

# Model Card: ResNet18

## 1 Model Overview

**Architecture:** ResNet18 employs residual (skip) connections, which help mitigate the vanishing gradient problem during training of deep networks.

**Training Data:** The model is trained on the ASL Alphabet dataset comprising 87,000 images, each resized to 200x200 pixels across 29 classes (26 letters plus 3 additional classes to aid live classification)

**Hyperparameters:**

- Optimizer: Adam
- Loss Function: Cross-Entropy
- Learning Rate: 0.01
- Batch Size: 64
- Epochs: 20 (best validation accuracy selected)

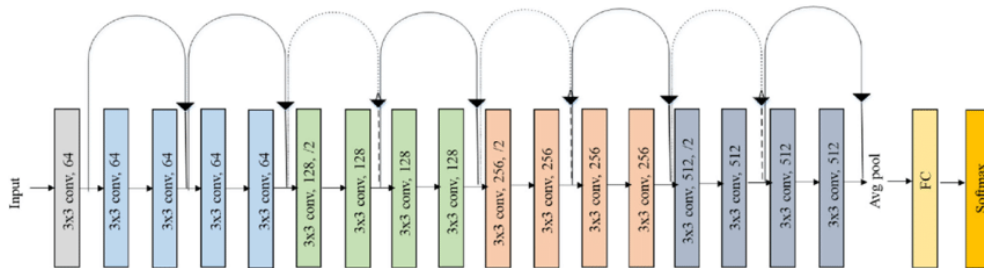


Figure 1: ResNet18 Architecture [1]

## 2 Intended Use

ResNet18 is an instance of the ResNet architecture designed for image classification. Our ResNet18 implementation uses a pre-trained ResNet18 model with transfer learning to classify images of American Sign Language (ASL) letters. The model is intended for:

- Classifying American Sign Language alphabet letters from images
- Real-time sign language interpretation using live video inputs

### 3 Performance

On a separate test dataset, the ResNet18 model achieved:

- **Test Accuracy:** 100%
- **Precision:** 1.0
- **Recall:** 1.0

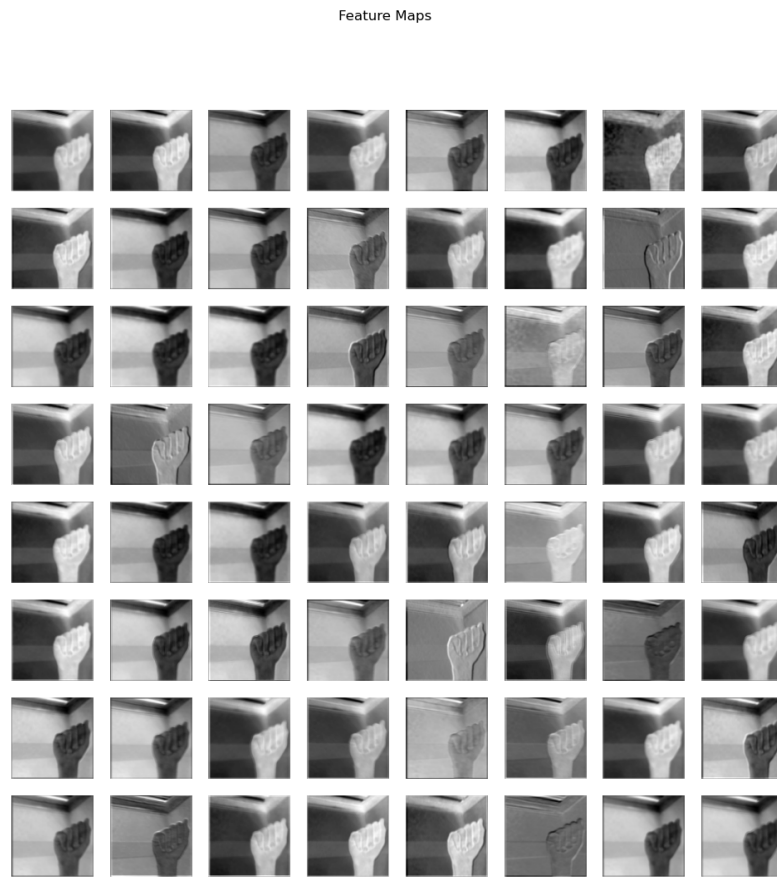


Figure 2: Feature Maps from the ResNet18 model

Figure 2 shows sample feature maps extracted from intermediate layers of the model.

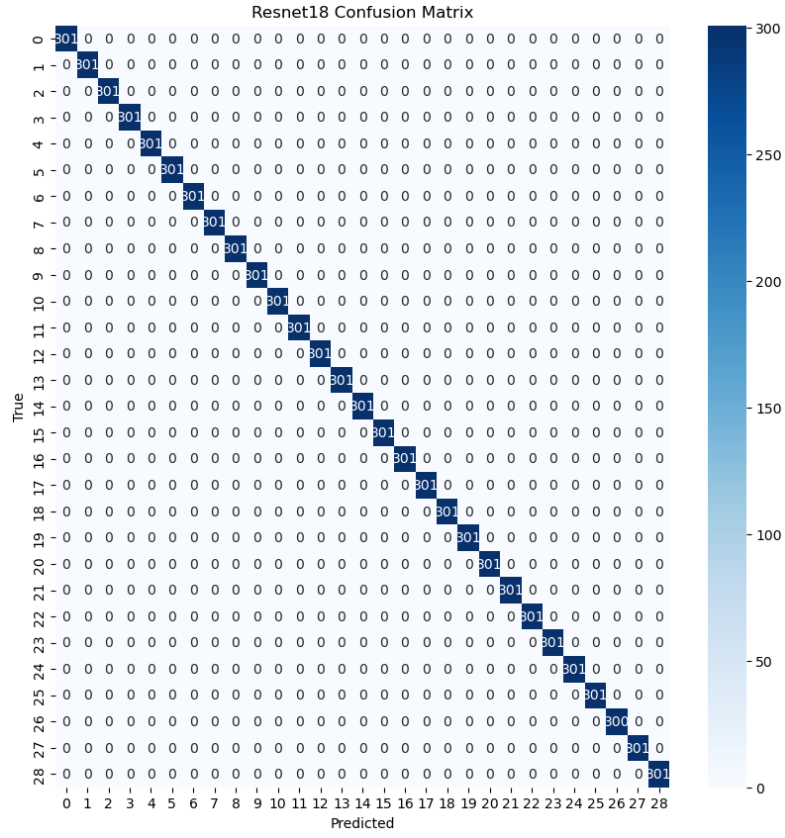


Figure 3: Confusion Matrix for ResNet18

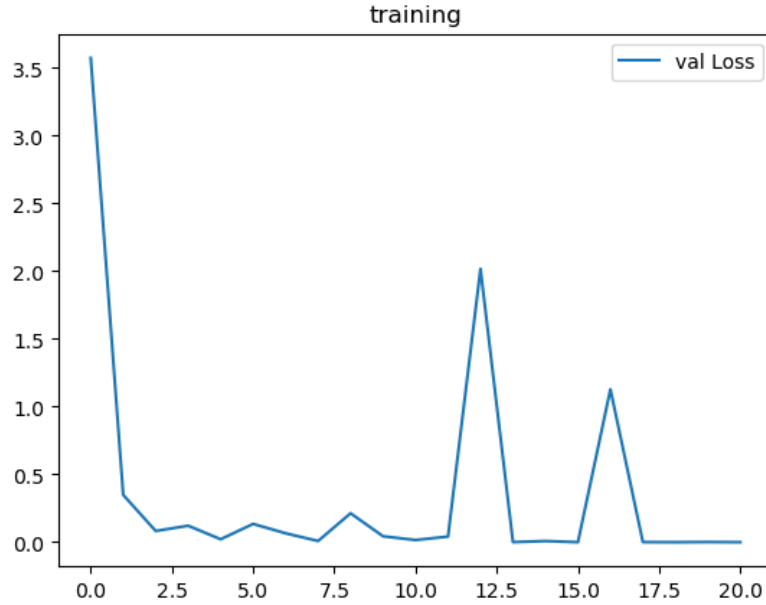


Figure 4: Training Loss for ResNet18

## 4 Limitations

Despite high accuracy, some limitations are noted:

- Sensitivity to variations in image quality and lighting conditions during live classification
- Dependence on precise hand positioning for real-time classification
- Potential challenges in deployment on resource-constrained devices

## 5 Ethical Considerations

- Ensure the ASL dataset is diverse and representative to avoid biased outcomes
- Implement privacy protections when deploying real-time video classification

## References

- [1] “A deep learning approach for automated diagnosis and multi-class classification of alzheimer’s disease stages using resting-state fmri

and residual neural networks,” [https://www.researchgate.net/publication/336642248\\_A\\_Deep\\_Learning\\_Approach\\_for\\_Automated\\_Diagnosis\\_and\\_Multi-Class\\_Classification\\_of\\_Alzheimer's\\_Disease\\_Stages\\_Using\\_Resting-State\\_fMRI\\_and\\_Residual\\_Neural\\_Networks](https://www.researchgate.net/publication/336642248_A_Deep_Learning_Approach_for_Automated_Diagnosis_and_Multi-Class_Classification_of_Alzheimer's_Disease_Stages_Using_Resting-State_fMRI_and_Residual_Neural_Networks), accessed: 2025-05-09.