

WildTrackAI

Jonathan D'Souza
Jacques Makutonin
Dan Price
Mike Reiter



Introduction: A Message from the WildTrack Founders

Video



Context

- **Problem Statement:**

Can cutting-edge **computer vision technology** complement traditional wildlife tracking techniques and **enhance the speed and accuracy** of animal footprint classification?

- **Impact:**

Near-term: **improved monitoring of wildlife behavior**

Mid-term: improved **protection of endangered species**

Long-term: **reduced biodiversity loss, sustainable coexistence of humans and wildlife, and reduced disease transmission** from animals to humans

Target Personas

Use Case 1: Field Researchers



Researcher: Berend Reinhard
Target Species: Black Rhino; Namibia
Roles: Field-based data capture;
Access inference results

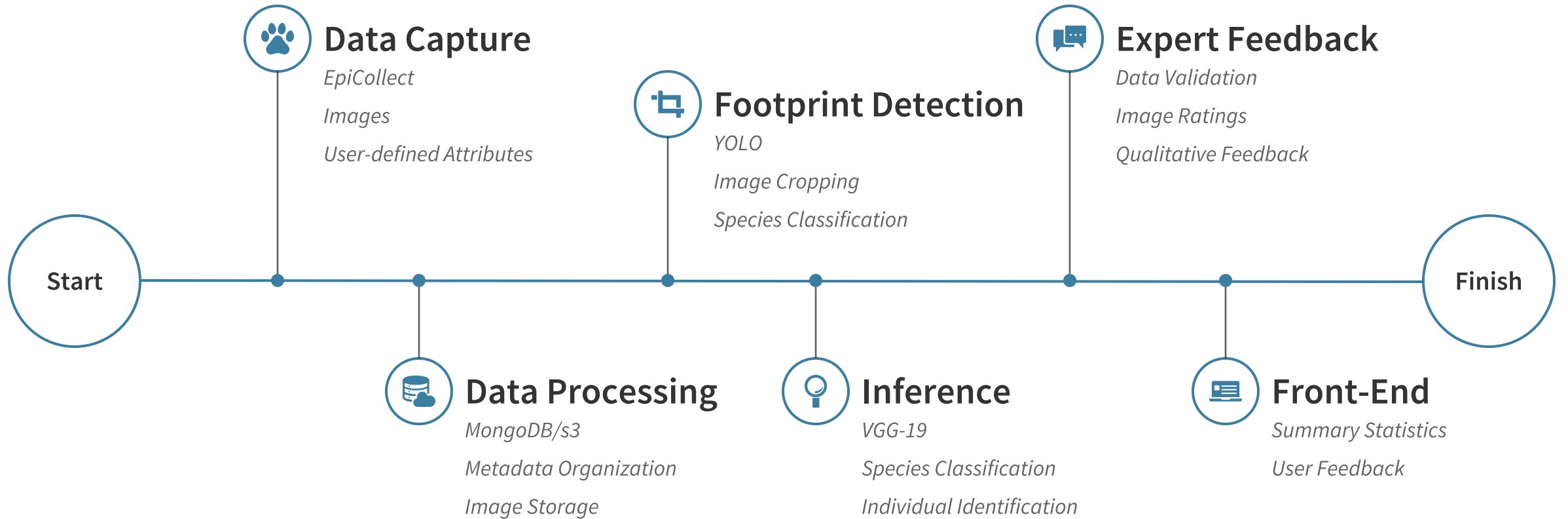
Use Case 2: Administrators



Administrator: Zoe Jewell
Affiliation: co-Founder of WildTrack
Roles: Manage images / AI models;
Provide expert feedback



Integrated and Automated Data Flow

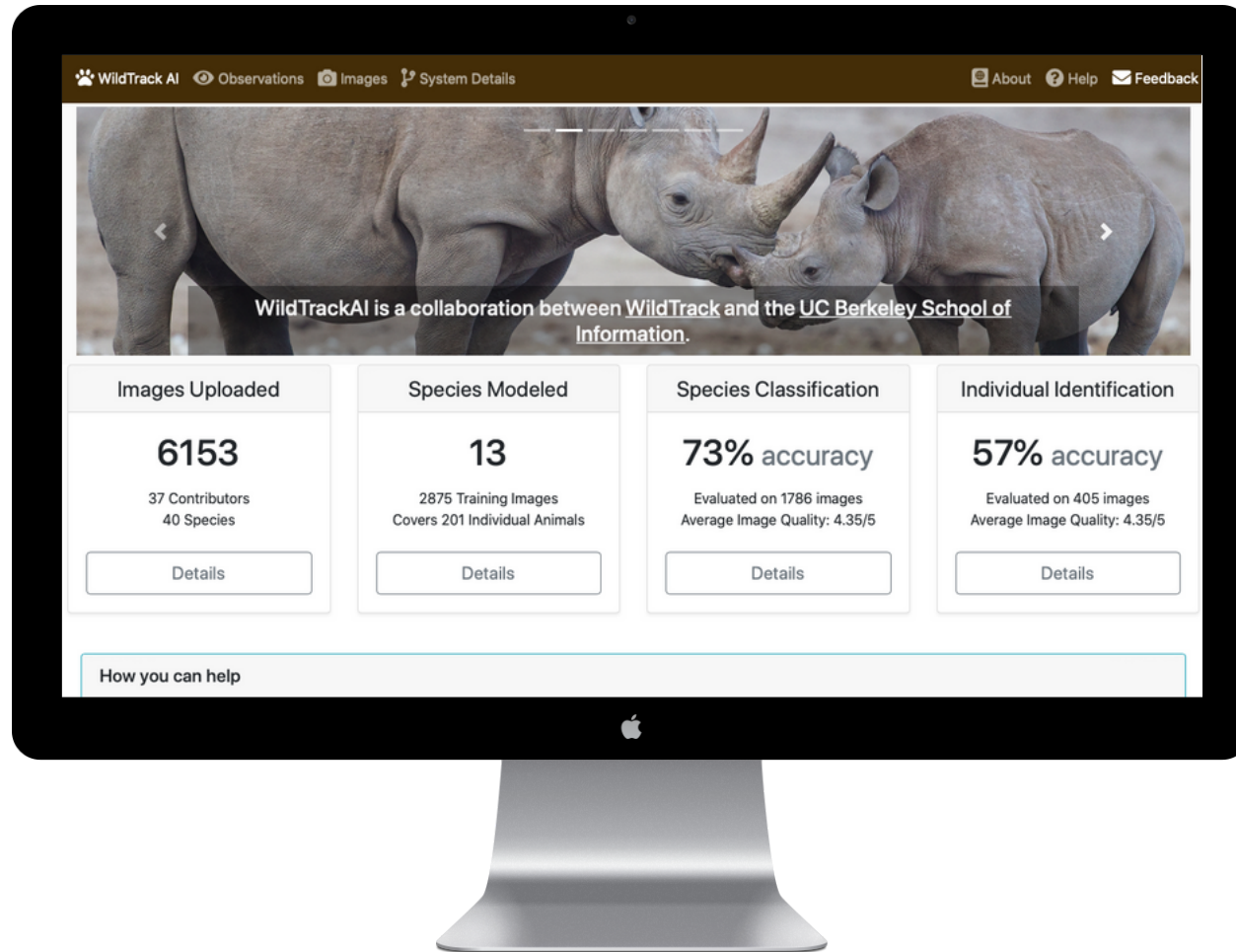


Generating Field Data in Real-Time - EpiCollect

Video

Front-End User Demo

www.wildtrackai.ml



- **EpiCollect**

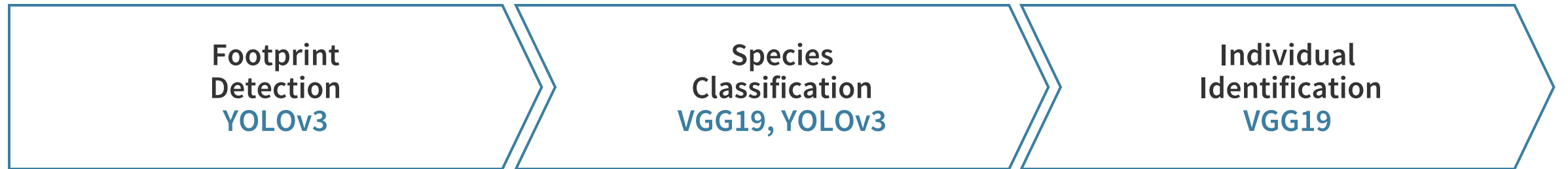
2,000+ additional images

19 Species

20 Users

20 Locations Worldwide

Under the Hood - Modeling Tasks



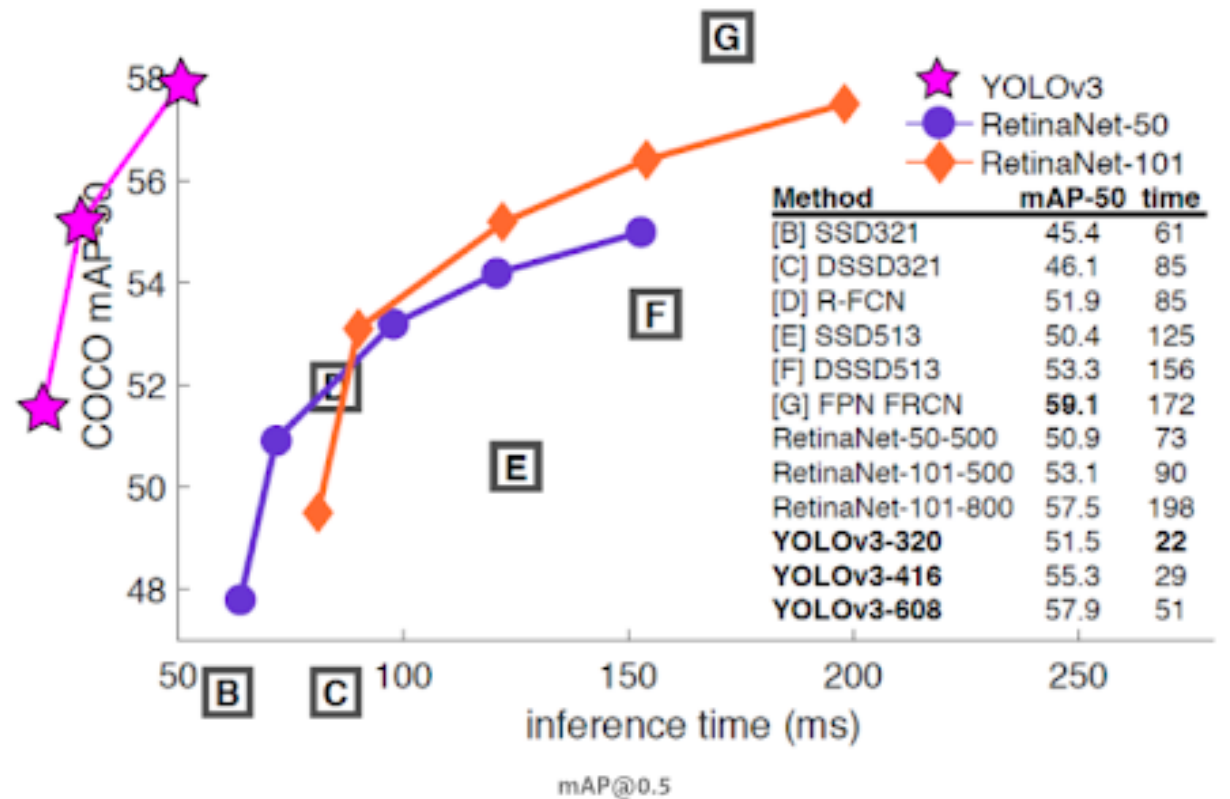
Footprint Detection

- YOLO V3

Keras implementation

Tensorflow backend

Initial Test Accuracy ~99%



Species Classification - Ensemble modeling

- **VGG19**

Pretrained Model + fully connected layers

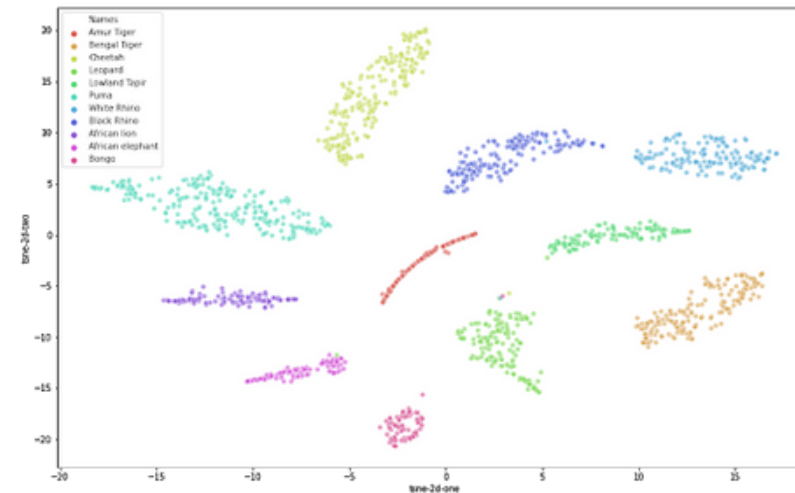
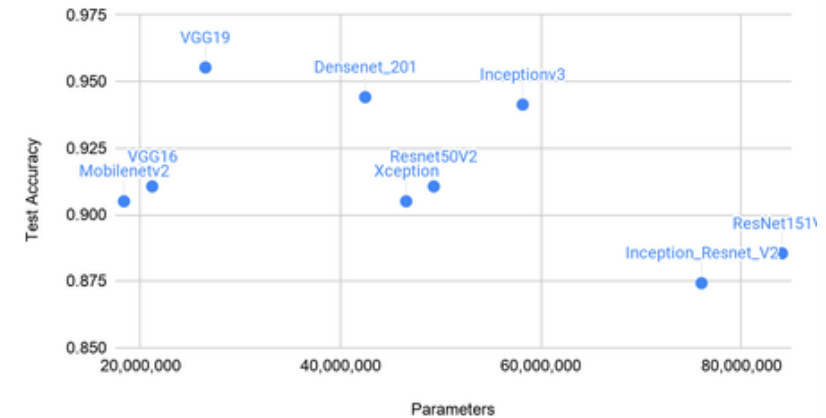
Used as basis for downstream tasks

Initial Test Accuracy: ~96%

- **YOLOv3**

Initial Test Accuracy ~99%

Comparing PreTrained Model Accuracy on Species Classification



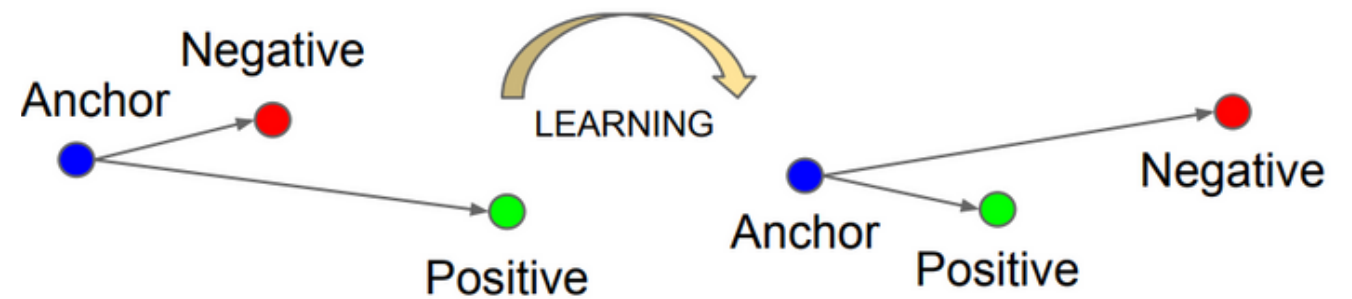
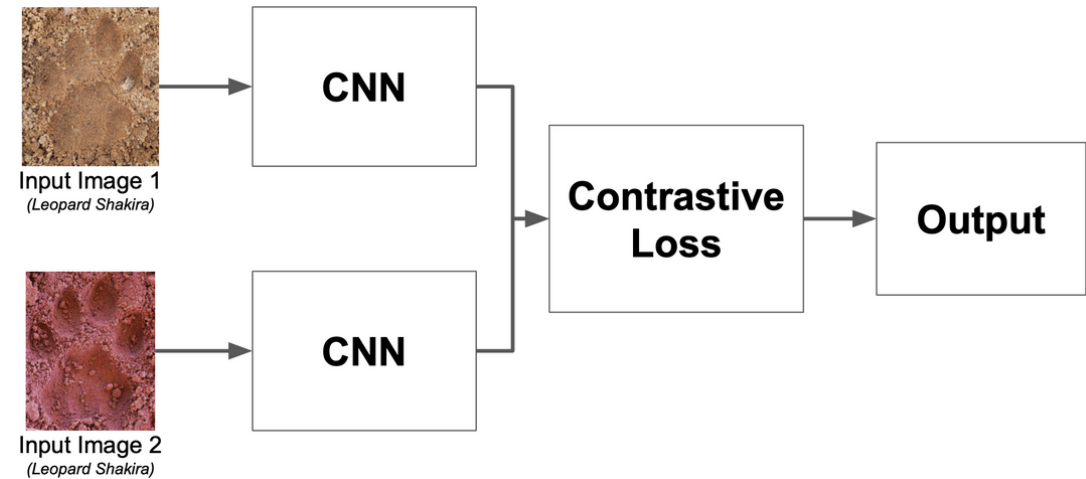
Individual Identification

- **VGG19 with Triplets Loss**

Fine tuned distinct model for each species

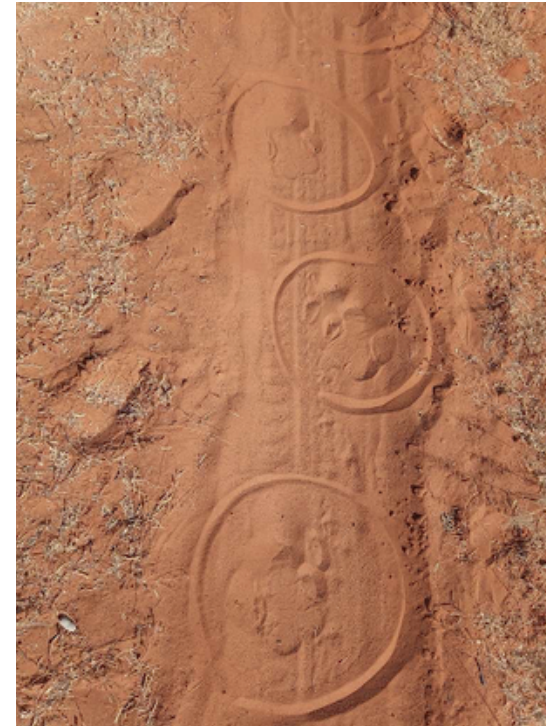
256-D vector representations

Initial Test Accuracy: ~84%



The Distribution Gap...

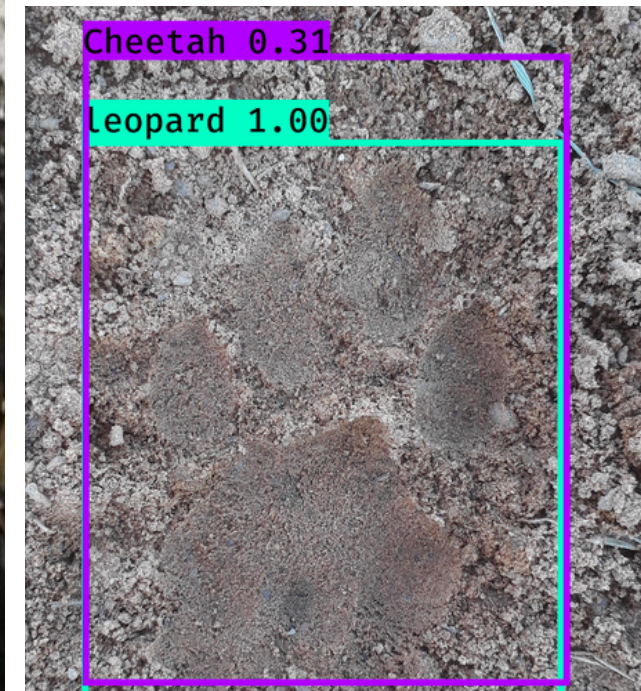
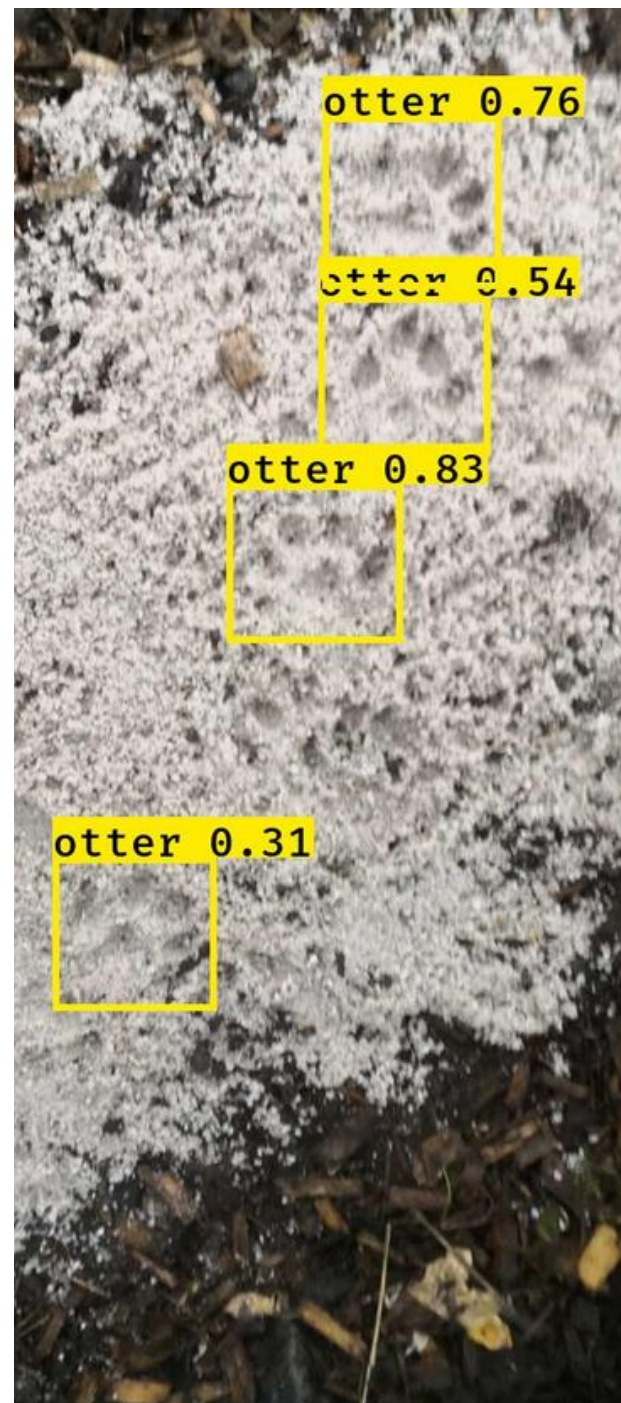
- Single foot (LH), close cropped, NS Orientation high quality



- Multiple feet, no cropping, variable orientation & quality

Bridging the Distribution Gap

- Detection + Classification with YOLOv3 for ensemble modeling
- Image augmentation
- Incorporation of newer field images into training
- Leverage User/ Expert Labels



Administrator Use Case



Administrator: Zoe Jewell
Affiliation: co-founder WildTrack
Roles: Manage images / AI models

WildTrack AI Observations Images Model Species Users Feedback About Help Feedback

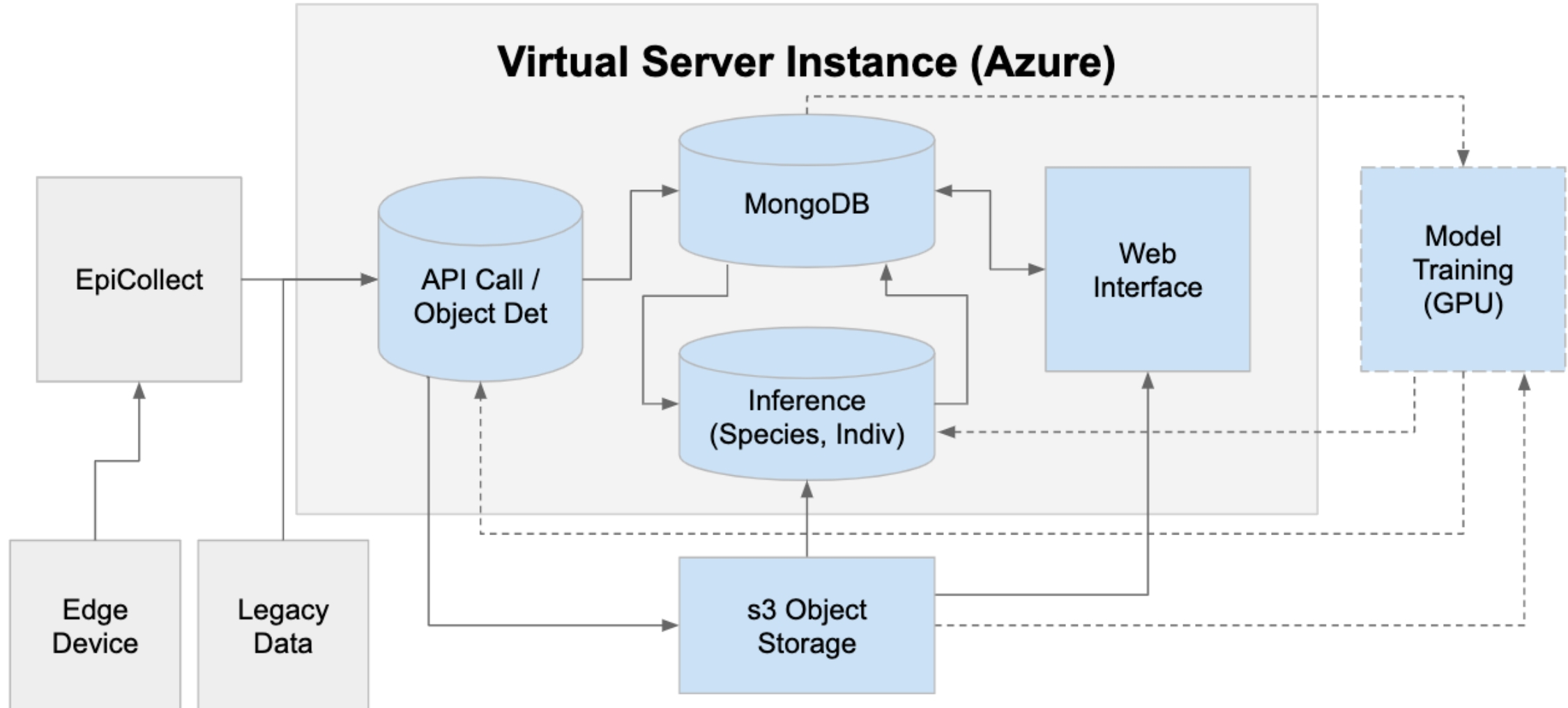
Last Model Refresh: 2020-07-30 01:55:11. Species: Amur Tiger, Bengal Tiger, Cheetah, Leopard, Puma, African Lion, African Elephant, Black Rhino, White Rhino, Lowland Tapir, Bongo, Otter.

Search [] [Refresh] [Close] [Zoom] [List]


Image	Species	Individual	Rating	WildTrack Comments	AI Information		Recorder Information			
					Species	Individual	Date	Name	Comments	Source
	Rhino: Black	Click to Edit	4	Click to Edit	Cheetah: South East African (97.13%)	Ver Db Veronica (8.8%)	2020-07-23	Zoe Jewell, Sky Alibhai		WildTrack
	Rhino: Black	Click to Edit	4	Click to Edit	Cheetah: South East African (100%)	Kal Db M2 (98.6%)	2020-07-23	Zoe Jewell, Sky Alibhai		WildTrack
	Rhino: Black	Click to Edit	4	Click to Edit	Cheetah: South East African (99.63%)	Kuz Db Jonas (62.51%)	2020-07-23	Zoe Jewell, Sky Alibhai		WildTrack


- Curation of Images and Metadata
- Communication with Field Researchers
- Model Evaluation & Retraining


Built for Scalability and Sustainability





Success Criteria

1 Expanded Use Cases 
Species prediction
Ability of non-expert trackers to participate

2 Improved Accuracy 
Results largely comparable to FIT, with time savings

3 Time Savings 
Significant time savings in image processing
Integrated and automated infrastructure

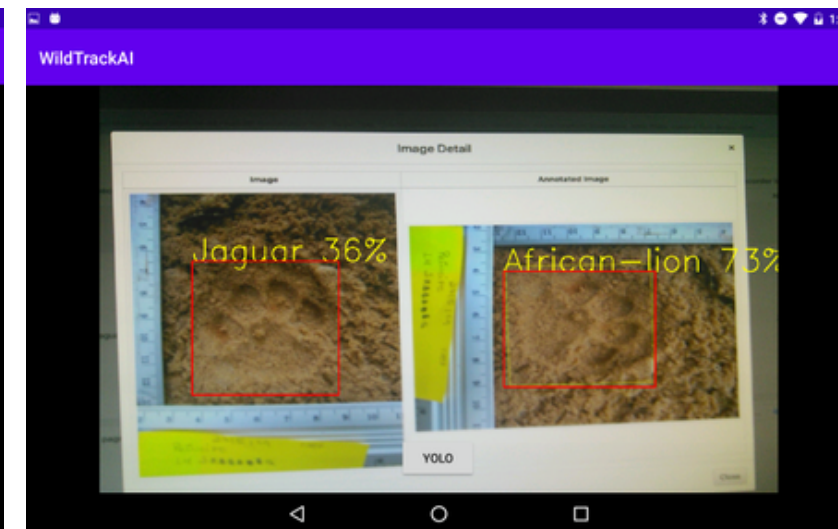
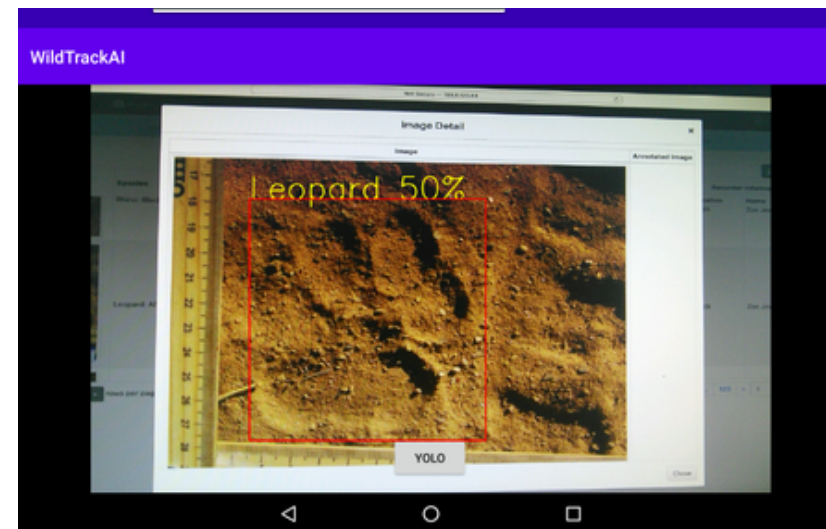
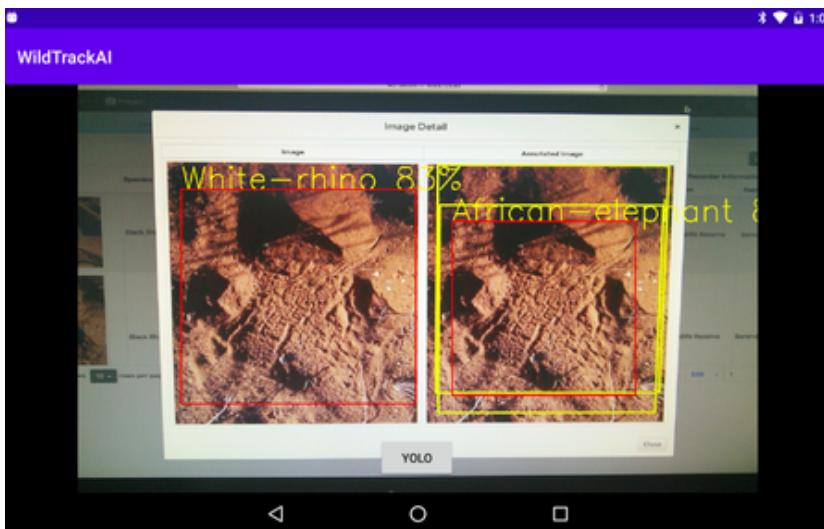
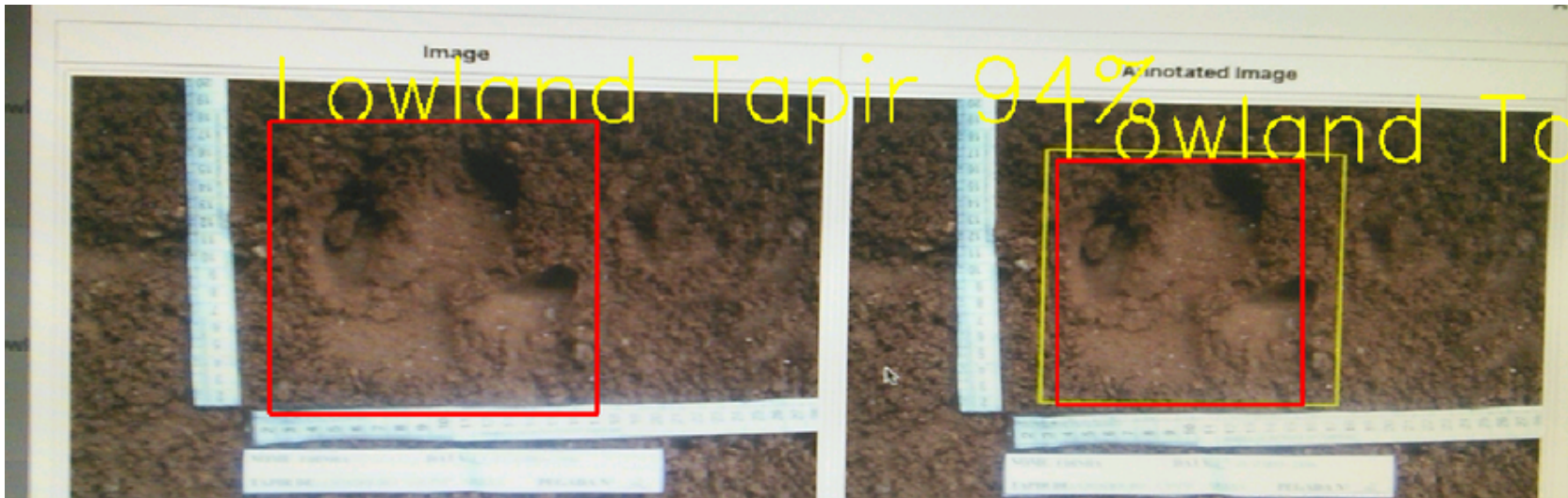
4 Improved Model Tolerance 
Footprint Detection
Augmentation during Training

5 Adaptability 
Generalizable framework to other applications

Inference at the edge on a mobile device



- Casual User



Inference at the Edge

Video

Looking Ahead



Jonathan D'Souza

- Turtle Tracking using Shells



Mike Reiter

- Agriculture



Jacques Makutonin

- Model on Drones to detect trails



Dan Price

- Army Research
Cryptic Ground
Evidence

WildTrack Conclusion

Video

Thank You

