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Pose Guided Attention for Multi-label Fashion Image Classification

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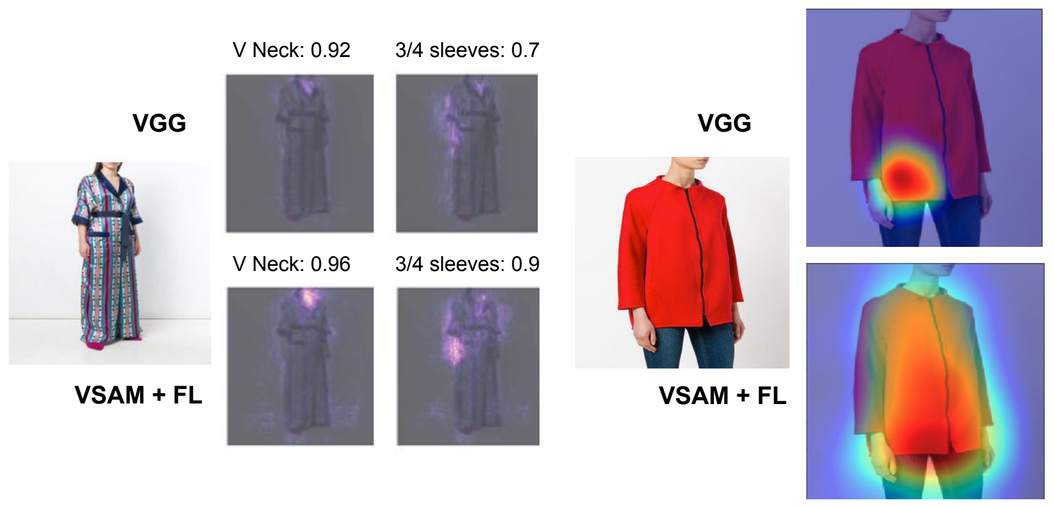
Abstract: We propose a compact framework with guided attention for **multi-label** classification in the fashion domain. Our **visual semantic attention model (VSAM)** is **supervised by automatic pose extraction** creating a discriminative feature space. VSAM **outperforms the state of the art for an in-house dataset** and **performs on par with previous works on the *DeepFashion*** dataset, **even without using any landmark annotations**. Additionally, we show that our semantic attention module **brings robustness to** large quantities of **wrong annotations** and **provides more interpretable results**.



The effect of pose guided attention. Saliency and class activation maps highlight most relevant regions

Introduction

- **Fashion attributes are associated with specific locations** (e.g. sleeve, neckline)

Purely data driven approaches disregard this fact and are less robust

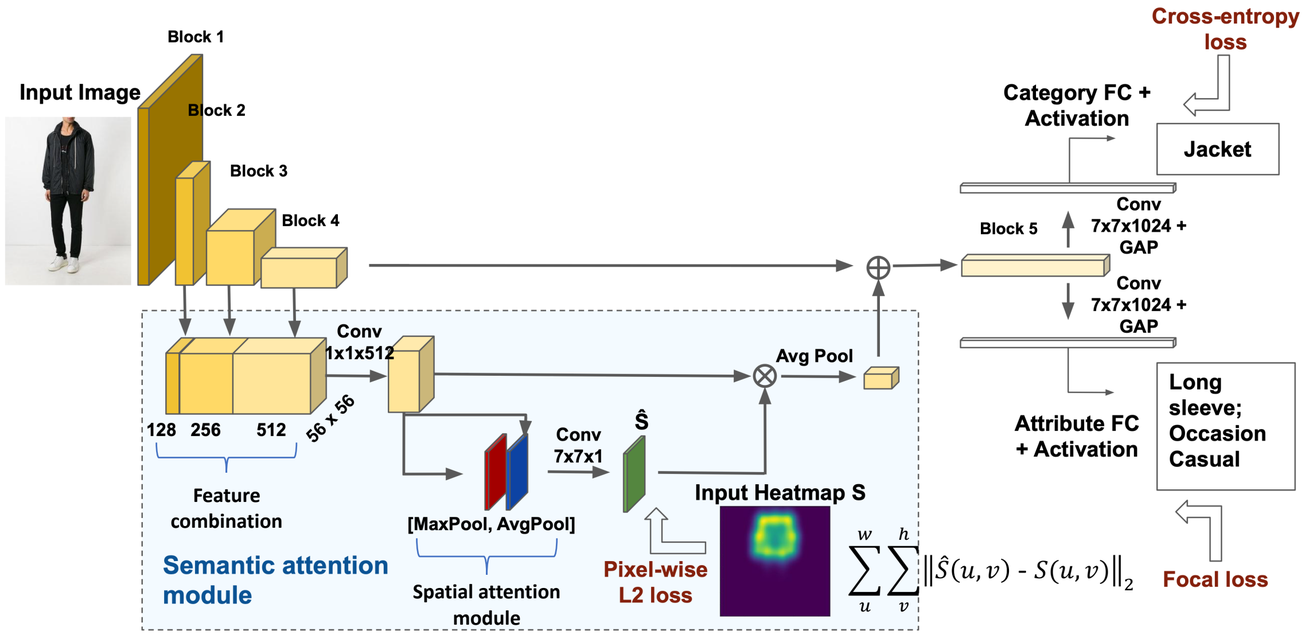
Other approaches require an expensive annotation process, impractical at large scale

- We exploit the **relation between attribute localization** and **visual appearance**, by **embedding a semantic attention** module **guided by body pose**

Proposed model - VSAM

- **Task:** predict category C (multi-class) and attribute vector A (multi-label) for each image
- The attention mechanism acts on a feature combination scheme and is supervised by the pose of the model wearing the clothing item

Examples of pose detections (by *OpenPose*) and respective heatmaps, used during training



Proposed Visual Semantic Attention Model (VSAM) architecture with the semantic attention mechanism regularization

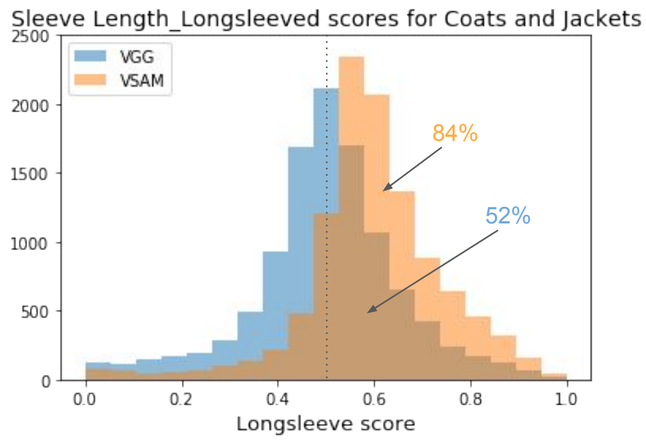
Experiments and Results

Datasets:

- "In-house" dataset, with approx. 245k images with 17 categories and 53 attributes, and avg. 1.2 attributes annotations per product
- *DeepFashion* dataset, with approx. 289k images with 50 categories and 1000 attributes

Method/Metric	P@k	R@k	F1@k	AP
Model from [1]	73.02	72.56	73.33	69.17
VSAM + FL	**80.70**	**81.56**	**80.63**	**75.44**

Quantitative results for multi-label classification for the "in-house" dataset



VSAM increases model robustness to large quantities of noisy annotations

Method/ Metric	Texture		Fabric		Shape		Part	
	Top-3	Top-5	Top-3	Top-5	Top-3	Top-5	Top-3	Top-5
Model from [1]	44.39	53.91	31.82	41.70	39.88	50.51	31.11	40.76
Fashion Net [2]	37.46	49.52	39.30	49.84	39.47	48.59	44.13	54.02
Liu et al. [3]	56.30	65.82	43.05	53.64	58.75	67.80	46.47	57.39
VSAM + FL	56.28	65.45	41.73	52.01	55.69	65.40	43.20	53.95

Quantitative results for multi-label classification for the *DeepFashion* dataset. VSAM does not use any landmark annotations

Contributions:

- Creating **complete** and **consistent fully labeled fashion datasets** requires tremendous **effort** and is **extremely expensive**
- We take advantage of ***a priori* cues** to look for details in images
- In spite of its **much lower complexity**, **VSAM outperformed** by a large margin previous work on **multi-label [1]**, and **performs on par with state-of-the-art** methods for **DeepFashion** even **without using landmark annotations**
- **VSAM** was **robust to wrong annotations** and provides **more meaningful visualizations and interpretability**

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References: [1] B. Quintino Ferreira, L. Baía, J. Faria, and R. Sousa. "A Unified Model with Structured Output for Fashion Images Classification". In *KDD'18 Workshop on AI for Fashion*, 2018.
[2] Z. Liu, P. Luo, S. Qiu, X. Wang, and X. Tang. "DeepFashion: Powering Robust Clothes Recognition and Retrieval with Rich Annotations". In *CVPR*, 2016.
[3] J. Liu and H. Lu. "Deep fashion analysis with feature map up-sampling and landmark-driven attention". *ECCV Workshops on Computer Vision for Fashion, Art and Design, 2018*.