

3. MODEL SELECTION SUMMARY

Model Architecture Selection Rationale

Selected Models

1. ResNet-18

Rationale:

- Proven performance on image classification tasks
- Residual connections mitigate vanishing gradient problem
- Moderate computational requirements
- Strong feature extraction capabilities
- Expected Performance: 92-95% accuracy

2. EfficientNet-B0

Rationale:

- State-of-the-art efficiency/accuracy trade-off
- Compound scaling optimization
- Lightweight architecture suitable for deployment
- Excellent transfer learning capabilities
- Expected Performance: 93-96% accuracy

3. Vision Transformer (ViT-Tiny)

Rationale:

- Modern attention-based architecture
- Strong performance on structured data
- Global context understanding
- Future-proof architecture
- Expected Performance: 90-94% accuracy

4. Custom CNN

Rationale:

- Domain-specific architecture optimization
- Computational efficiency
- Interpretable feature learning
- Customizable for satellite imagery characteristics
- Expected Performance: 88-92% accuracy

Selection Criteria

- **Accuracy:** Primary consideration for classification performance
- **Efficiency:** Computational requirements and inference speed
- **Interpretability:** Model explainability for stakeholder trust
- **Deployment:** Suitability for production environment
- Expected Performance Metrics
- Overall Accuracy: >90%
- F1-Score: >0.89
- Precision/Recall: Balanced across classes
- Inference Time: <100ms per image