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Lead Instructor: Bruce Bolden – **Client:** Dev Shrestha

Objective

The purpose of this project is to identify and classify different weeds from the air in real-time, utilizing machine learning to process the images.

Background & Value Proposition

- The RPi does not possess a dedicated graphics processing unit and therefore requires the NCS2 to aid in the classification of different weeds at least 10 frames/sec.
- When paired, the two can accomplish the computationally heavy task of real-time object detection while also using the RPi HQ camera.
- Pesticides are currently being sprayed by agricultural aircraft. Our suggestion is to automate the process by using a lightweight drone paired with the RPi setup to improve precision and efficiency.

Key Requirements

Functionality:

- Perform real-time object detection
- Achieve a 90% accuracy rate

Environment:

- Function properly in good weather conditions

Durability:

- 27-minute operation time (drone battery capacity)

Physical Properties:

- Lightweight (< 2lbs)

Logistics:

- Low-cost
- Energy efficient



Concept Development

TensorFlow

- Offers a variety of pre-trained models
- Offers tools such as TensorBoard to view training
- Compatible with NVIDIA GPU's



SSD MobileNet

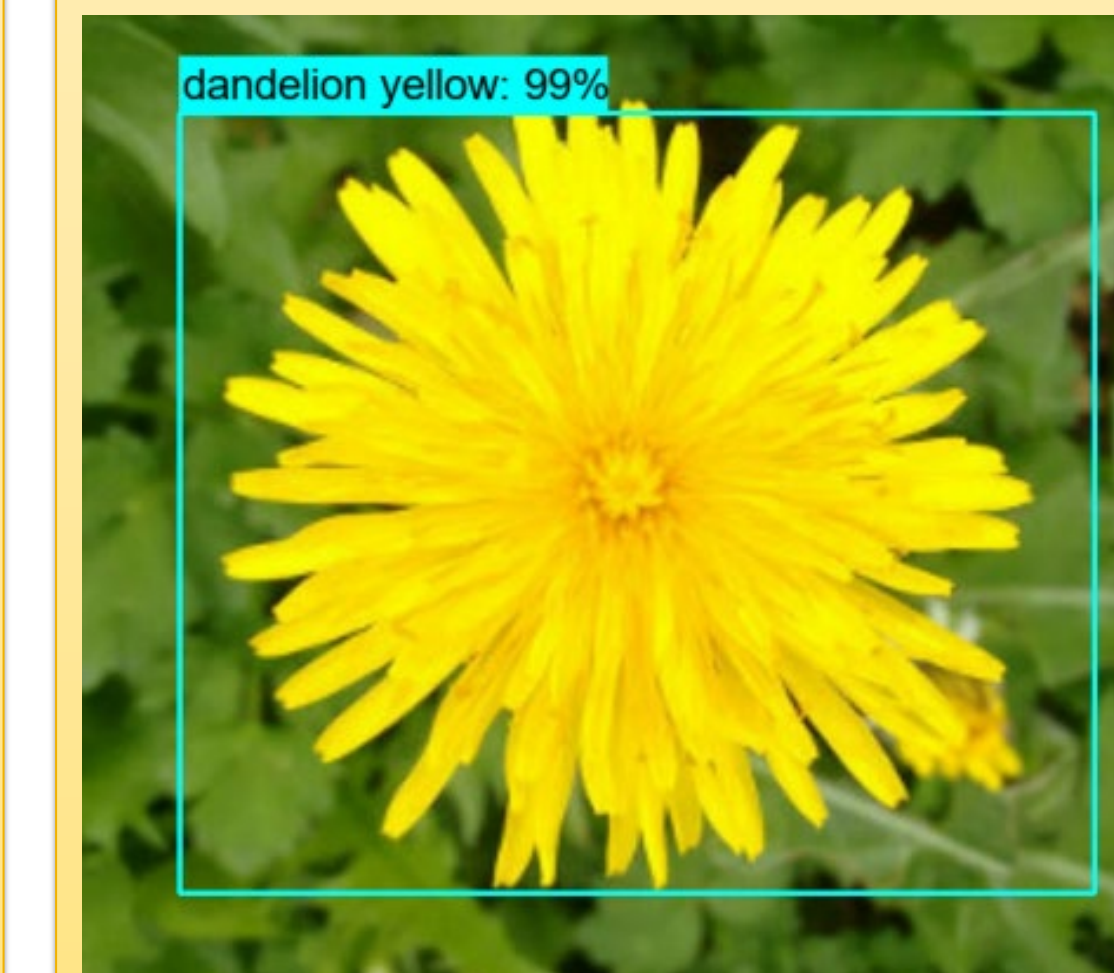
- Compatible with NCS2 and RPi
- Fast, commonly used model



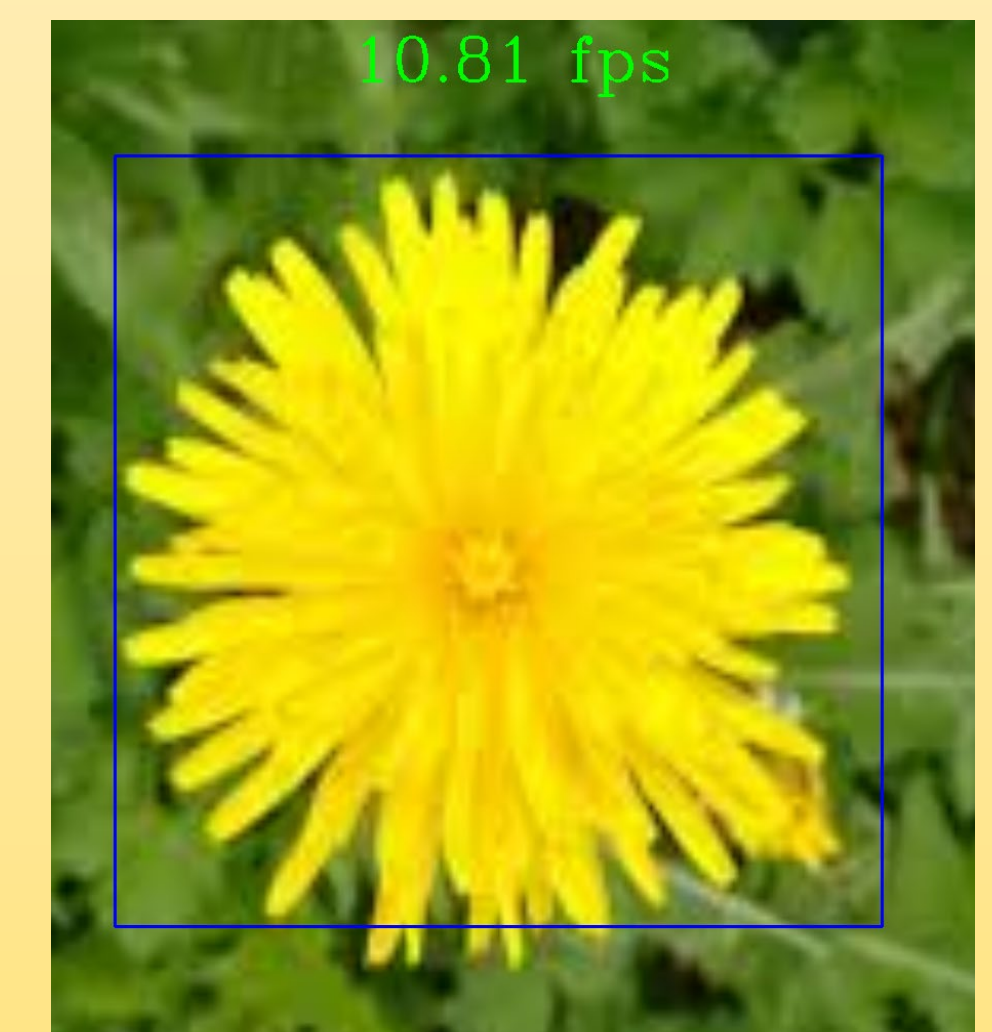
Design Validation

Current Model

- Classes:
 - Dandelion
 - Clover
 - Yellow Wood Sorrel
 - Bull Thistle
 - Bindweed
- 148 training images
- 20K steps
- Precision: 96%
- Recall: 65%



Model on GPU



Model on Pi

Final Design



Final Design Includes: RPi, NCS2, External Battery Pack, and HQ Camera Component

Future Recommendations

- Develop custom Python script for running model
- Incorporate SDK and RPi to utilize drone camera
- Test the system on Agricultural Spray-Drones
- Compare Google Coral USB with Intel NCS2
- Retrain model with a larger training dataset

Acknowledgements

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