Capstone Project 1

Image Recognition for Invasive Species Management

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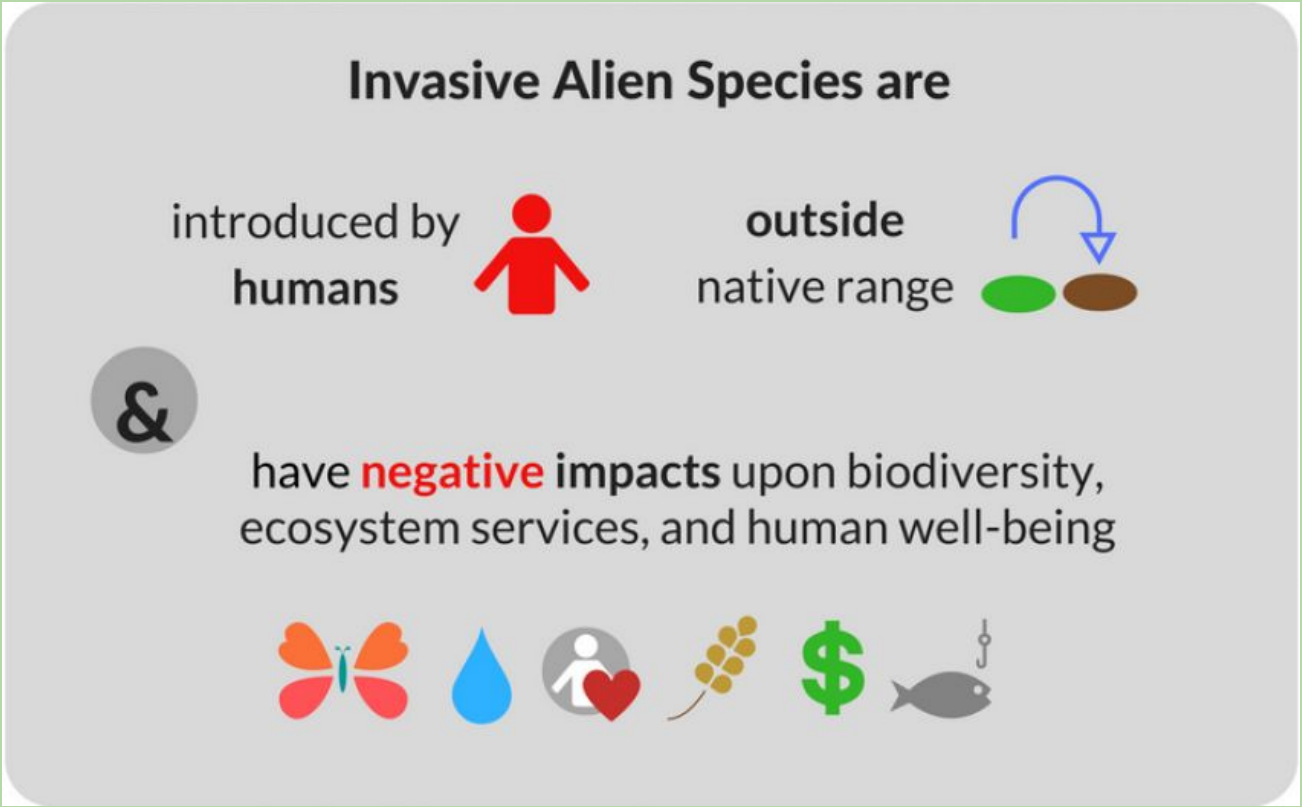
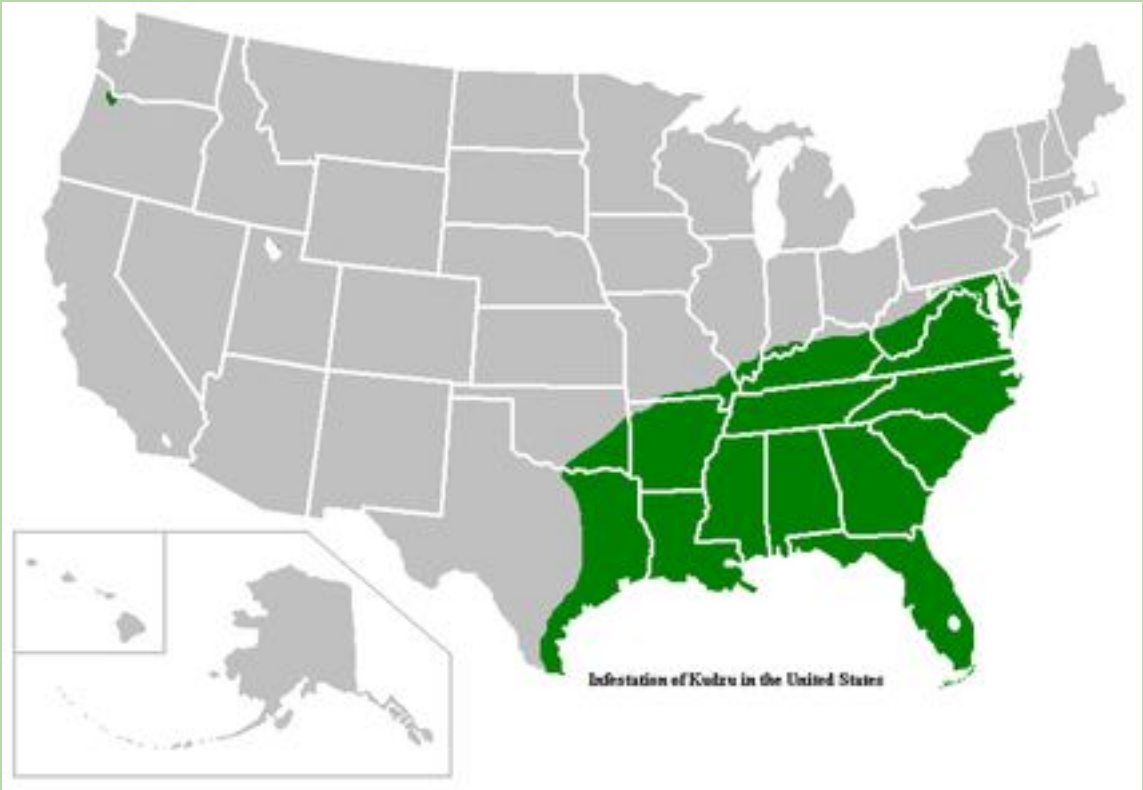
The Problem of Invasive Species



Source: https://www.iucn.org/theme/species/our-work/invasive-species/honolulu-challenge-invasive-alien-species/why-honolulu-challenge

Kudzu



Kudzu, *Pueraria lobata,* is a vine native to Asia, specifically parts of Japan and Southeast Asia. It grows at a rate of one foot per day until maturation (when it reaches approximately 100 feet long).

The economic cost of maintaining Kudzu ranges from $100-500 million yearly. It has become an issue in National Parks as Kudzu has invaded hundreds of acres of land.

Project

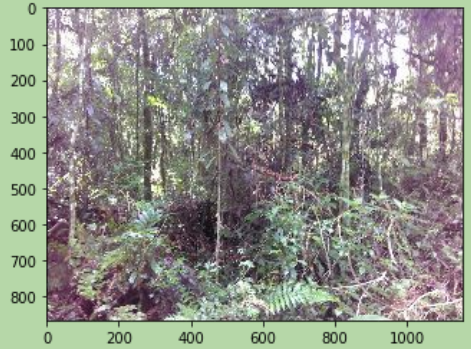
- There is a need to upscale the detection efficiency of kudzu in the field.
- Advances in deep learning algorithms can provide a solution.
- Image recognition through CNNs will be implemented to discriminate between invaded and non-invaded sites.

Model

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 864, 1152, 12)	336
conv2d_1 (Conv2D)	(None, 862, 1150, 24)	2616
max_pooling2d (MaxPooling2D)	(None, 431, 575, 24)	0
conv2d_2 (Conv2D)	(None, 429, 573, 24)	5208
dropout (Dropout)	(None, 429, 573, 24)	0
flatten (Flatten)	(None, 5899608)	0
dense (Dense)	(None, 48)	283181232
dropout_1 (Dropout)	(None, 48)	0
preds (Dense)	(None, 1)	49

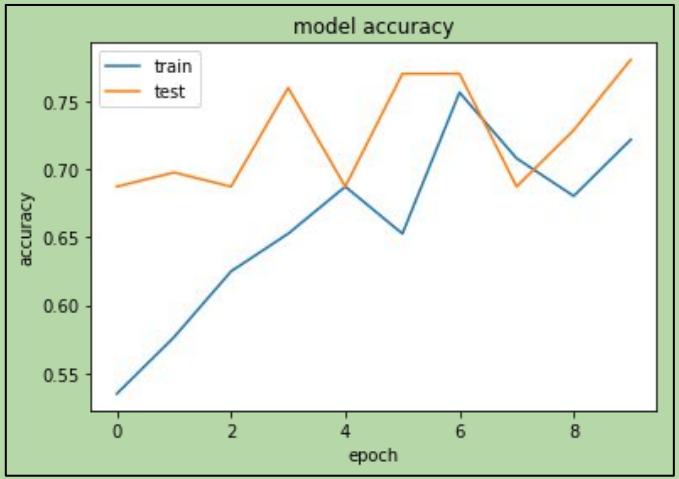
Total params: 283,189,441
Trainable params: 283,189,441
Non-trainable params: 0

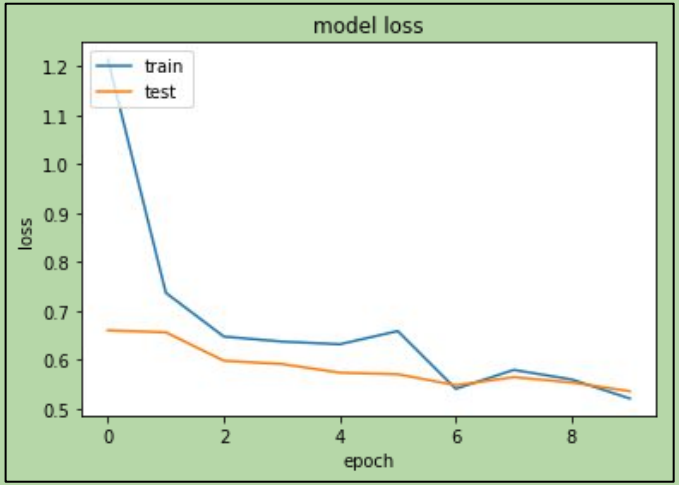


Results

Test loss: 0.5362207492192587
Test accuracy: 0.78125

Eval loss: 0.5362207492192587
Eval accuracy: 0.78125





First five probabilities:
[[0.80146617]
 [0.59831256]
 [0.8071442]
 [0.7685373]
 [0.48514572]]

First five class predictions:
[[1]
 [1]
 [1]
 [1]
 [0]]

The results are highly indicative that a CNN model needs a greater number of samples and epochs to train properly and learn to differentiate among the two types of vegetation for this problem. Given the extraordinary results of CNN models on image recognition I am am certain that the model presented in this project works effectively and will allow conservation managers to make informed decisions for the control of the highly invasive Kudzu.