



Insect-Foundation: A Foundation Model and Large-scale 1M Dataset for Visual Insect Understanding

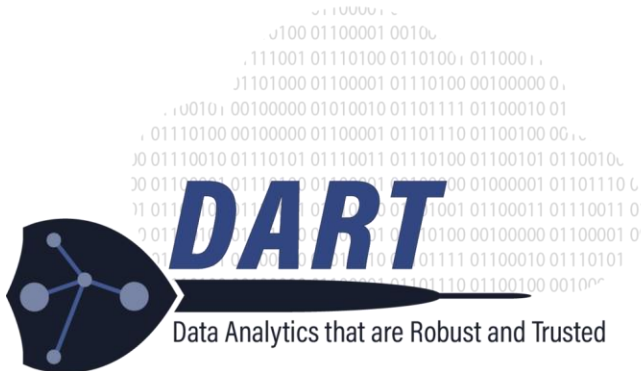
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https://uark-cviu.github.io/projects/insect_foundation.html



Visual Insect Understanding



Classification



Prediction

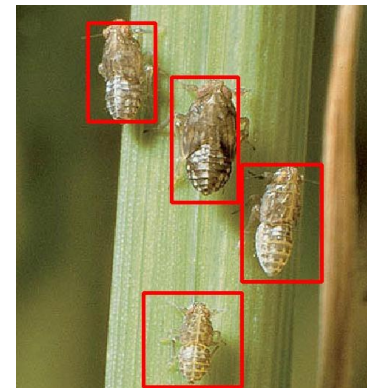
“Rice Leaf Roller”



Detection

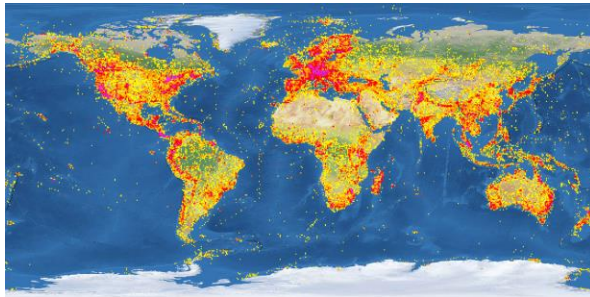


Prediction



Motivation - Dataset

Real-world scenario



~5.5 million different insect species

Previous datasets

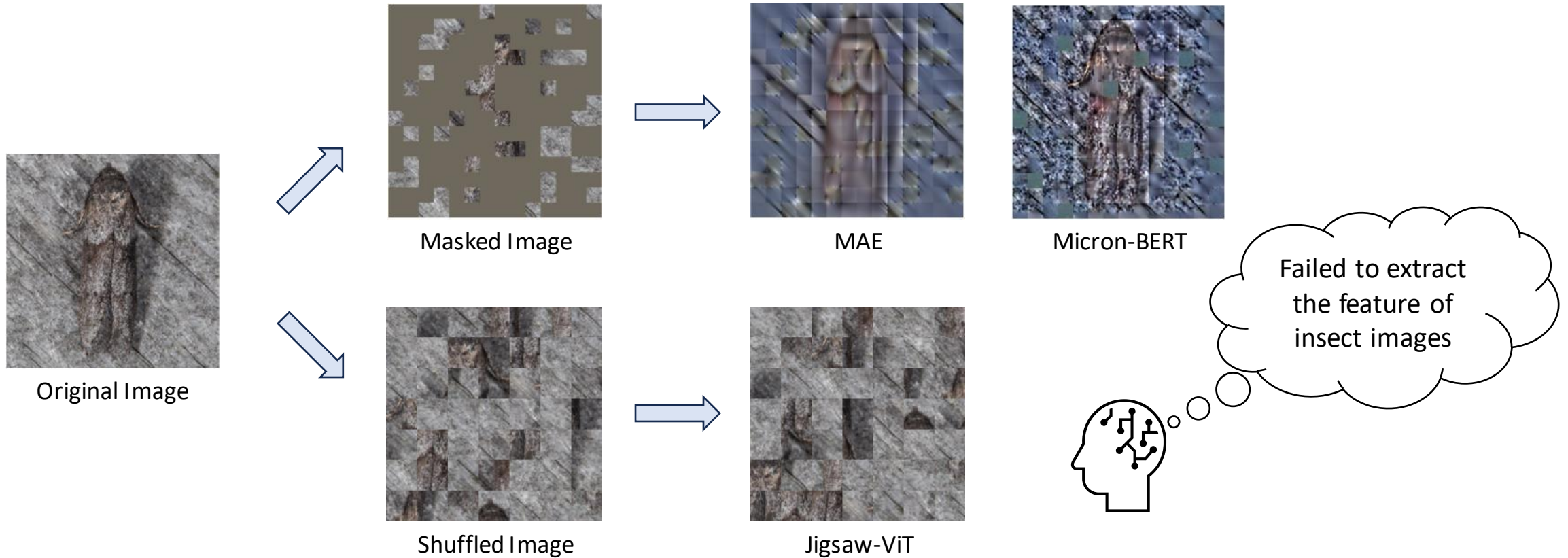
Dataset	Year	Species	Descriptions	Number of Samples
PestNet [1]	2019	16	x	88,670
IP102 [2]	2019	102	x	75,222
AgriPest [3]	2021	14	x	49,707
INSECT [4]	2021	1,213	x	21,212
iNat-2021 [5]	2021	2,752	x	723,816

Low number of species and samples



Introduce a novel high-volume dataset with sample descriptions

Motivation - Model



Contributions

- Insect-1M dataset
 - Over 1 million samples of images
 - Dense identifications of taxonomy hierarchy
 - Detailed descriptions of insect features
- Insect Foundation Model
 - Patch-wise Relevant Loss
- The SOTA performance on Visual Insect Understanding benchmarks

Insect-1M Dataset

1. Data collection



Internet

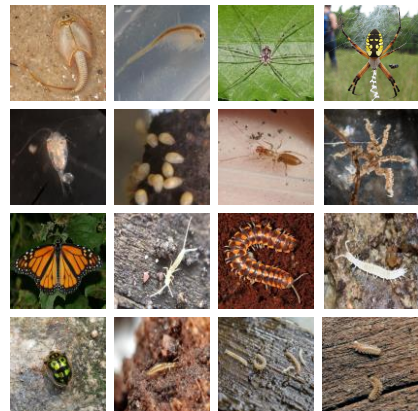


Entomology libraries



2. Data labeling

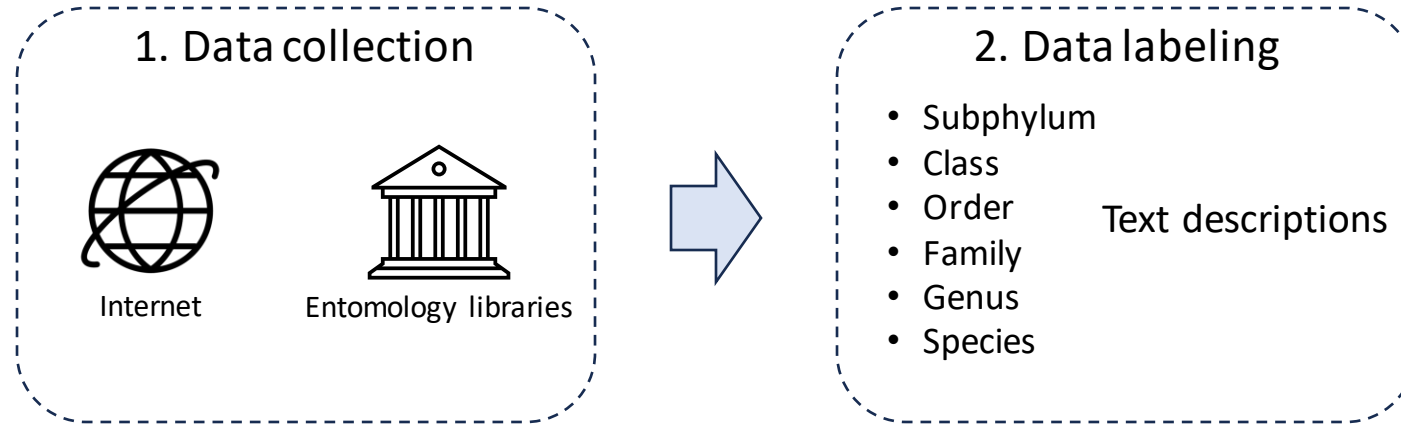
- Subphylum
- Class
- Order
- Family
- Genus
- Species



> 1 million



Insect-1M Dataset



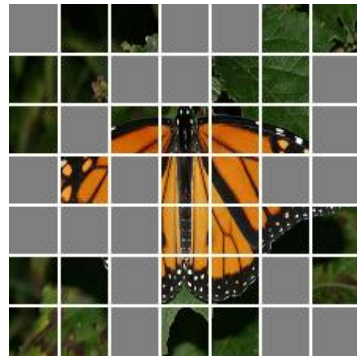
Genus: Argiope
Description: They own black and yellow patterning all around their body, occasionally on their legs. Their legs mainly being black, with red or yellow patterning closer to the body. Their cephalothorax is covered with short silver hairs. They own an egg shape abdomen.

Species: Aurantia
Description: Stabilimentum (reinforced area) in web makes a vertical zigzag band above and below the middle of the web. Juveniles make a circular stabilimentum in the center of the web.

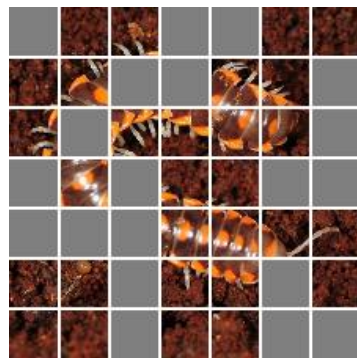
Family: Araneidae
Description: The Araneidae are ecribellate, entelegyne, three-clawed spiders, having eight eyes in two rows. The lateral eyes are usually adjacent and some distance from the medians; the four medians form a trapezoid.

Black and Yellow Argiope

Insect Foundation Model

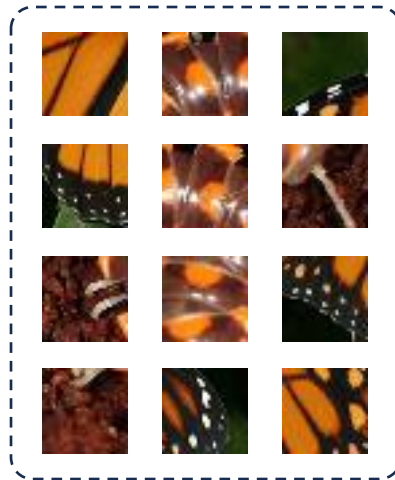


Masked Monarch



Masked Euryurus

Pool of insect
image patches



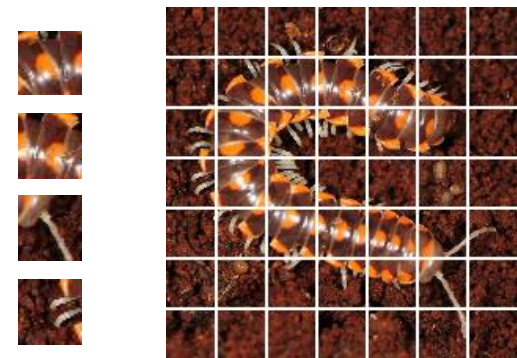
Which patches
belong to the
Monarch/Euryurus?



Patch-wise Relevant Attention

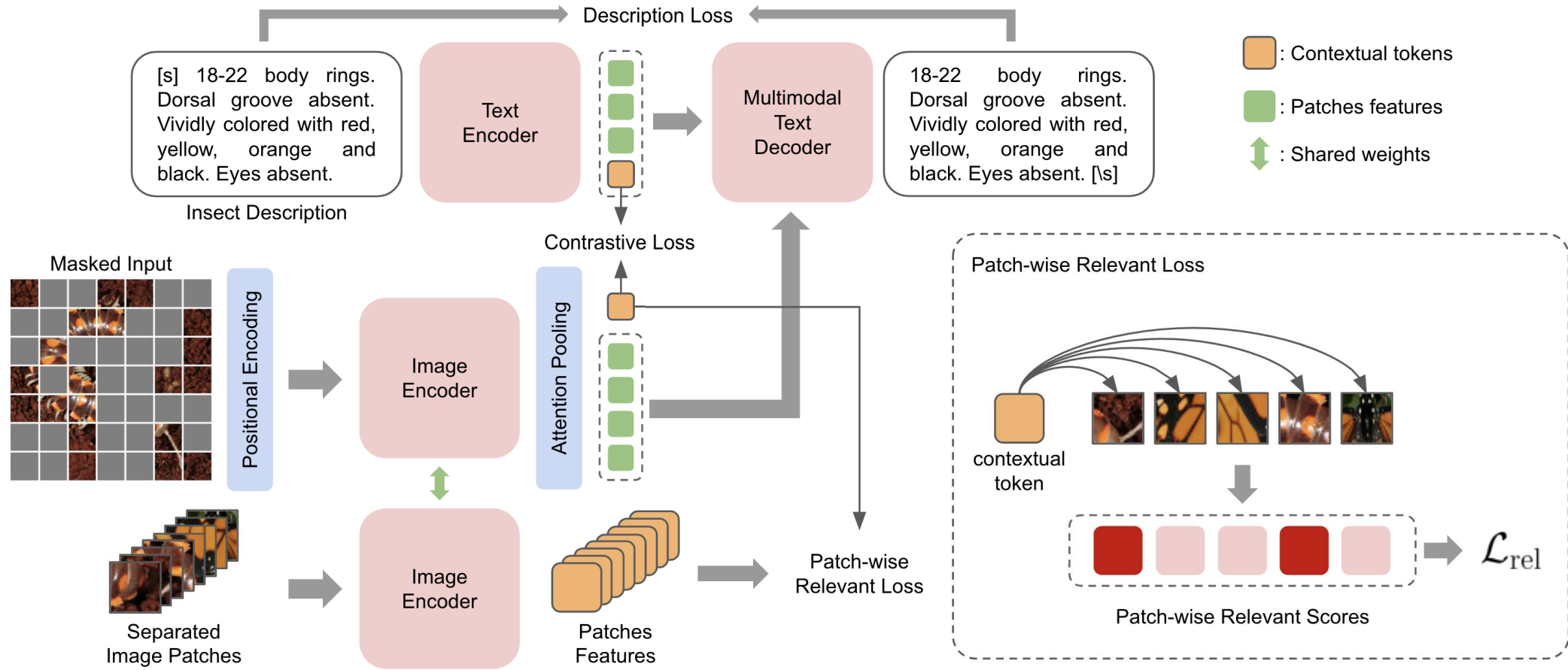


Completed Monarch



Completed Euryurus

Insect Foundation Model



Video Demo

Attention Comparison between Masked Autoencoder (MAE) and our Insect Foundation Model

MAE [1]

Ours



Thank you for watching

Contact: CVIU Lab - <https://uark-cviu.github.io/>

