Classifying Texture Anomalies at First Sight

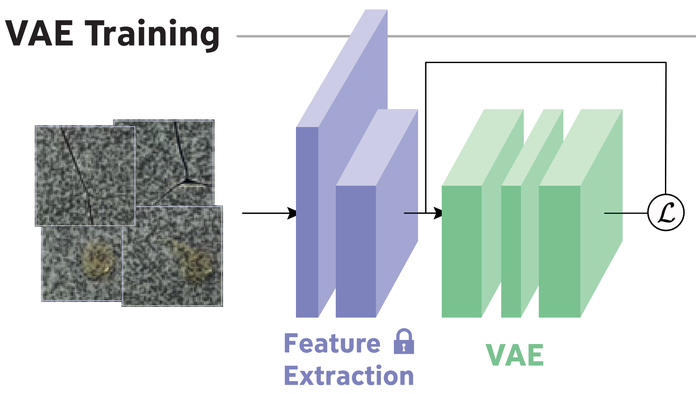
ANDREI-TIMOTEI ARDELEAN TIM WEYRICH

FRIEDRICH-ALEXANDER-UNIVERSITÄT ERLANGEN-NÜRNBERG, GERMANY

SIGGRAPH 2024
DENVER+ 28 JUL — 1 AUG

OVERVIEW

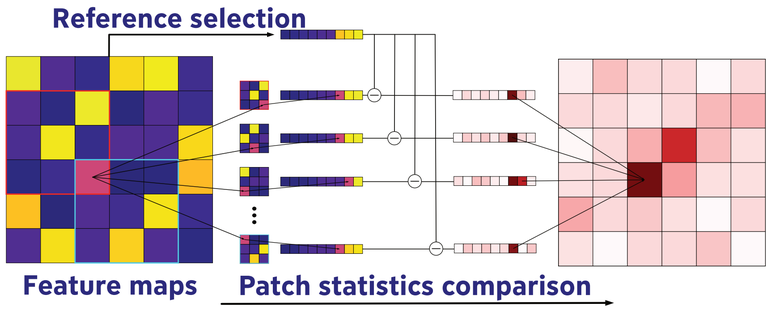
I. VAE Training



- Any VAE is reconstructing frequent features better than infrequent (abnormal) ones.

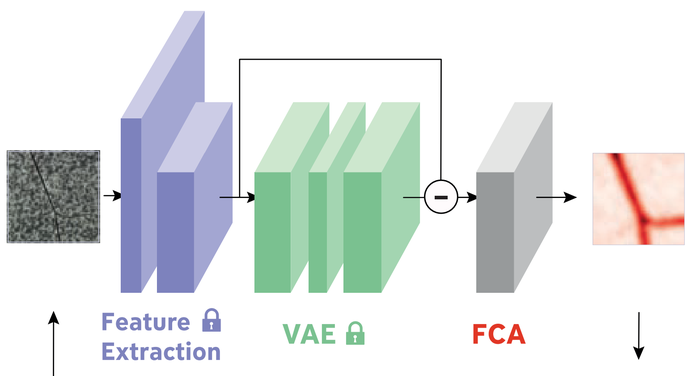
  ⇒ hence, its reconstruction error is a measure of anomaly.

II. FCA (training-free anomaly detection)



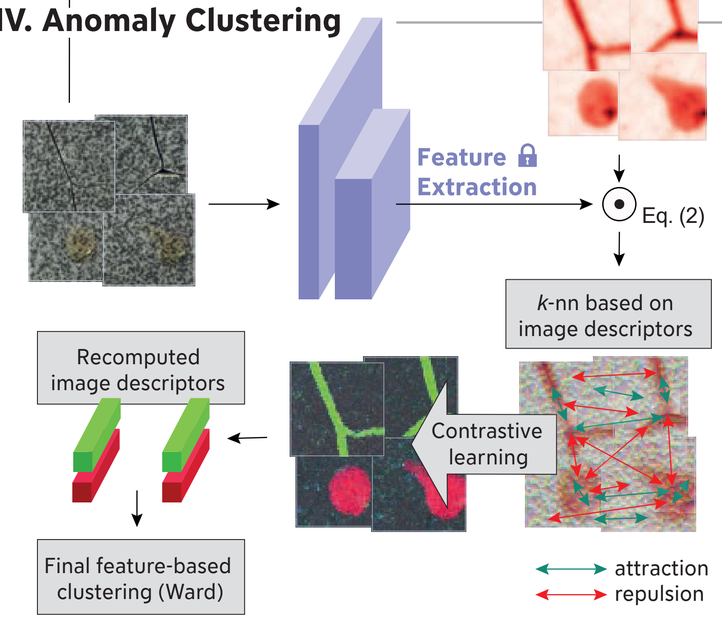
- Instead of using the Wasserstein distance holistically, we obtain a missmatching score for each element in a distribution.
- Each pixel is evaluated in the context of multiple patches.

III. Blind Anomaly Localization (BAL)



- We combine VAE and FCA, by applying zero-shot anomaly localization on the residual maps from the VAE.

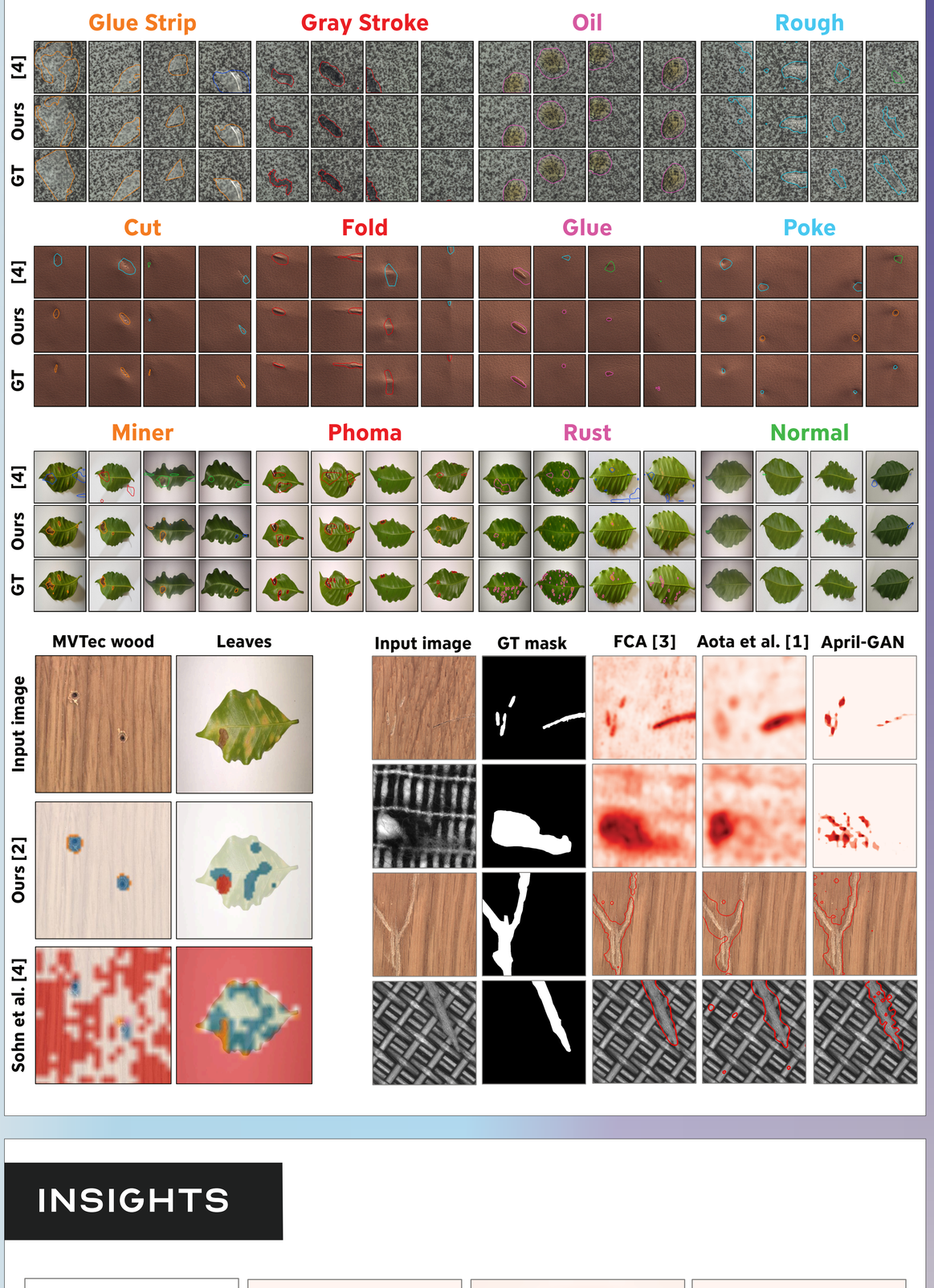
IV. Anomaly Clustering



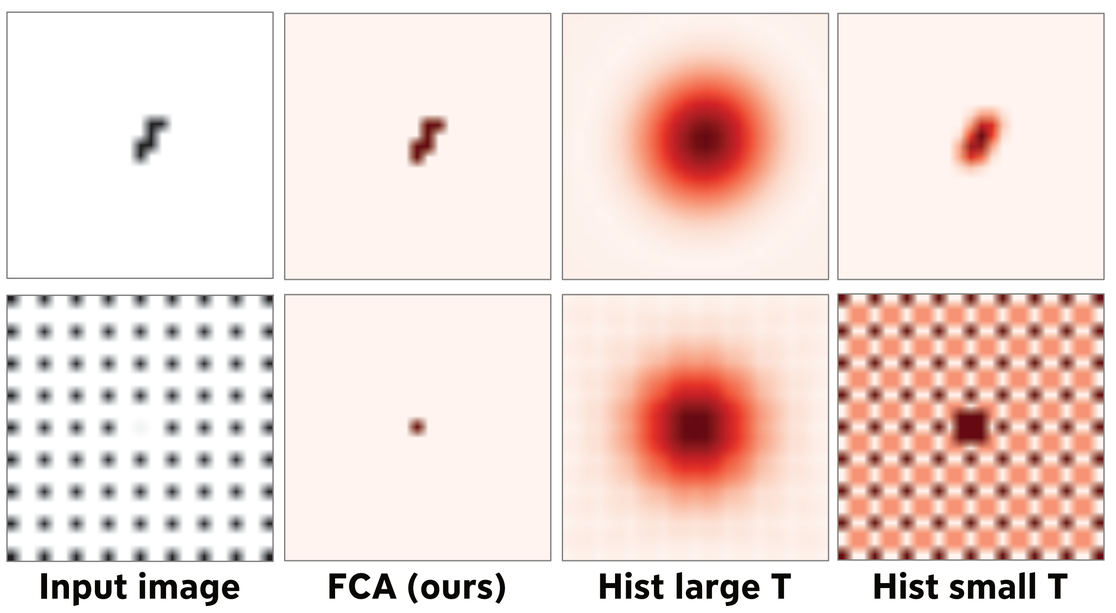
- We mine similar and dissimilar pairs of features, guided by the anomaly map.
- Contrastive learning yields an improved feature space

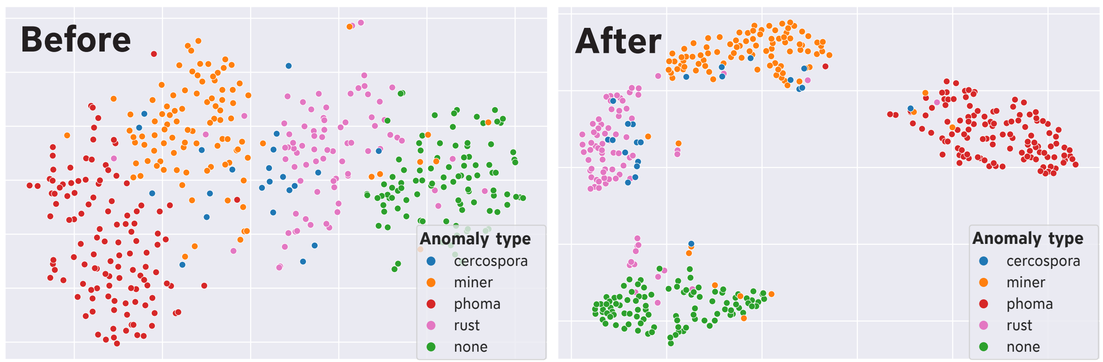
  ⇒ anomalies of different types are well separated.
- Clustering in that space yields the different anomaly classes.

RESULTS



INSIGHTS





REFERENCES

[1] Toshimichi Aota, Lloyd Teh Tzer Tong, and Takayuki Okatani. Zero-shot versus many-shot: Unsupervised texture anomaly detection. In IEEE/CVF Winter Conference on Applications of Computer Vision, 2023.
[2] Andrei-Timotei Ardelean and Tim Weyrich. Blind Localization and Clustering of Anomalies in Textures. In IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops, 2024.
[3] Andrei-Timotei Ardelean and Tim Weyrich. High-fidelity zero-shot texture anomaly localization using feature correspondence analysis. In IEEE/CVF Winter Conference on Applications of Computer Vision, 2024.
[4] Kihyuk Sohn, Jinsung Yoon, Chun-Liang Li, Chen-Yu Lee, and Tomas Pfister. Anomaly clustering: Grouping images into coherent clusters of anomaly types. In IEEE/CVF Winter Conference on Applications of Computer Vision, 2023.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 956585

visual computing erlangen

FAU Lehrstuhl für Digital Reality