CAN AI ACCURATELY DISTINGUISH REAL FROM AI IMAGES ?

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Introduction

Artificial Intelligence (AI) has achieved major breakthroughs in image generation.
This project investigates whether AI can truly create images indistinguishable from real photographs by training a model to classify real versus AI-generated images, revealing AI's current capabilities and limitations.

Objectives

- **Can** a model correctly tell real and AI images apart without knowing the category?
- **What** features (like edges, colors) help in classification?
- **How** do image edits (like resizing or brightness changes) affect results?
- **What** mistakes does AI make during classification?
- **How** well do humans perform compared to AI?

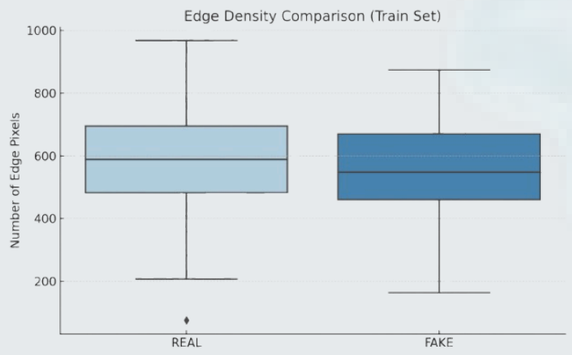
Data Collection

- **Dataset**: CIFAKE (from Kaggle)
- **Content**:
  - 60,000 real images (from CIFAR-10 categories).
  - 60,000 AI-generated images (via Stable Diffusion model).
- **Preparation**:

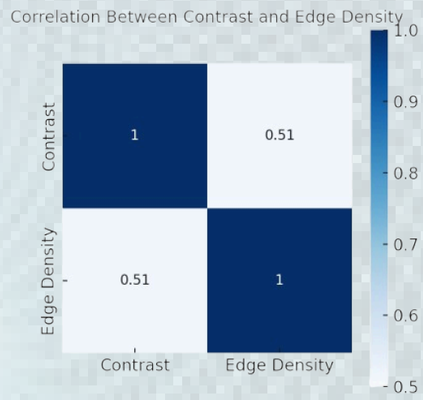
Organized into training and testing sets, ensuring diversity in lighting, backgrounds, and styles.

Data Analysis

- **Key Findings from EDA:**
  - Real images have natural edges and texture variations.
  - AI images often show overly smooth or sharp features.
  - Color distribution showed minimal impact.
- **Important Observations:**
  - Blurring images significantly reduced model accuracy.
  - Preprocessing (e.g., flipping, brightness changes) confused the model in some cases.



Examples of real images with low edge density.

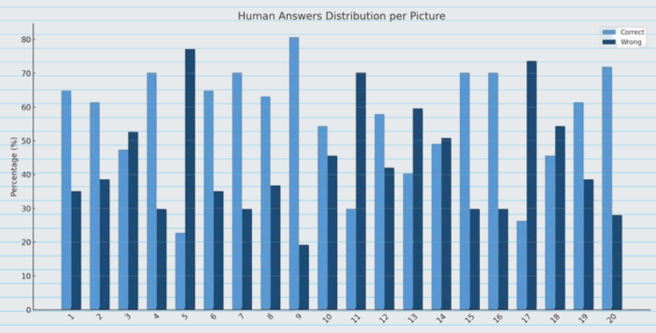


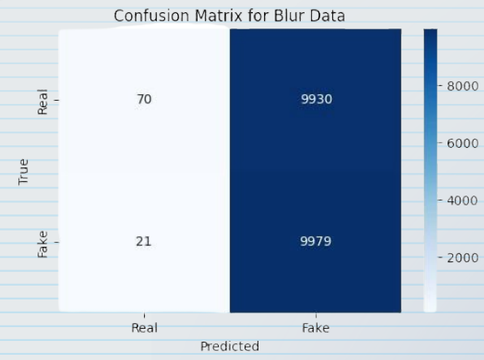
Moderate correlation between contrast and edge density.

Models and Findings

- Models Used: Pre-trained Vision Transformer (ViT), Lightweight CNN, Deeper CNN.
- Best Accuracy: 98% (Pre-trained ViT).
- Insights:
- Fine details (edges, texture) are critical.
- Color alone is not enough.
- Transformations (blur, rotation) reduce accuracy.
- **Human vs. AI:**

AI outperformed humans in classification: **98.41% vs. 56.14%.**





Accuracy dropped after blurring, confirming the importance of fine details.

Conclusions

- **AI** models effectively distinguish real from AI-generated images.
- **Fine** details are crucial for accurate classification.
- **Preprocessing** impacts model reliability.
- **Real-world** image variations still challenge AI performance.
- **Humans** achieved only 56.14% accuracy, confirming AI's superiority.