1st Kendeda Micro-Grants
Research Symposium
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Monitoring Biodiversity

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Georgia Tech

Research Problem

- Living Building serves the people, can its environment serve more?
- When targeting the imperatives set forth in the various Petals, can we also consider the native species that call this environment home?
  - Place Petal – urban agriculture
  - Equity Petal – universal access to nature and place
  - Health & Happiness Petal – biophilic environment
  - Beauty Petal – uplift the human spirit

EcoCommons

Approach

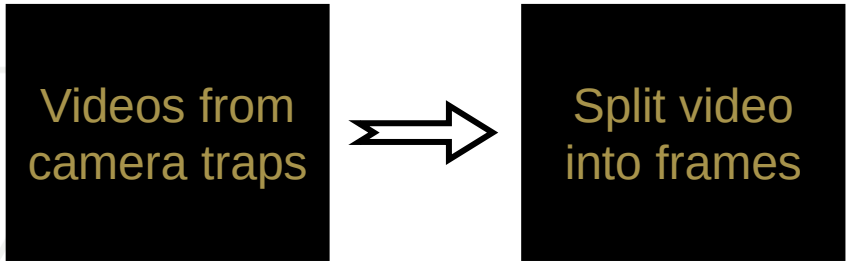
- Utilize pre-trained machine learning models to study animals that live on and pass through our campus
- Partnered with Dr. Emily Weigel, Department of Biological Sciences

  - Biodiversity Camera Trap Project – Spring 2021 VIP Team
  - Cameras at green locations stayed for many weeks
    - EcoCommons
    - MoSe
    - MRDC
  - Cameras at yellow locations moved after a week
    - People, vehicles, low wildlife
  - Utilized the videos collected by their motion sensor cameras as the input to our methodology

Methodology

Videos from camera traps

Methodology



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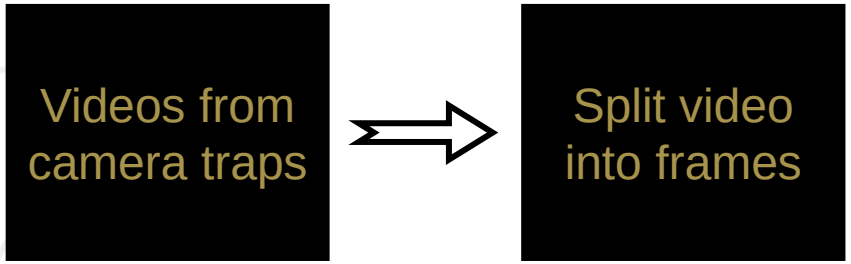

Script to read videos from google drive and store image files of each frame

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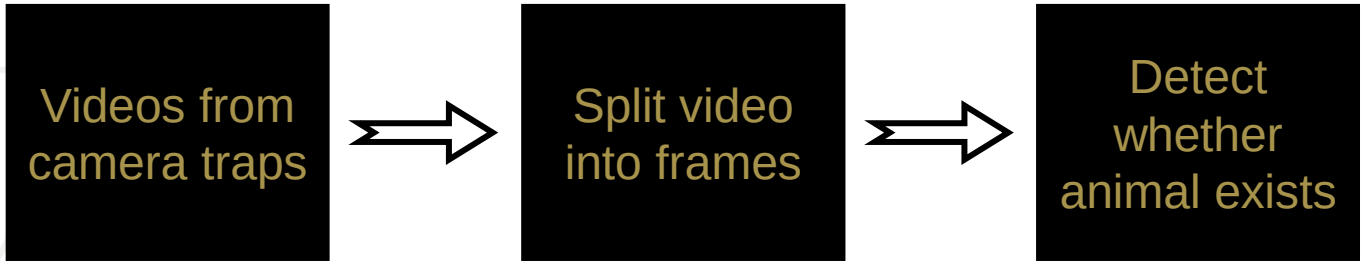

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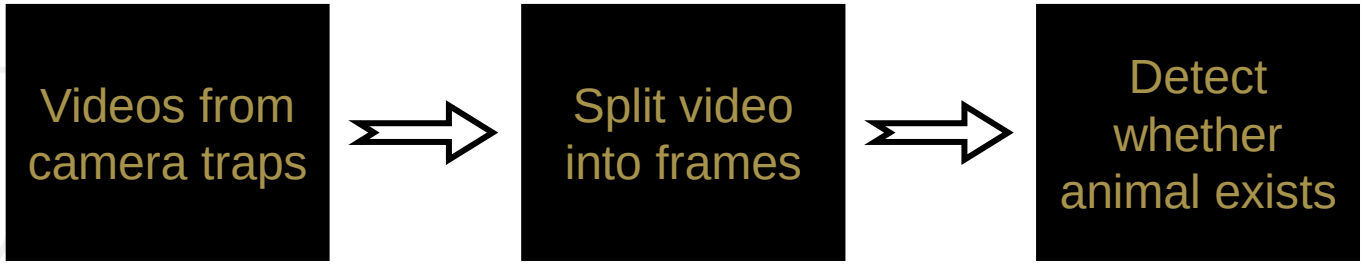

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TensorFlow Object Detection – pretrained model to identify "animal objects" and simultaneously exclude humans

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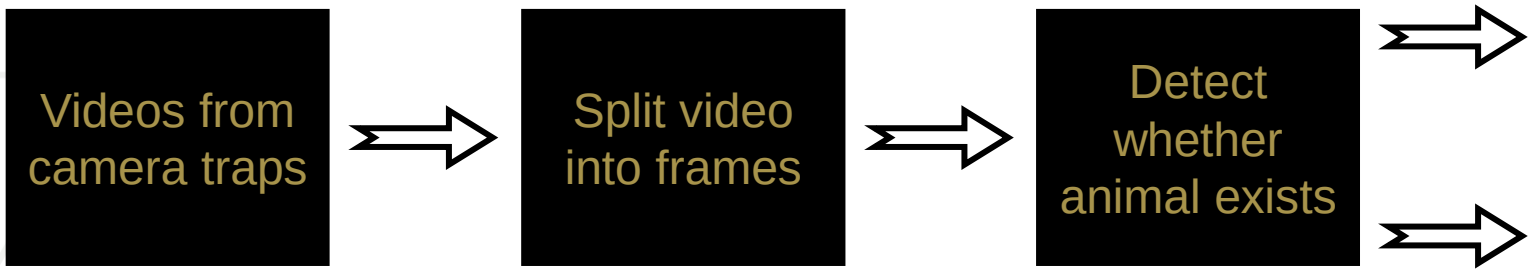

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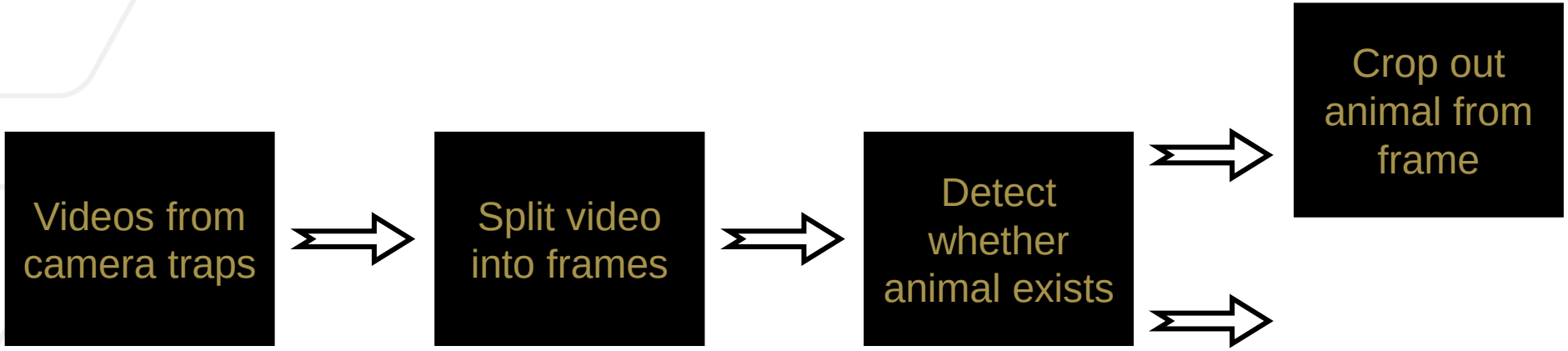

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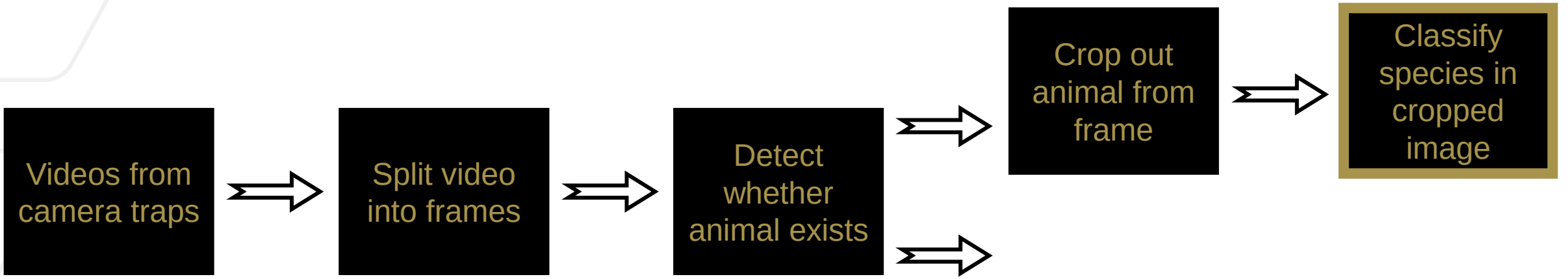

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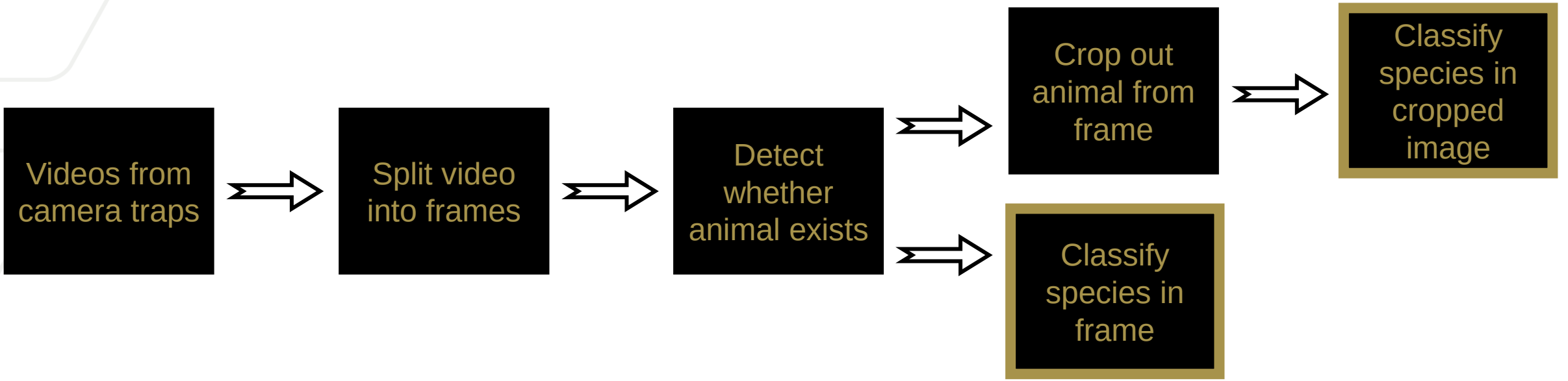

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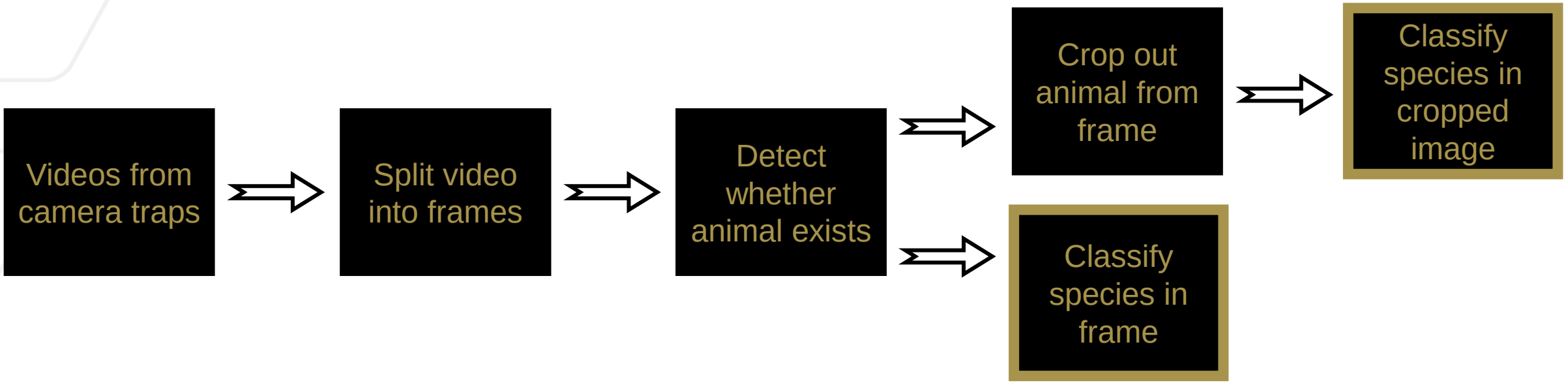

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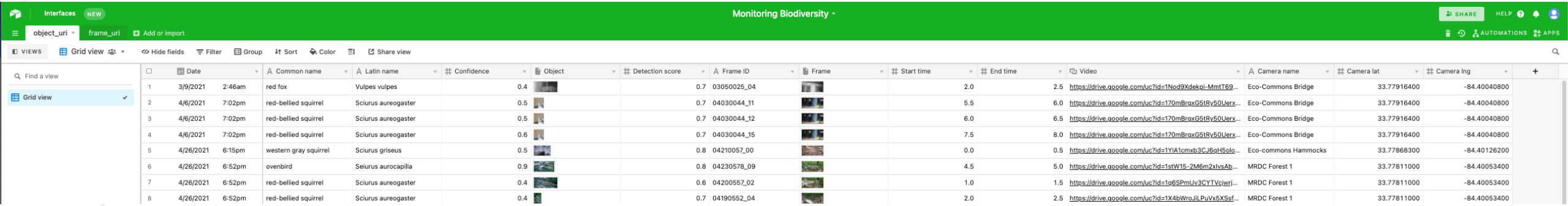
TensorFlow Object Detection – pretrained model to identify "animal objects" and simultaneously exclude humans

TensorFlow Image Classification and Microsoft Species Classification – pretrained models to classify species

Results

- Airtable
- Threshold for confidence at each step
- Comparison of two different ways of classifying

- Screenshot of Airtable to display results to others



	Date	Common name	Latin name	Confidence	Object	Detection score	Frame ID	Frame	Start time	End time	Video	Camera name	Camera lat	Camera lng
1	3/9/2021 2:46am	red fox	Vulpes vulpes	0.4		0.7	03050025_04		2.0	2.5	https://drive.google.com/uc?id=1Nod9Xdekpi-MmtT69...	Eco-Commons Bridge	33.77916400	-84.40040800
2	4/6/2021 7:02pm	red-bellied squirrel	Sciurus aureogaster	0.5		0.7	04030044_11		5.5	6.0	https://drive.google.com/uc?id=170mBrqxG5tRy50Uerx...	Eco-Commons Bridge	33.77916400	-84.40040800
3	4/6/2021 7:02pm	red-bellied squirrel	Sciurus aureogaster	0.5		0.7	04030044_12		6.0	6.5	https://drive.google.com/uc?id=170mBrqxG5tRy50Uerx...	Eco-Commons Bridge	33.77916400	-84.40040800
4	4/6/2021 7:02pm	red-bellied squirrel	Sciurus aureogaster	0.6		0.7	04030044_15		7.5	8.0	https://drive.google.com/uc?id=170mBrqxG5tRy50Uerx...	Eco-Commons Bridge	33.77916400	-84.40040800
5	4/26/2021 6:15pm	western gray squirrel	Sciurus griseus	0.5		0.8	04210057_00		0.0	0.5	https://drive.google.com/uc?id=1YlA1cmxb3CJ6qH5olo...	Eco-commons Hammocks	33.77868300	-84.40126200
6	4/26/2021 6:52pm	ovenbird	Seiurus aurocapilla	0.9		0.8	04230578_09		4.5	5.0	https://drive.google.com/uc?id=1stW15-2M6m2xlvsAb...	MRDC Forest 1	33.77811000	-84.40053400
7	4/26/2021 6:52pm	red-bellied squirrel	Sciurus aureogaster	0.4		0.6	04200557_02		1.0	1.5	https://drive.google.com/uc?id=1q6SPmUv3CYTVcjwrj...	MRDC Forest 1	33.77811000	-84.40053400
8	4/26/2021 6:52pm	red-bellied squirrel	Sciurus aureogaster	0.4		0.7	04190552_04		2.0	2.5	https://drive.google.com/uc?id=1X4bWroJiLPuVx5XSsf...	MRDC Forest 1	33.77811000	-84.40053400

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Conclusion

- Pipeline is developed to remove manual labor in the post-processing phase after collecting videos
  - Less concerned about humans in videos
  - Data ingestion and analysis foundation is set with this pipeline
  - Can be built out more over time
  - Replicable and scalable
- Pretrained models are powerful and not too hard to use!
  - Human validation is necessary, but models allow for less man hours and more manageable data
- Develop strong partnerships to make your effort more meaningful and your results more long term

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Future Research

- Compare different pre-trained models and test performance against human labeled dataset
- Develop model that is specifically trained on common species in the Southeast
- Separate out by different fauna: birds vs rodents
- Can develop similar pipeline for audio data to focus in on birds and insects
  - Dr. Weigel's team has microphone data as well
- Develop a mapping system that tracks animals as they move across campus
- All the findings can be shared with other cross-disciplinary research teams to mutually work towards tying back to the Petals
  - urban agriculture
  - biophilic environment
  - universal access to nature and place

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