Classification of interior architectural styles using deep learning

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Abstract

This paper presents a study on the automatic classification of interior architectural styles using deep neural networks. The challenges of identifying and categorizing interior styles manually and subjectively are addressed with the use of deep learning algorithms. Both CNNs and visual transformers were used as models for classification and were fine-tuned on the annotated dataset. The results of the study were integrated into a web application, allowing users to upload an interior photo and receive an automatic prediction of the architectural style. Our findings demonstrate the potential of deep learning for automating interior style classification and advancing the field of interior architecture.

Keywords: Interior Design Classification, Deep Learning, Computer Vision

1. Introduction

The development of automatic interior architectural style classification has practical applications in advertising and marketing of interior design services. Businesses drives the research and efforts, as it has the potential to improve both accuracy and efficiency of their advertising strategies. With the assist of modern deep neural networks, we aim to automate the process of classifying interior design styles.[1]

2. Data

Collecting the data was challenging, as there are no publicly available datasets with real or even synthetic images of architectural interiors. Most of the real photos available on the internet do not represent a specific interior design style, which makes the task even more difficult. The data was entirely collected by us, consisting of around 10000 images, with balanced eight classes.

3. Models

Both convolutional neural networks (CNNs) and visual transformers as classification models were used. Our approach involves fine-tuning pre-trained architectures on our annotated dataset. For CNNs, we utilized popular models such as VGG16, VGG19, ResNet34. For the visual transformers - VIT-b-16. [2]

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Model Type	Accuracy	Precision	Recall	F-score	Loss
VGG19	**0.8407**	**0.8422**	**0.8407**	**0.8399**	**0.7327**
ResNet34	0.4568	0.4825	0.4568	0.4527	1.5111
ViT-B-16	0.5386	0.5037	0.5386	0.5006	1.3865

Table 1. Various model evaluation metrics

4. **Results**

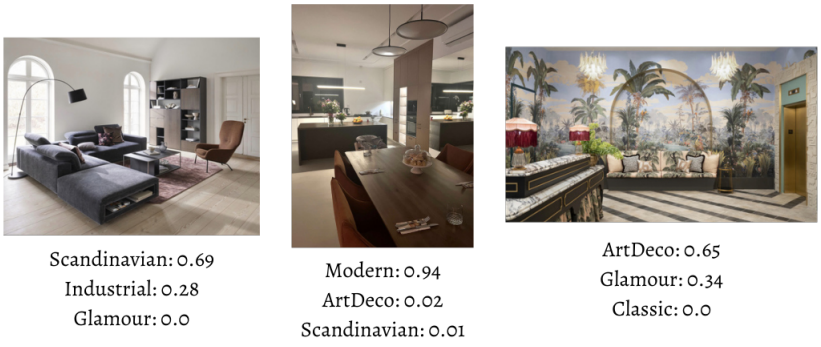

Figure 1. Sample class probabilities (VGG19)

In future work, we plan to expand our dataset to include a wider variety of styles and improve the generalizability of our model. Our goal is to make the process of style classification and design generation more accessible and to help advance the field of interior architecture, and provide business value for advertisements websites with home listings.

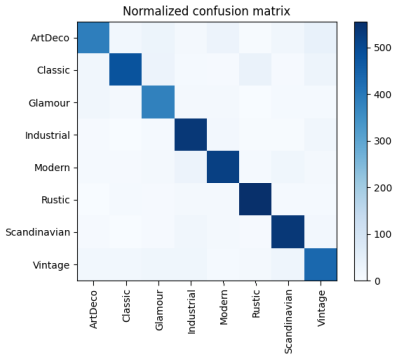

Figure 2. Confusion Matrix (VGG19)

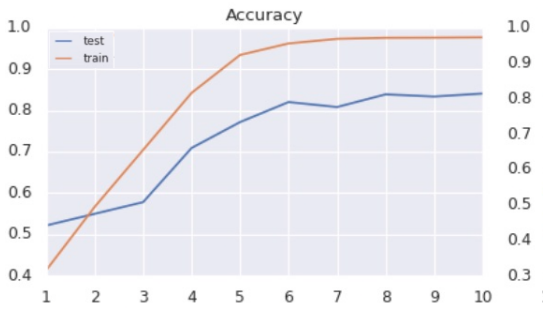

Figure 3. Learning curve (VGG19)

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References

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