An Intelligent Approach to Detect and Classify Facial Image Forgery

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Introduction

In the world of enhancing facial attractiveness, the pursuit of beauty takes shape through three distinct avenues, each wielding its unique methods to transform one's visage. The process of changing a person's face in a photo or video using digital editing tools is known as facial retouching. This might involve a variety of changes, including as erasing wrinkles or blemishes, modifying skin tone, altering the size or form of facial features, or boosting specific facial features to give the face a more polished or glamorous appearance. The purpose of this work is to investigate the potential role of the transfer learning approach for the detection and classification of facial retouching. This study presents a comprehensive investigation into the classification of retouched face images using a fine-tuned pre-trained VGG16 & ResNet50 model with ImageNet weight. We explore the impact of different train-test split strategies on the performance of the model and also evaluate the effectiveness of two distinct optimizers namely Adam and RMSprop. The model generalizability has been checked over two standard datasets ND-IIITD retouched faces and MDRF (Multi Demography Retouched Faces-Caucasian samples).

Chapter 1 Introduction

This chapter gives overview of the research work, its scope, objectives, need etc. in detail. Also, chapter covers the fundamental of facial retouching and different types of retouching done on face images. The problem definition and motivation of the research is described in detail. The objectives and future scope of the research work is described briefly, too.

Chapter 2 Literature Review

A literature review is a continuous learning process which has been carried out throughout the course of research. The major objective of this chapter is to gain enough background knowledge on the facial retouching. The literature review for this study is broken down into five distinct sections providing section-by-section information on these phases, along with their goals and conclusions.

Chapter 3 Data Collection and Pre-processing

The data collection and preprocessing chapter is a critical component of any research project, analysis, or machine learning endeavor. It lays the foundation for the quality and reliability of the data used, which in turn affects the validity and robustness of the conclusions

and models built upon it. This chapter contains the two distinct datasets used for the research purpose and the preprocessing employed over the face images before training and evaluating the model.

Chapter 4 Proposed Methodology

In this chapter, we delve into the heart of our proposed methodology for addressing the classification problem at hand, which leverages the power of transfer learning. The introduction provides an overview of the primary architectural components we will be working with, namely the VGG16 and ResNet50 architectures, both in their original forms and as modified models tailored to our specific requirements.

Chapter 5 Results and Discussion

This chapter provides a comprehensive presentation and analysis of experimental outcomes, data, or investigations. Its primary purpose is to elucidate the significance of the findings, establish links to prior research, and offer insights into the broader implications of the study. The generalization of the proposed methodology is checked by taking two distinct datasets differ in terms of no. of total face images, unequal distribution of both (real & fake) samples. The effectiveness of the proposed methodology is evaluated by considering different train-test split ratio, as the different CNN don't give equal efficiency on all split ratio.

Conclusion

This comprehensive study has explored various facets of transfer learning in the context of two distinct datasets that vary in terms of editing tools employed, size, and data distribution. Our research has demonstrated the flexibility and adaptability of these retouching classification by utilizing two different transfer learning models i.e. ResNet50 and VGG16 and two different fine-tuning optimizers like Adam and RMSprop. Furthermore, four different train-test split ratios were investigated, which shed light on how well the model performed with different data distributions. This research has introduced a Transfer Learning (TL) model, ResNet50, as a robust solution for facial retouching detection, showcasing its superiority over VGG16. The findings reveal that utilizing RMSprop as the optimizer significantly enhances classification efficiency. Notably, ResNet50 demonstrates exceptional generalization

capabilities, consistently achieving top accuracy on both Dataset 1 and Dataset 2 which are having diverse and contrasting data characteristics with an 80%-20% train-test split ratio. These results underscore the potential of ResNet50 in real-world applications, confirming its value in the field of image forensics and retouching detection. This research not only contributes to the advancement of image analysis techniques but also opens new avenues for improved authenticity verification in multimedia content.