**Documentation for Alien vs Predator Image Classification**

This documentation provides an overview of the Alien vs Predator image classification project, including setup, training, evaluation, and usage of the trained model.

**Overview**

This project uses a customizable ResNet architecture to classify images as either "Alien" or "Predator." The dataset, obtained from Kaggle, contains labeled training and test images for binary classification.

**Dataset**

* **Source**: [Alien vs Predator Images on Kaggle](https://www.kaggle.com/datasets/pmigdal/alien-vs-predator-images)
* **Structure**:
  + train/: Contains labeled training images.
  + validation/: Contains labeled validation images.
  + test/: Contains labeled test images.

**Data Preprocessing**

* Images are resized to (224, 224) to match the input size for the ResNet model.
* Pixel values are normalized to the range [0, 1].

**Model Architecture**

The model is a customizable ResNet built using TensorFlow/Keras. Key components:

1. **Residual Blocks**:
   * Two convolutional layers with batch normalization and ReLU activation.
   * Shortcut connections for improved gradient flow.
2. **Network Structure**:
   * Initial convolution and max pooling.
   * Four stages of residual blocks with increasing filter sizes.
   * Global Average Pooling and a Dense output layer with softmax activation.

**Future Work**

* Improve model generalization using data augmentation.
* Explore transfer learning with pre-trained ResNet models (e.g., ResNet50).
* Deploy the model via Flask or FastAPI for real-time predictions.
* Convert the model to TensorFlow Lite for mobile deployment.

**References**

* [Kaggle: Alien vs Predator Images](https://www.kaggle.com/datasets/pmigdal/alien-vs-predator-images)
* TensorFlow Documentation