SkyNet: Satellite Image Classification with Deep Learning

Welcome to our project, SkyNet. We'll explore satellite image classification using Convolutional Neural Networks (CNNs), uncovering its potential for environmental monitoring and other applications.

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The Challenge: Understanding Earth from Above

Satellite Images

Complex data capturing Earth's surface.

Classification Goal

Categorize images into predefined classes.

Applications

Environmental monitoring, agriculture, disaster response.

Dataset: Our Window to Earth

1 **20,000 Images**

Diverse categories: water, urban, desert, forest, mountains.

2 **Image Dimensions**

128x128 pixels, RGB format.

3 **Data Preprocessing**

Resizing, normalization, data augmentation.

Preprocessing: Preparing the Data

1. **Resizing**

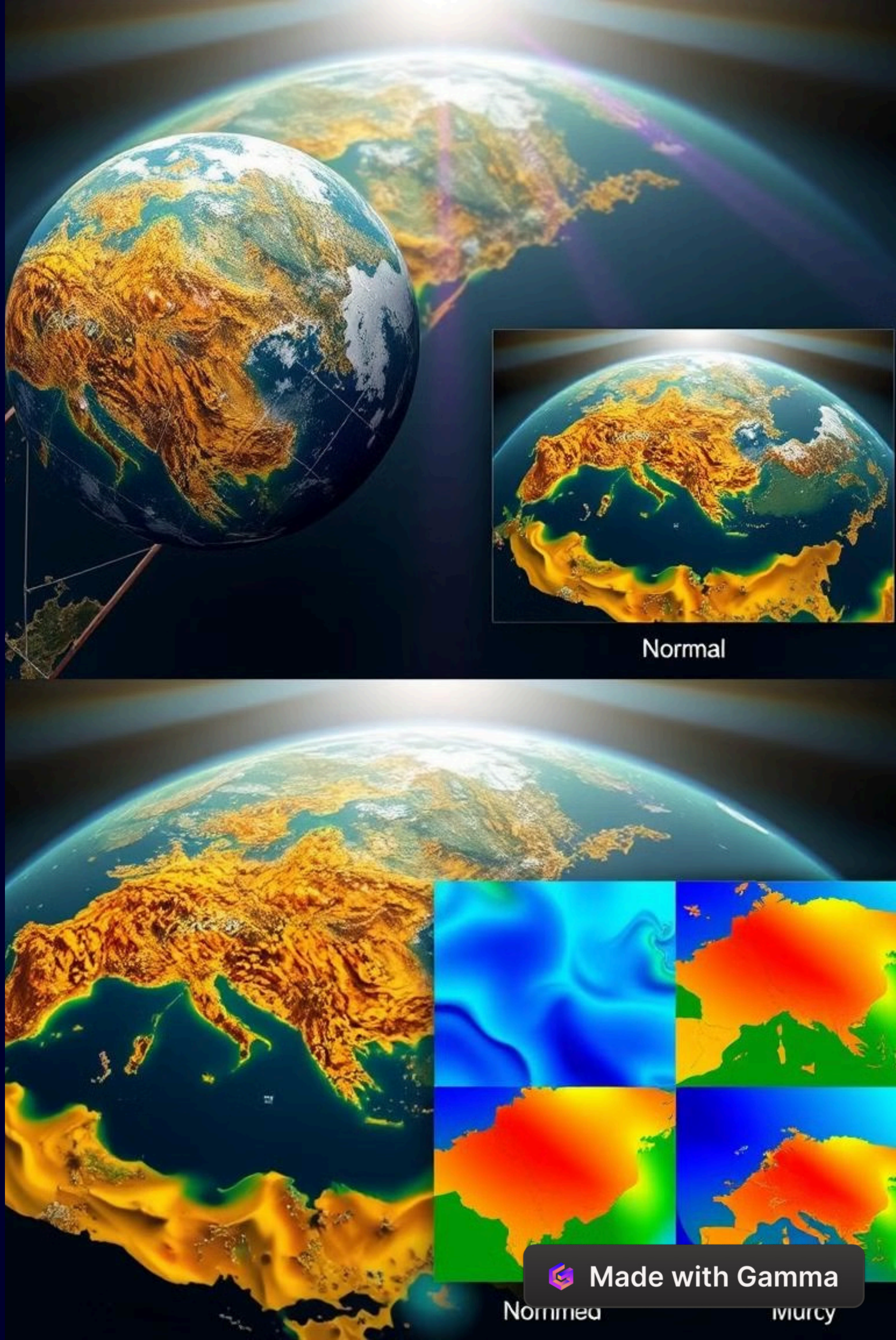
   Ensures uniform image size for consistent model input.

2. **Normalization**

   Scales pixel values for faster model convergence.

3. **Data Augmentation**

   Artificial increase in dataset size to reduce overfitting.



CNN Architecture: The Deep Learning Engine

1

Convolutional Layers

Extract features like edges and textures.

2

Pooling Layers

Downsampling for computational efficiency.

3

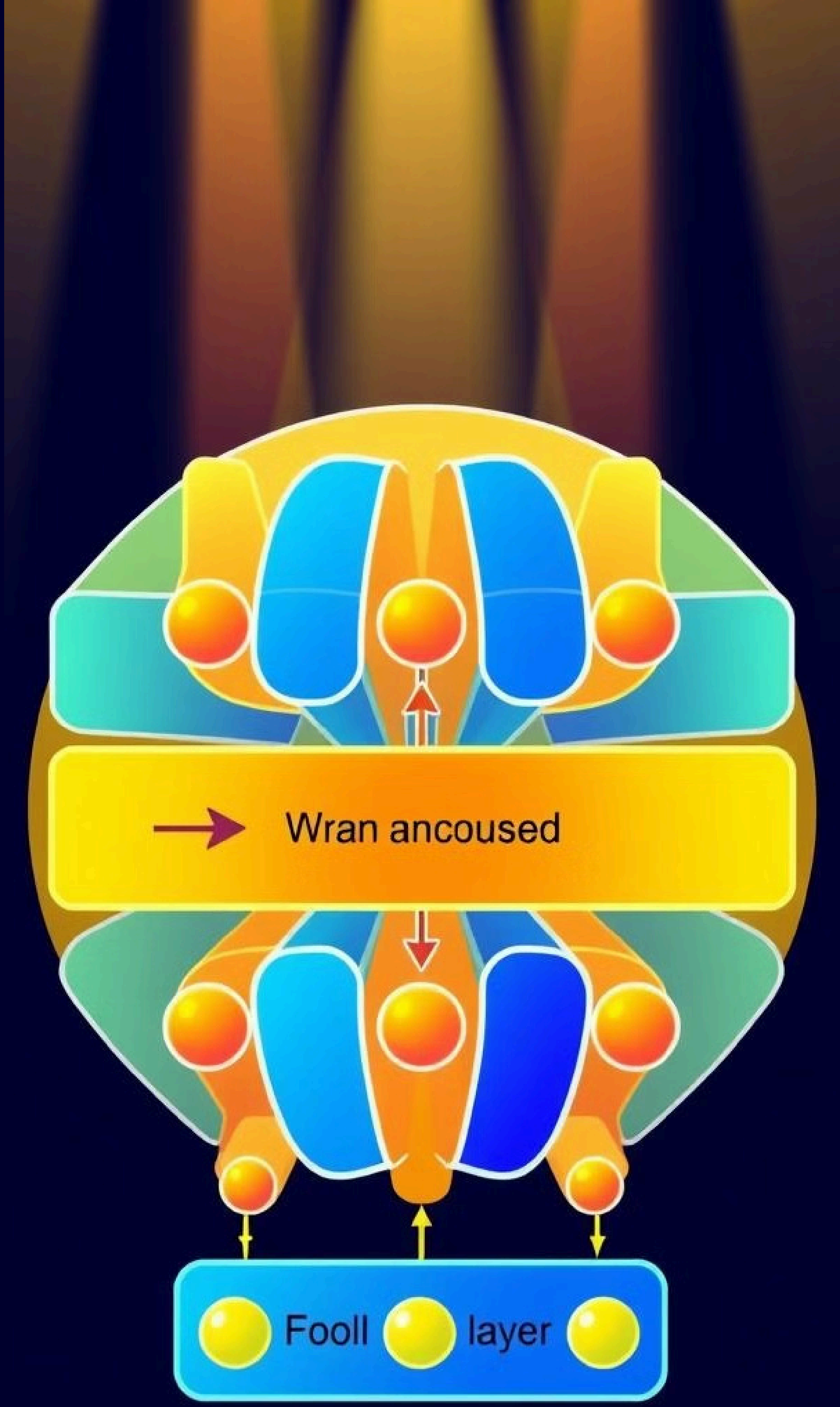
Dropout Layer

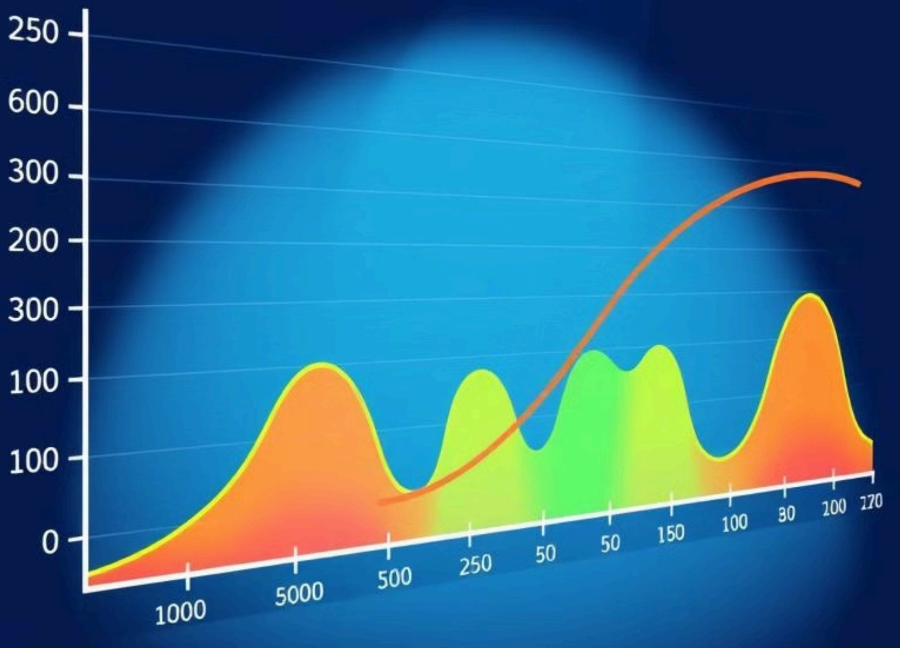
Prevents overfitting by randomly deactivating neurons.

4

Fully Connected Layer

Maps extracted features to final classification.





Training: Teaching the CNN to See

Loss Function

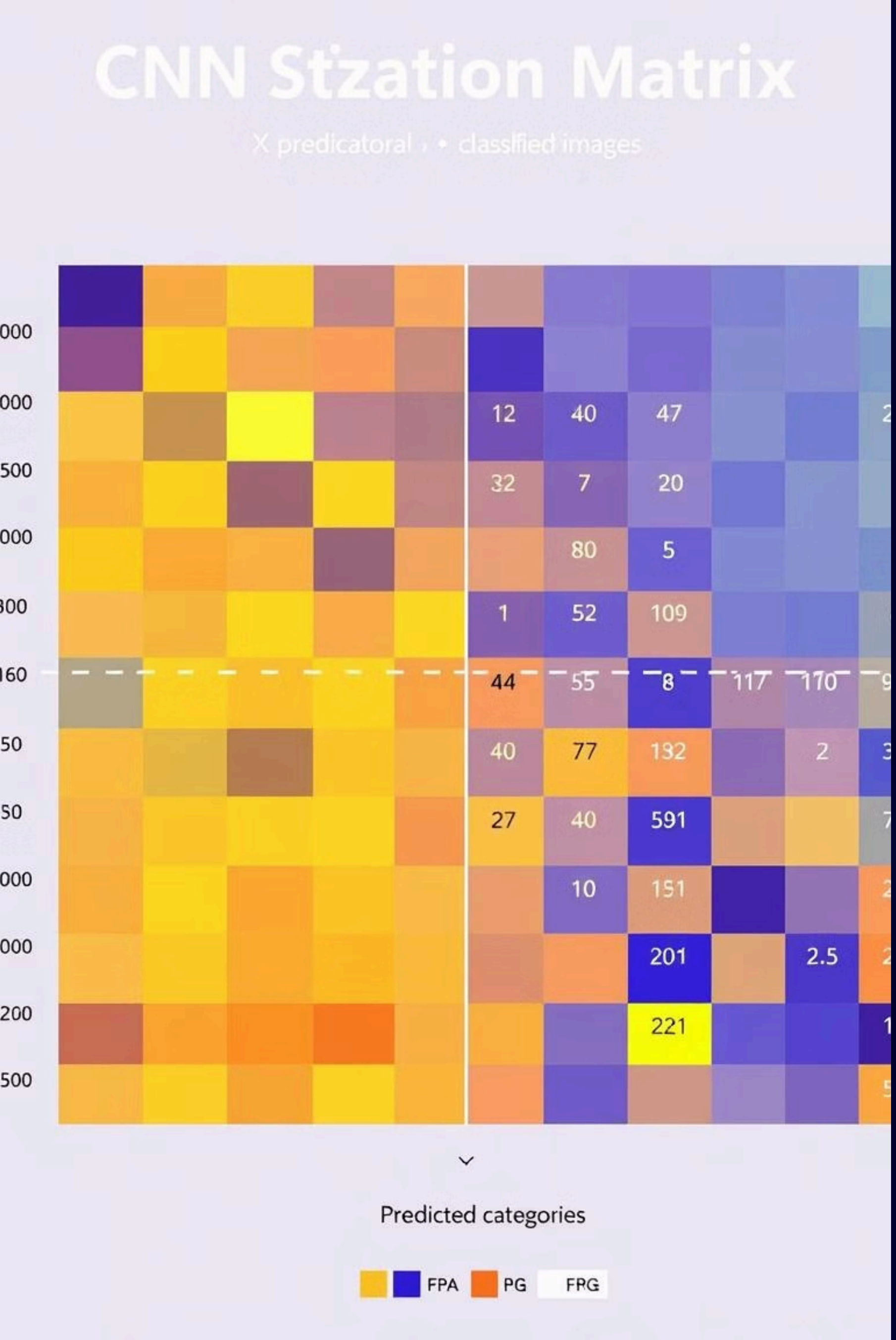
Categorical cross-entropy for multi-class classification.

Optimizer

Adam optimizer with adaptive learning rate.

Metrics

Accuracy and validation loss for model evaluation.



Evaluation: Measuring the CNN's Performance

Overall Accuracy	92%
Water	Highest Accuracy
Urban	Occasionally Misclassified as Desert

Deployment: Making the Model Accessible

Flask Framework

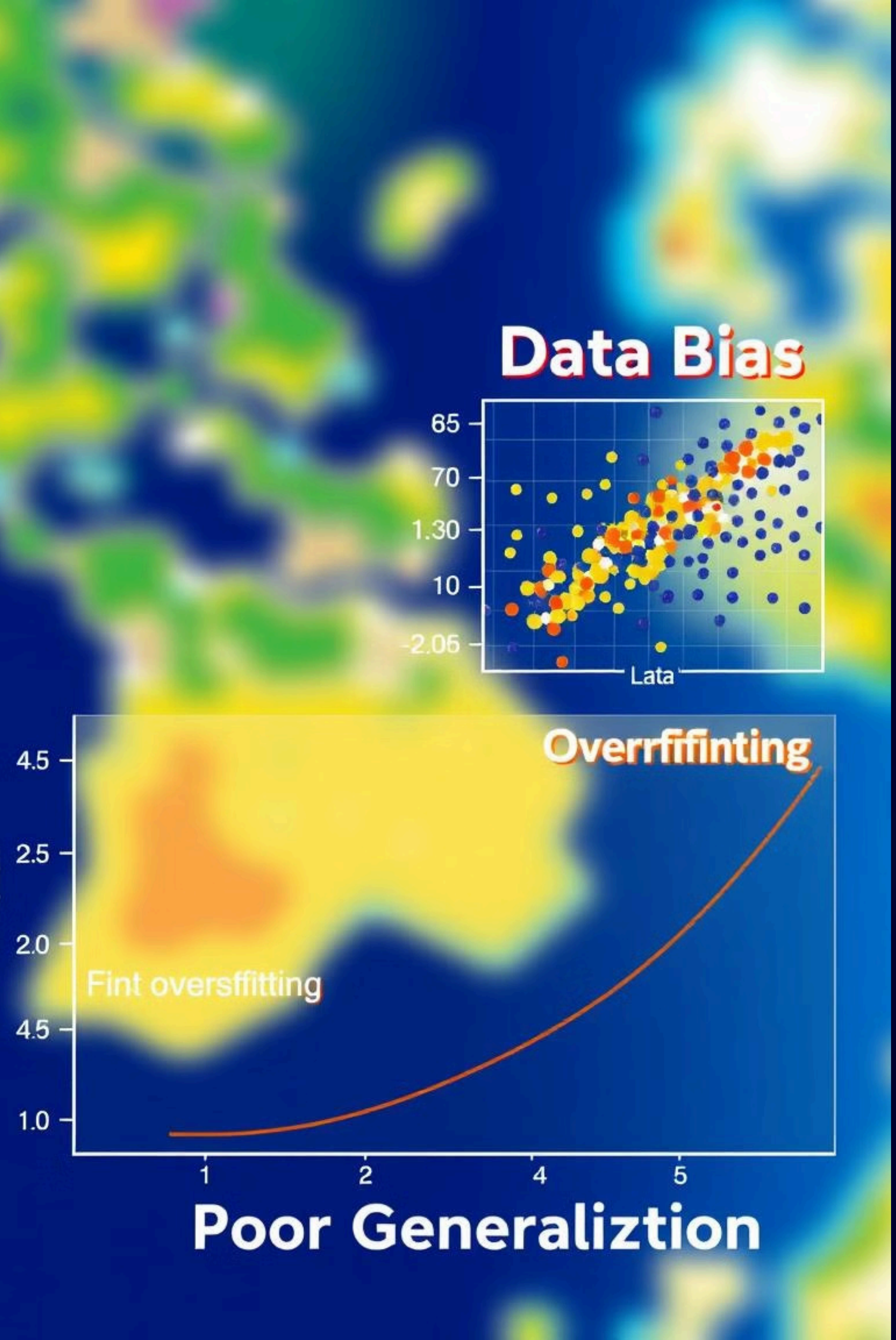
Creates a lightweight API for serving predictions.

Image Upload

API accepts satellite images as input.

Category Prediction

Returns the predicted category for the input image.



Challenges and Solutions

1 **Noisy Images**

Data augmentation techniques were used to mitigate noise.

2 **Overfitting**

Dropout layers and early stopping were employed to prevent overfitting.

3 **Deployment Optimization**

Model size was optimized for faster prediction performance.

Future Directions

1 **Dataset Expansion**

Incorporate more diverse categories and images.

2 **Transfer Learning**

Utilize pre-trained models like ResNet for accuracy improvements.

3 **Real-Time Video Classification**

Optimize the API for classifying video streams in real-time.

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