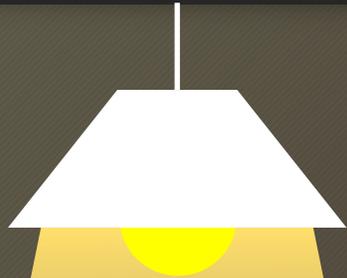


Pictures of deer acquired from a UAS at 400 feet AGL
Unique/distinguishable features of a deer

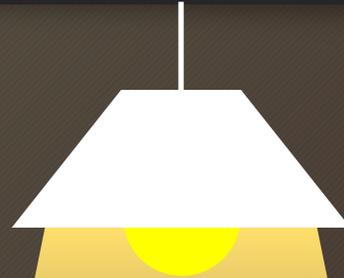
Different computer vision problem

That requires a completely
different training data

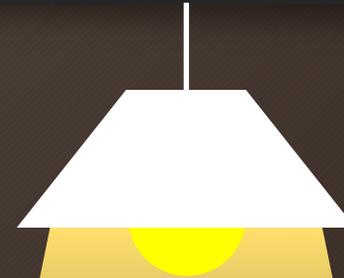
Wildlife Detection using sUAS



Google Scholar
Wildlife + Monitoring + UAS
2650 articles since 2017



Google Scholar
"Wildlife Abundance" + UAS
822 articles since 2017



Google Scholar
Animal + Detection + UAS
14500 articles since 2017
5660 articles since 2020
2310 articles in 2021 so far

More on Why AWIR?

1

Increased use of sUAS to survey wildlife

2

Opportunity to train computer vision models using AWIR

3

Refined models provide accurate detection and counting

4

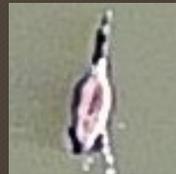
Computer vision researchers need datasets

5

Automated detection is the way to go forward

Mini AWIR

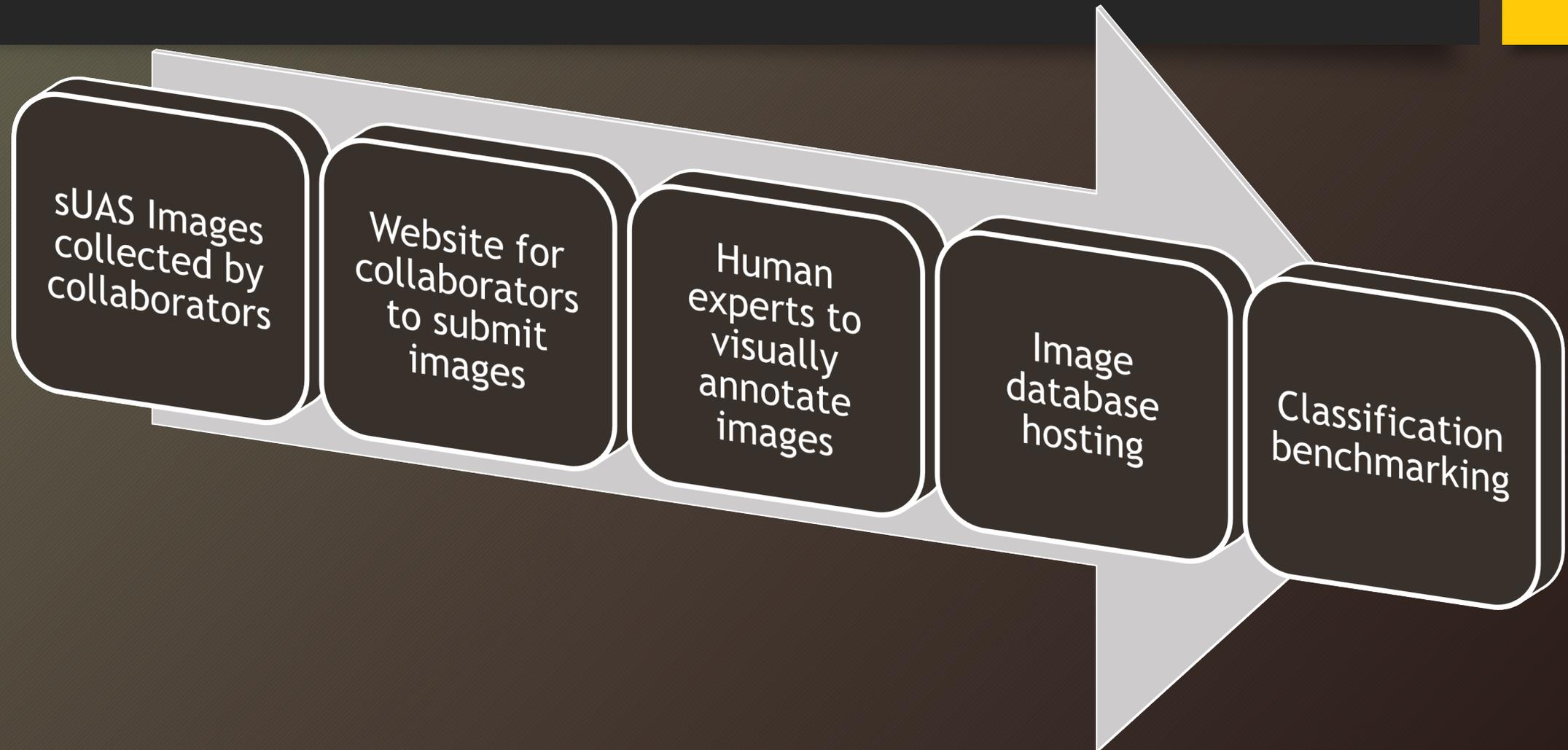
Images of Five Species
Acquired from a small
UAS



Mini AWIR

Cows - 102 images
Deer - 101 images
Geese - 103 images
Herons - 5 images
Horses - 103 images

Ongoing and Future Work



To learn more about Mini AWIR & it is currently being used to develop deep learning models



Tuesday 11:00 am – 1:00 pm Technical Session 2

Classifying wildlife from aerial imagery using deep learning neural networks

Jared Elmore, Meilun Zhou, Sathish Samiappan, Ray Iglay, Kristine Evans
Mississippi State University

Brad Blackwell, Morgan Pfeiffer
USDA-NWRC, Ohio Field Station

To learn more about sUAS applications on airports

A Survey of Current sUAS Users

Tuesday 3:00-5:00 pm Technical Session 2

*Systematic Map Effort of Using Small Unmanned
Aircraft Systems to Monitor Animals*

Thursday 3:00-5:00 pm Technical Session 3

Thank You

MSU sUAS Wildlife Research Team

uaswildlife@cfr.msstate.edu

Co-PIs: Dr. Ray Iglay, Dr. Sathish Samiappan, & Dr. Kristine Evans

Postdocs: Dr. Jared Elmore & Dr. Landon Jones

Ph.D. Student: Ms. Emma Schultz



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