iCrow

An AI powered scarecrow to protect your home garden from animal pests
Our Team

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Home Gardening in the US

1 in 3 American households do home/community gardening.

Estimated spend of over 50 billion dollars annually.

Animal pests damage crop and carry over 60 diseases.

... have safety concerns, are expensive & need maintenance.

Deterrents include chemicals, fence and pet dogs, which ...
## The Problem with Current Solutions...

<table>
<thead>
<tr>
<th>Problems...</th>
<th>We introduce a device that...</th>
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<tbody>
<tr>
<td>01</td>
<td>Current deterrent strategies fall short</td>
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<tr>
<td>02</td>
<td>Different animals require different deterrent strategies</td>
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<tr>
<td>03</td>
<td>Effectiveness of repellent diminishes over time as pests become familiar with them</td>
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Our Mission

Create a **one stop solution** to protect and **monitor** your home garden from common animal pests **without chemicals**, at a **low cost**, requiring **minimal maintenance** and **without the commitment of owning a pet**.
Enter iCrow

A compact, low-maintenance, visual and auditory scare device

Features

1. Support multiple AI-powered cameras to identify the type of animal

2. Animal specific deterrent is applied

3. Deterrent varies each time to maintain “surprise” effect

4. Both visual and auditory deterrent available depending on time of the day

5. Custom dashboard provides analytics of pests in your garden
iCrow Dashboard in Action
End to End Architecture - Inputs & Outputs

- Camera + Motion Capture
- Inferred pest
- Deterrent deployed
- Web UI for sightings
- Statistical visualizations
End to End Architecture - Assumptions & Choices

1. Cheap and low power device
2. WiFi access in the garden
3. Use Tensorflow

Raspberry Pi + Motion Detection + TF Lite
Model Overview

- **Data**
  - Caltech Camera Trap dataset*
  - 243,100 images

- **Transfer learning**
  - InceptionV3 trained on ImageNet
  - Custom dense layers on top

- **Model Structure**
  - Model 1: Original InceptionV3
  - Model 2: Frozen body + custom top layers
  - Model 3: Custom top layers + fine tuning full model

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*http://lila.science/datasets/caltech-camera-traps
Model Evaluation

- Fine tuned model performs the best, followed by the model with custom top layers
- “Empty” and “other” classes have high precision and low recall, as opposed to the rest of the classes
- Model achieved 63% accuracy on binary class
Key Technical Takeaways

● Modelling: Weighted error by class
  ○ For class imbalance

● Modelling: Image pre-processing
  ○ Saves time for training for frozen layers

● Edge device: Quantized model saves compute requirements
  ○ ~80mb to 20mb with 97% recall

● Edge device: multiple python processes over threads
  ○ python-tensorflow is inherently only built for single-threaded workloads
  ○ A single python process couldn’t manage two camera devices with OpenCV

● Web Backend: Use datastores optimized for your data
  ○ Store images in S3 and inference data in Postgres
User Feedback

We are building a smart scarecrow device that can identify common animals harmful to home gardens like rabbits and squirrels. Once it sees an animal it uses light and sound to scare them away. Would you be interested in using it for your garden? Learn more here: http://www.icrow.us/

37 responses

Would you recommend this project to any friends or family who own home gardens? Learn more here: http://www.icrow.us/

37 responses
Future Roadmap

- Reinforcement learning with user feedback
  - Push updated models to user device
- More deterrents, more analytics
- Model with bounding box
- Build iCrow community for users

Image courtesy of https://www.gardeners.com/how-to/community-gardening/7339.html