State of Purpose

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Preliminary Approach for OMR Sheet Bubble Detection

1. **Tools and Technologies**:
    - **Programming Language**: Python.
    - **AI/ML Frameworks**: TensorFlow, PyTorch, or scikit-learn for model development.
    - **Image Processing**: OpenCV and PIL for preprocessing and visualization.
    - **Data Handling**: pandas and NumPy for managing datasets.
2. **Methodologies**:
    - **Dataset Preparation**: Utilize the GitHub dataset for training and testing, preprocessing with noise reduction and alignment corrections.
    - **Model Development**: Train supervised learning models for bubble detection, leveraging convolutional neural networks (CNNs) for image recognition tasks.
    - **Sheet Alignment**: Implement algorithms to detect corner markers and correct misaligned scanned sheets.
    - **Template Customization**: Enable user-defined customization for non-standard OMR sheets.
    - **Error Handling**: Incorporate error analysis mechanisms, such as confidence scoring and failure case categorization.
3. **Visualization and Performance Analysis**:
    - Use Matplotlib, Seaborn, and scikit-learn for error heatmaps, confusion matrices, and performance dashboards.
    - Develop interactive dashboards with tools like Dash or Streamlit to monitor accuracy, error rates, and trends.
4. **Deployment**:
    - Convert the trained model to TensorFlow Lite for integration with a Flutter-based application, ensuring portability and compatibility with mobile platforms.
    - Test and optimize the system for multiple OMR templates, maintaining high accuracy across diverse datasets.