

SUPERVISED LEARNING FOR FINDING PATTERN IN SENTINEL SATELLITE DATA



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INTRODUCTION

Brief Overview:

- Significance of deep learning in satellite image categorization.
- Utilization of EuroSAT dataset with 13 multi-spectral bands.



RESEARCH OBJECTIVES

Objectives:

- Develop and assess deep learning models for EuroSAT image categorization.
- Evaluate the performance of VGG16 and ResNet50 architectures.

Research Methods

METHODOLOGY OVERVIEW



DATA PREPROCESSING:

Extract, standardize, and balance EuroSAT dataset.



LABEL ENCODING:

One-hot encoding for model compatibility.



MODEL CONSTRUCTION:

CNN architectures: VGG16 and ResNet50.



DATA AUGMENTATION:

Keras ImageDataGenerator for increased model resilience.



TRAINING

PROCESS:

Early halting, model checkpointing, and learning rate reduction.

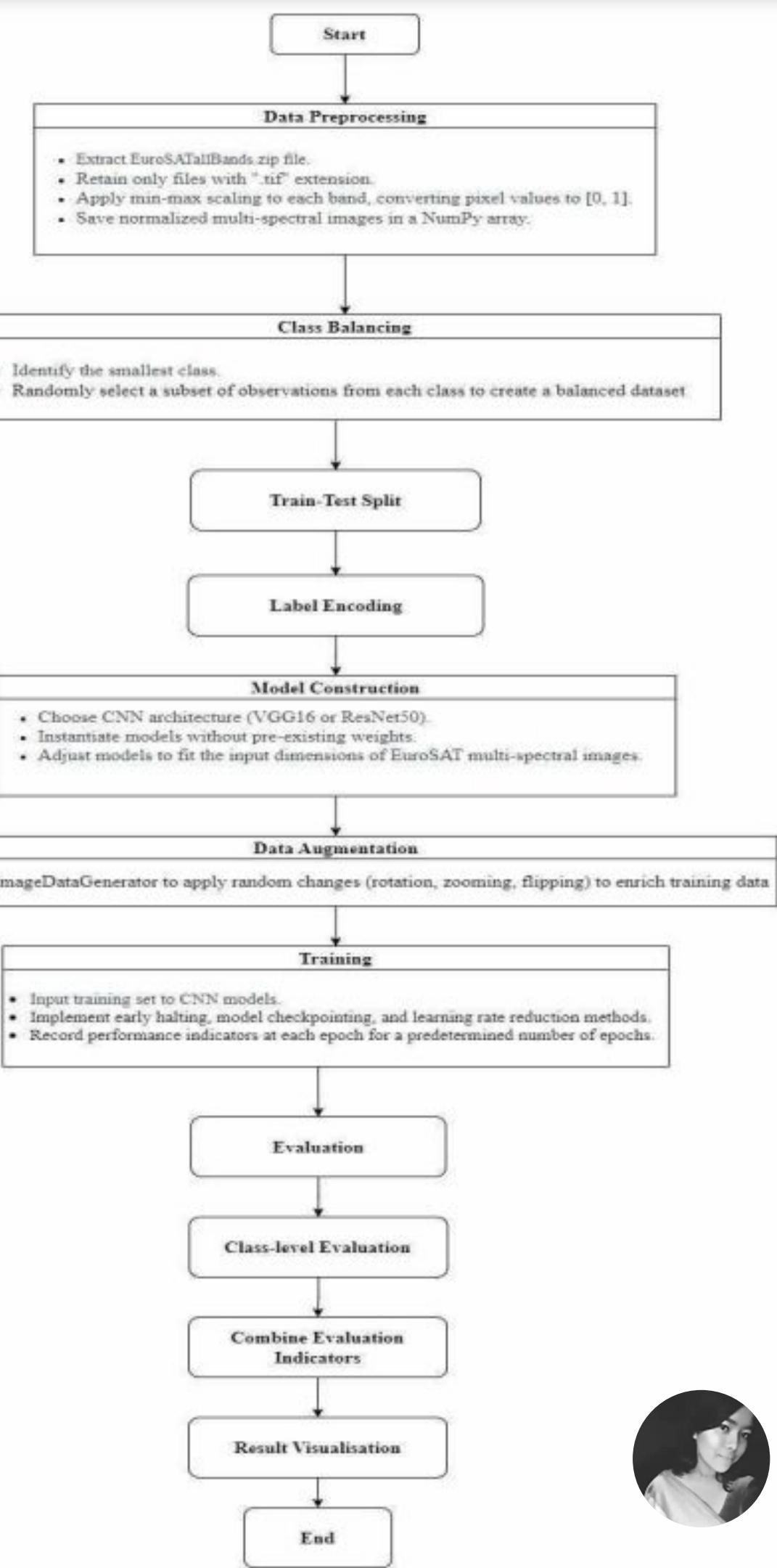


EVALUATION:

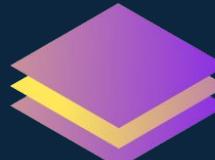
Assess models on test set using various metrics.



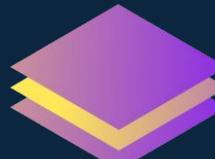
FLOWCHART OF THE METHODOLOGY.



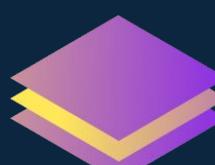
DATA PREPROCESSING (Specifics):



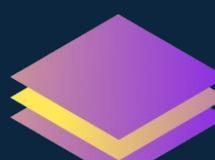
Extract EuroSATallBands.zip and filter ".tif" files.



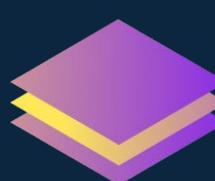
Min-max scaling for standardization.



Class balancing for equal representation.



Stratified division into training and testing sets.



Data Preprocessing Visual: Before and after images of preprocessed data.



CNN MODEL ARCHITECTURE

- Details:
 - VGG16 and ResNet50 architectures.
 - Adjusted for EuroSAT multi-spectral image dimensions.
 - No pre-existing weights for better adaptation.



DATA AUGMENTATION FOR MODEL ROBUSTNESS

- Techniques:
 - Rotation, zooming, flipping via Keras ImageDataGenerator.
 - Enhancement of data diversity and model resilience.

SUPERVISED TRAINING PROCESS

COMPONENTS:

- Supervised training with early halting.
- Model checkpointing for saving best-performing models.
- Learning rate reduction for improved convergence.

VISUAL:

Training curves showing loss and accuracy trends.



PERFORMANCE EVALUATION METRICS

METRICS:

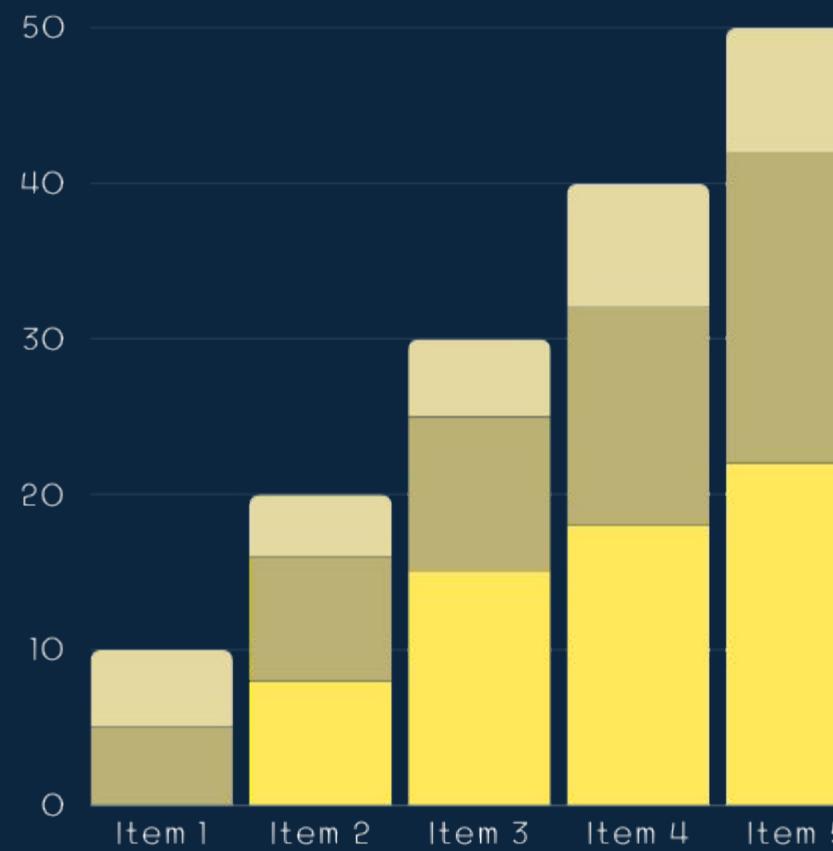
- Categorical cross-entropy loss.
- Classification accuracy.
- Class-specific metrics (precision, recall, F1-score).

VISUAL:

Confusion matrix highlighting true positives, negatives, false positives, and negatives.

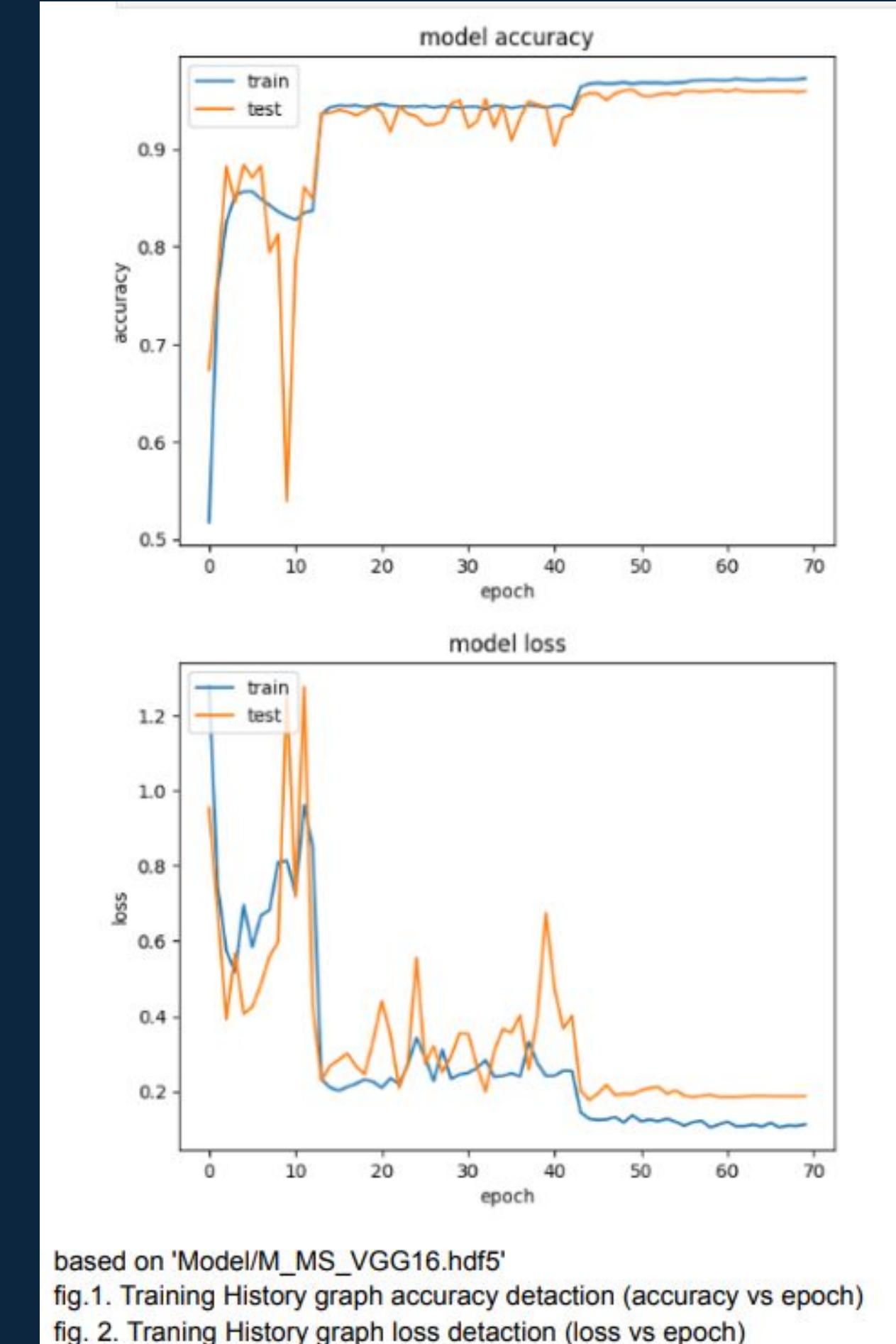
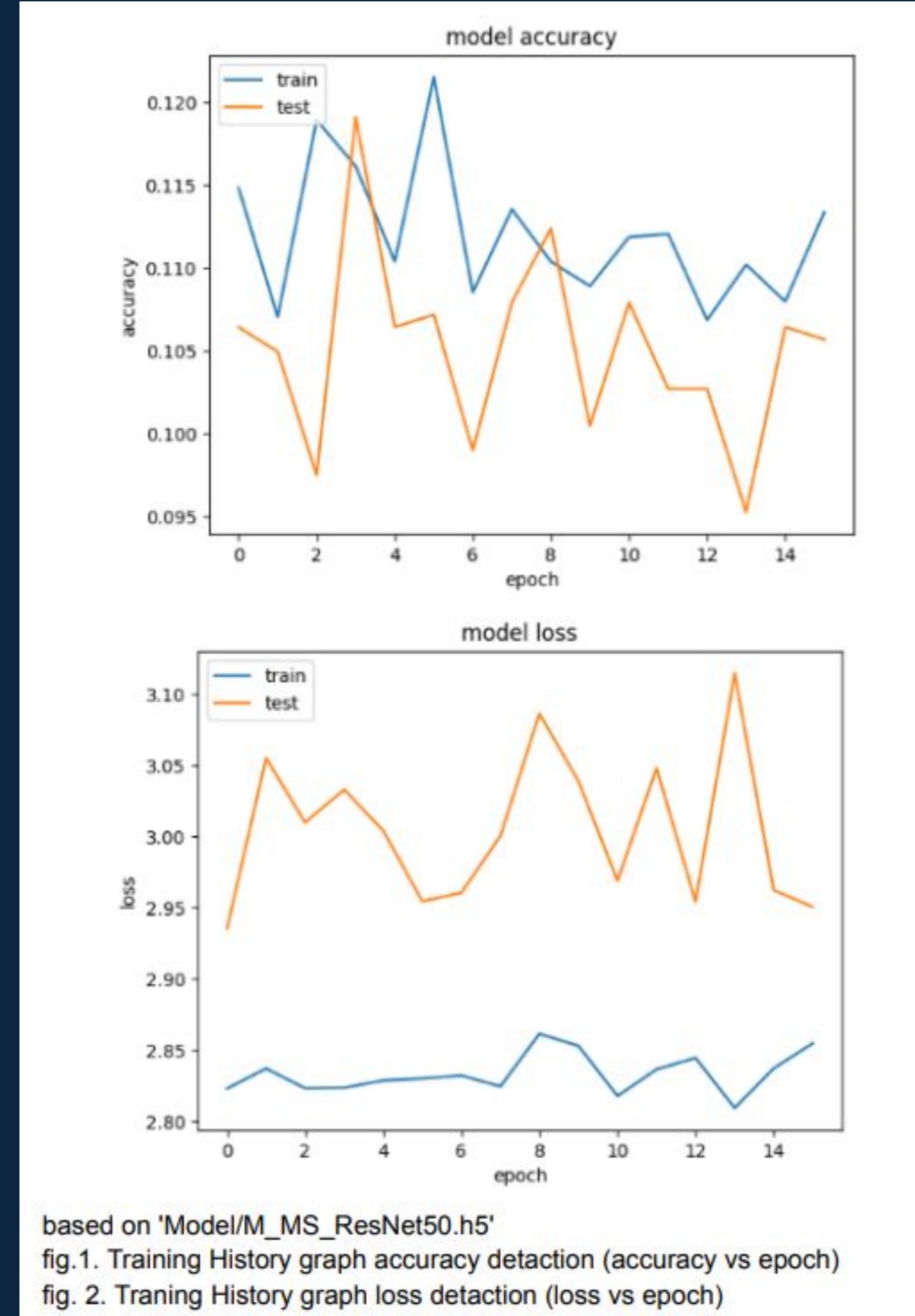


EMPIRICAL FINDINGS AND ANALYSIS



- Model Performance:
 - Detailed analysis of VGG16 (M_MS_VGG16) and ResNet50 (M_MS_ResNet50).
 - Interpretation of loss, accuracy, and class-specific metrics.
- Visual: Comparative analysis charts and graphs.





LIMITATIONS

- Identified Challenges:
 - Challenges faced during model training and evaluation.
 - Limitations of the selected CNN architectures.
- Suggestions: Recommendations for addressing limitations.



FUTURE WORK

- Opportunities for Improvement:
 - Potential enhancements in model architecture.
 - Exploration of advanced deep learning techniques.
- Collaboration: Encouragement for collaborative research in the field.



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CONCLUSION AND KEY TAKEAWAYS

Summary:

- Recap of research objectives and methodology.
- Key findings and contributions to the field.
- Encouragement for further research in satellite image classification.



THANK YOU

