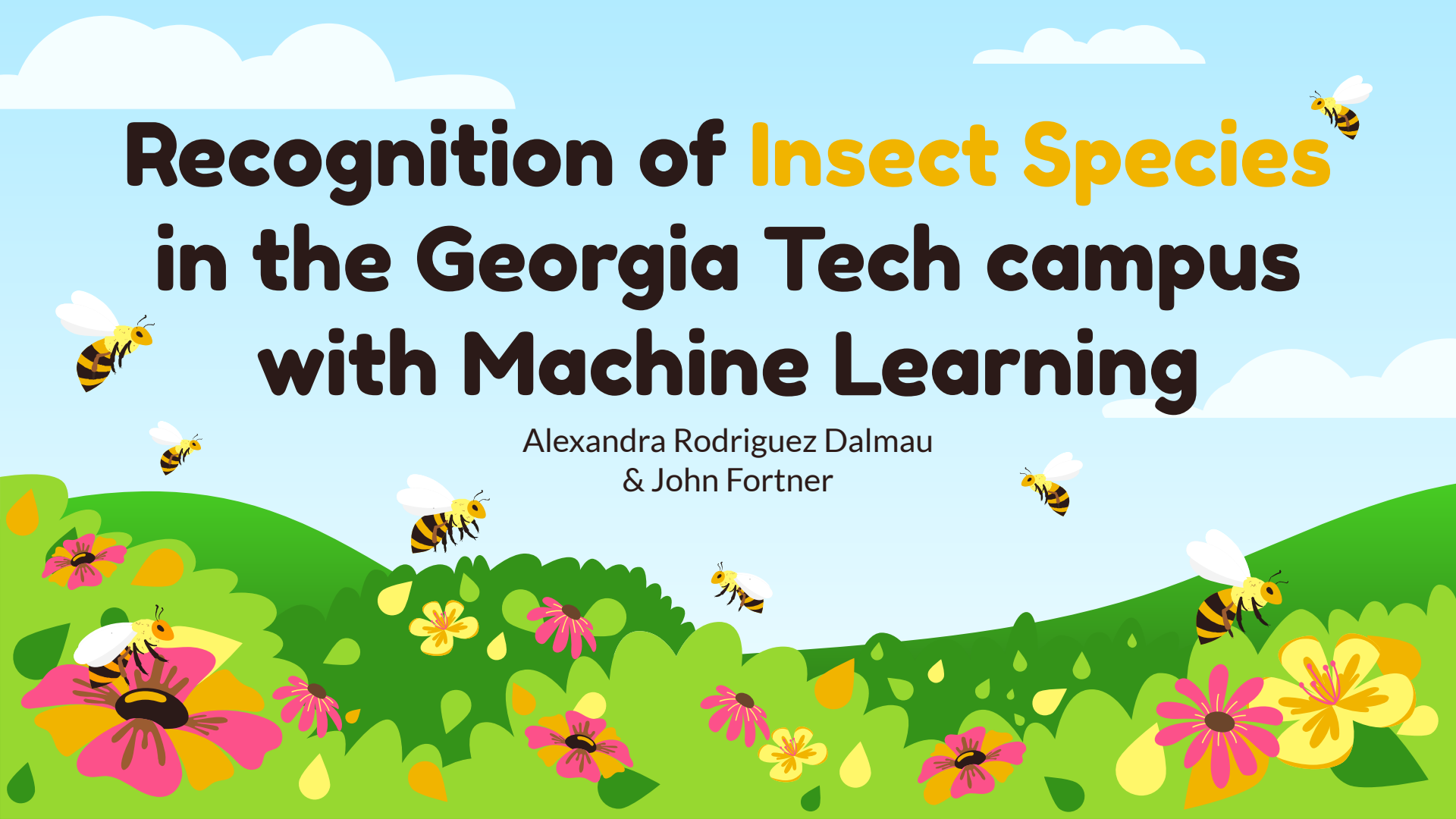


Recognition of **Insect Species** in the Georgia Tech campus with Machine Learning

Alexandra Rodriguez Dalmau
& John Fortner



01

Research Questions

RQ1: What are the most commonly seen insects found on the Georgia Tech campus?

RQ2: Can machine learning be used to identify insects present on the Georgia Tech campus?



Methodology

Insects @GT



- Walks arounds GT campus
- Google forms
- iNaturalist

ML

- Created a convolucional neural network with PyTorch
- Collected images from iNaturalist
- Powered by Google Colab





The Gulf fritillary
(Dione vanillae)



**Common eastern
bumble bee**
(Bombus impatiens)



Fiery skipper
(Hylephila phyleus)



Western honey bee
(Apis mellifera)



Asian lady beetle
(Harmonia axyridis)



**Cloudless Sulphur -
Phoebis sennae**
(Linnaeus)



Hunter Wasp
(Chlorion aerarium)



Roly Poly
(Armadillidiidae)



Native

The Gulf fritillary
(Dione vanillae)



Native

Common eastern bumble bee
(bombus impatiens)



**Non-native
Widely
established**

Fiery skipper
(Hylephila phyleus)



**Non-native
Widely
established**

Western honey bee
(Apis mellifera)



Invasive

Asian lady beetle
(Harmonia axyridis)



**Non-native
Widely
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**Cloudless Sulphur -
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Native

Hunter Wasp
(Chlorion aerarium)



Invasive

Roly Poly
(Armadillidiidae)

Types of bees

Common Eastern Bumble Bee

Bombus impatiens

- Native to eastern United States
- Very common across eastern North America
- Very important as a pollinator



Western Honey Bee

Apis mellifera

- Not native to North America, though are now widespread across the world
- Mostly domesticated, though feral honey bees can displace native populations



Classification of species



Goal

Take in images of *Bombus impatiens* and *Apis mellifera*.
Returns which species is in the image!

How?

Data from iNaturalist, PyTorch
Convolutional Neural
Network



Convolutional Neural Network

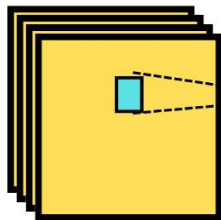
Structure



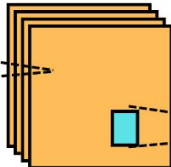
Input



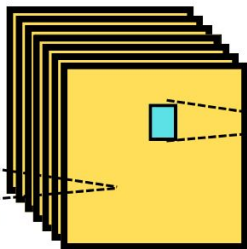
Convolutional Layer



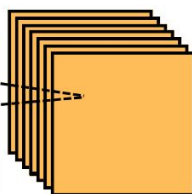
Pooling Layer



Convolutional Layer



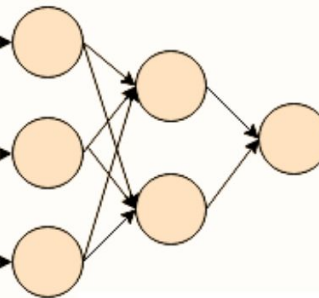
Pooling Layer



Flattening



Three Fully Connected Layers



Output

"Apis mellifera"

Did it work?

01

Accuracy

After training for 10 epochs, we got a testing accuracy of 65%

02

Potential

We could expand this model to include other species of insects.

03

Runtime

The model took about 2 hours to train for 10 epochs with about 2250 images of each species.

04

Size

This model is quite large, even while shrinking the images to 200x200.



How can we **improve?**

Structured Data

Have a system to identify and count insects. Account for bias.

Larger Model

Model and size of inputs could be made larger and more robust - bottleneck is computational power and time

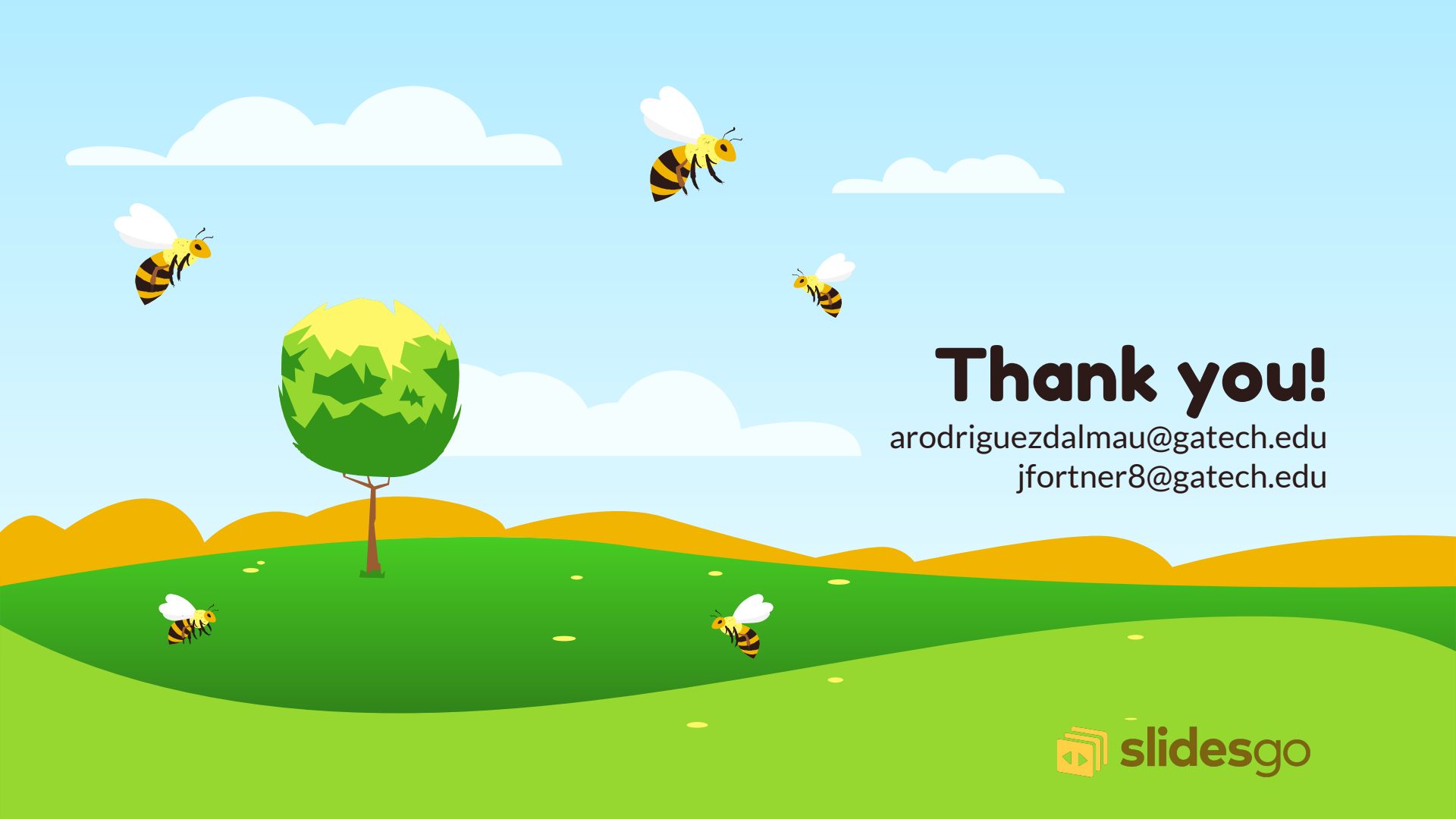
Refer to entomologists

More in depth research about the role of some species in the GT ecosystem

More Data

More images always helps, as well as resources for storing them efficiently





Thank you!

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Data citations

01

Bombus impatiens Cresson

GBIF.org (17 April 2023) GBIF Occurrence Download <https://doi.org/10.15468/dl.ubued6>

02

Apis mellifera

GBIF.org (17 April 2023) GBIF Occurrence Download <https://doi.org/10.15468/dl.gzzbu7>

