ENGLISH SUMMARY OF THESIS

Title: Motif Pattern Recognition with Image Processing and Presenting the Stages of Making the Motif to the User

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Crochet is a long–standing textile practice in which motifs are formed by repeated stitch structures. While experienced practitioners can visually distinguish motif families at a glance, automatic recognition remains challenging. A reliable system for recognizing crochet motifs from images would support beginners learning new patterns and help preserve the craft knowledge through accessible software tools. This thesis aims to develop a desktop application that recognizes and sorts images of crochet or knitting motifs and provides step-by-step instructions.

Research Focus: The focus of this thesis and project is exploring the following questions:

Data Scarcity: Can data scarcity be overcame? Do data augmentation strategies improve model generalization in niche domains with limited samples?

Automated Classification: Can crochet motifs be reliably categorized by deep learning techniques despite changing visual features and stylistic variance?

The project is designed with a deep learning based CNN technology (ResNet). The thesis covers dataset creation, data augmentation, model selection, model training and interface design.

Related Works:

The methodology is founded on established literature in deep learning and computer vision. A review of relevant work confirms that Convolutional Neural Networks (CNNs) are the standard for high-performance image classification [10, 11, 15], particularly for texture pattern recognition. Specifically, deep-architecture models like ResNet (Residual Networks) are known for their effectiveness in learning complex features and overcoming the 'vanishing gradient problem'.[28] Thus making them suitable for differentiating the minor textural differences between crochet stitches.

However, a significant gap was identified in the literature: the absence of standardized public or labeled datasets for this niche domain. While general image processing techniques are well-documented [8, 10], they do not address the specific problem of classifying these unique, repeating textile patterns.

Since there is little to no prior work focused on crochet and knitting motifs, the thesis has achieved good results by utilizing ResNet. These results were enabled by first creating a novel, curated base dataset and then applying aggressive data augmentation to expand it, providing sufficient data to effectively train the model despite the domain's scarcity.

Selected Bibliography

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