Statement of Purpose

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Preliminary Approach: Handwritten Letter and Digit Recognition

Tools and Technologies

1. **Programming Language**: Python
2. **Frameworks**: TensorFlow, TensorFlow Lite
3. **Mobile Development**: Flutter, Dart, Java, or Kotlin for Android app integration
4. **Visualization Tools**: Matplotlib, TensorBoard

AI Models and Methodologies

1. **Model Development**:
    - Use a Convolutional Neural Network (CNN) for image-based classification of handwritten characters.
    - Experiment with pre-trained models (e.g., MobileNet) for transfer learning to improve accuracy.
    - Optimize the model for lightweight deployment using TensorFlow Lite.
2. **Error Analysis and Iterative Improvement**:
    - Implement data augmentation techniques (rotation, scaling) to improve generalization.
    - Perform hyperparameter tuning (e.g., learning rate, batch size) to enhance model performance.
    - Conduct misclassification analysis and error correction.

Dataset Utilization

- Train on the provided dataset of handwritten English alphabets (A-Z) and digits (0-9).

- Split the dataset into training, validation, and testing subsets for robust evaluation.

Application Integration

- Convert the trained model to TensorFlow Lite and integrate it into an Android app.
- Build the app interface to process single-character images and display real-time predictions.

Visualization and Reporting

- Develop dashboards to track metrics such as model accuracy, inference time, and error rates.
- Use tools like confusion matrices and ROC curves for detailed error analysis.