

Classification of interior architectural styles using deep learning

Adam Wojdyła, Michał Ulaniuk, Marcin Kostrzewski

*Adam Mickiewicz University
Faculty of Mathematics and Computer Science
Uniwersytetu Poznańskiego 4 Street, 61-614 Poznań
adawoj5@st.amu.edu.pl*

Abstract. *This paper presents a study on the automatic classification of interior architectural styles using deep neural networks. Both CNNs and visual transformers were used as models for classification and were fine-tuned on the annotated dataset. 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

Automatic interior architectural style classification has practical application in advertising and marketing of interior design services. Businesses drives the research, 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 labeled interiors. Most of the real photos available do not represent a specific 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]

4. Results

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

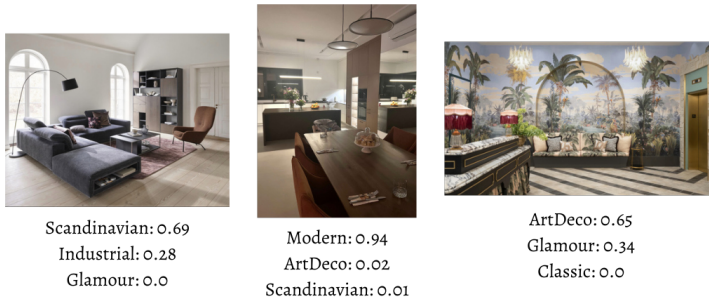


Figure 1. Sample class probabilities (VGG19)

5. Conclusions

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 provide business value for advertisements websites with home listings.

References

- [1] Kim, J. and Lee, J.-K. Stochastic detection of interior design styles using a deep-learning model for reference images. volume 10. 2020. doi:10.3390/app10207299. URL <https://www.mdpi.com/2076-3417/10/20/7299>.
- [2] Y. Yoshimura, Z. W. C. R., B. Cai. Deep learning architect: Classification for architectural design through the eye of artificial intelligence. *CUPUM 2019*, 53:249–265, 2019. doi:10.1007/978-3-030-19424-6_14.