# 4. Approach

## 4.1 Overview of the Approach

Our approach is structured into several key stages. First, we collect a dataset containing both real and AI-generated images. Next, we apply multiple AI-generated image detection tools (for now just one) to this dataset to evaluate their performance. Finally, we analyze the results to determine the robustness and applicability of each method, followed by refinements for detailed subcategory detection.

## 4.2 Dataset Preparation

We created a dataset comprising both authentic and AI-generated images from multiple sources. Images were standardized in size and format, and some were subjected to compression and noise to test the robustness of detection tools under realistic conditions.

## 4.3 Selected Detection Tools

We evaluated several AI-generated image detection tools, including [Tool A], [Tool B], and [Tool C]. Tool A relies on convolutional neural networks to detect subtle artifacts, Tool B leverages frequency domain analysis, and Tool C uses transformer-based architectures. All tools were tested using their default pre-trained models unless otherwise specified.

## 4.4 Evaluation Metrics

We assessed each detector’s performance using metrics such as accuracy, precision, recall, and F1-score. To evaluate robustness, images were systematically modified with noise and compression, and the detectors’ responses were compared across these conditions.

## 4.5 Architecture / Implementation Details

The evaluation pipeline was implemented using Python and integrated with the detectors. For models implemented from scratch, the architecture consisted of [layers, activation functions, etc.]. The system allows automated testing across large datasets and supports batch processing for efficiency.

## 4.6 Refinement and Subcategory Analysis

After initial evaluation, we refined our approach to classify detected images into subcategories, such as GAN-generated or diffusion-based images. This required additional labeling and adjustments in the evaluation pipeline to capture more granular distinctions between detection tools.

## 4.7 Summary

In summary, our approach combines careful dataset preparation, comprehensive evaluation of multiple detection tools, and refinement for subcategory analysis. This methodology allows us to objectively compare the detectors’ performance and robustness, providing insights into their real-world applicability.