



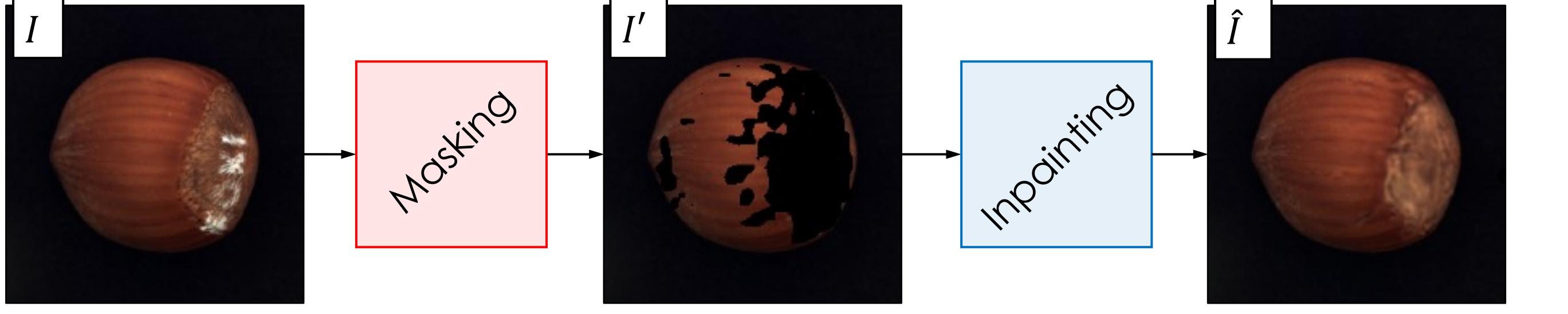
Feature Attenuation of Defective Representation Can Resolve Incomplete Masking on Anomaly Detection

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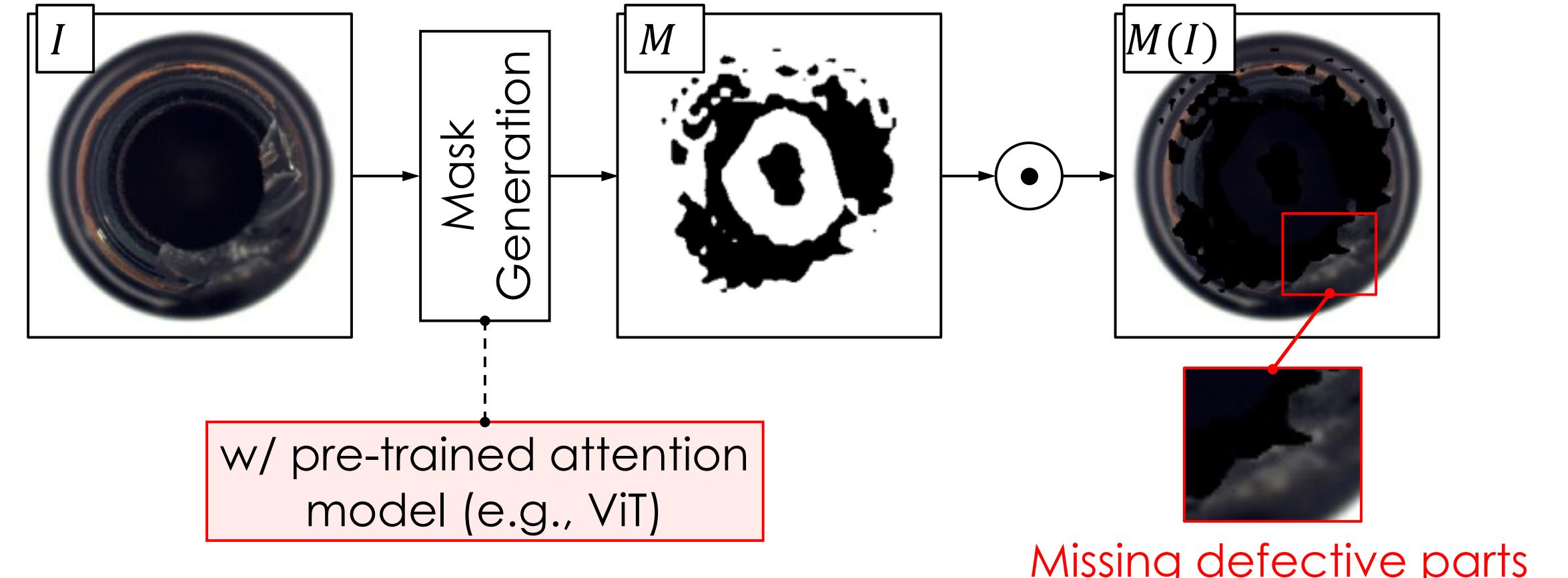
Reconstruction-by-inpainting

- Mask out the suspicious anomalous region
- Determine abnormality based on inpainting error, $\mathcal{L}(I, \hat{I})$

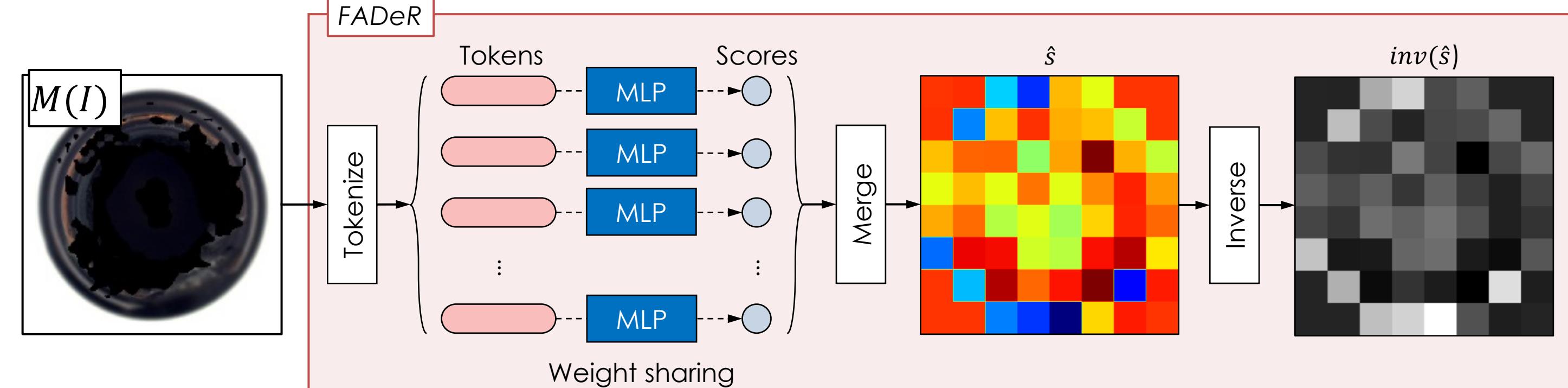


Motivation & Solution

- Challenge to completely cover anomalous regions using existing masking methods without additional training
- The model designed to compensate for mask incompleteness should enable label-free training and scalability

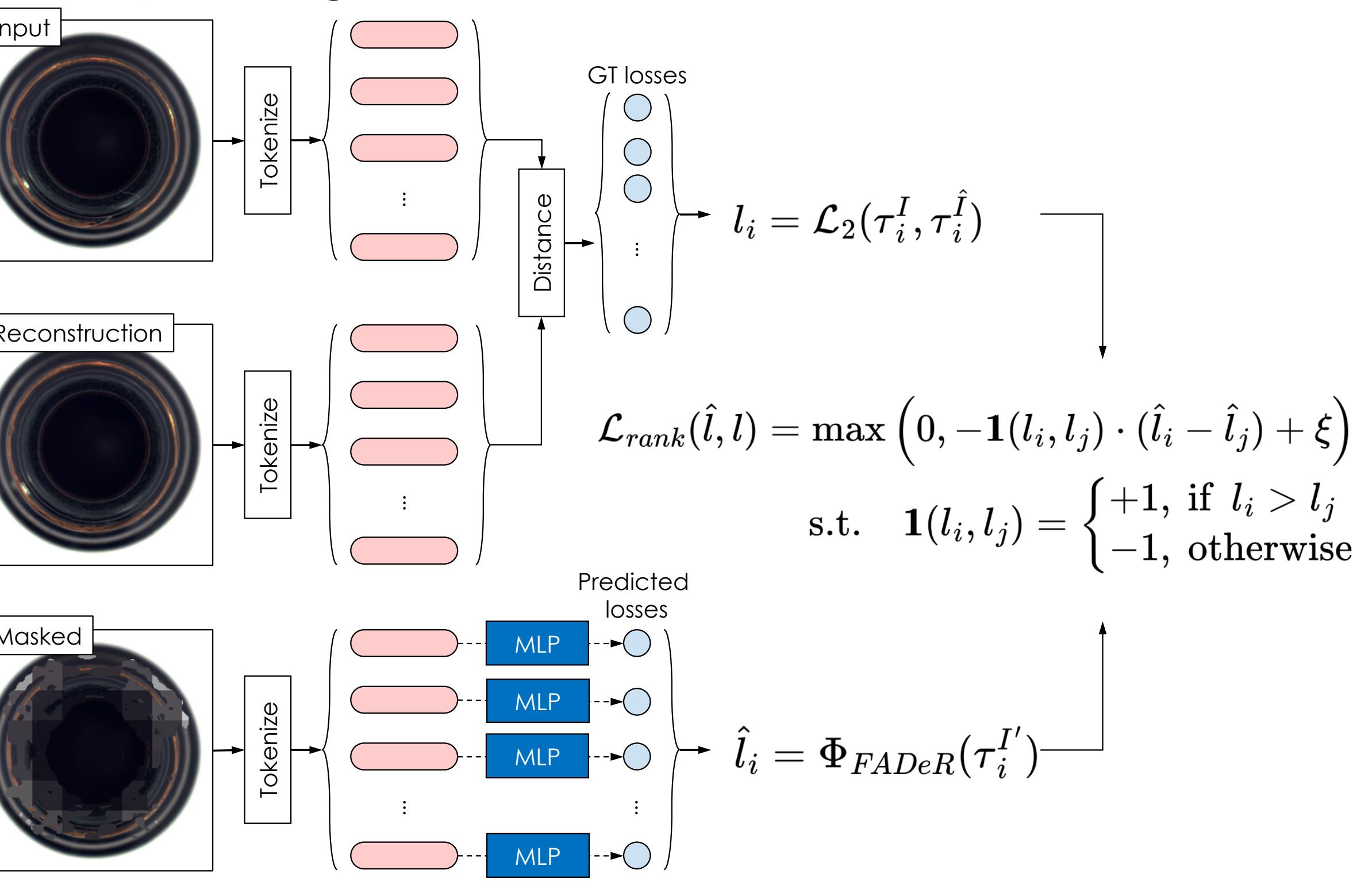


- An MLP component designed to overcome incomplete masking by attenuating defective feature representations

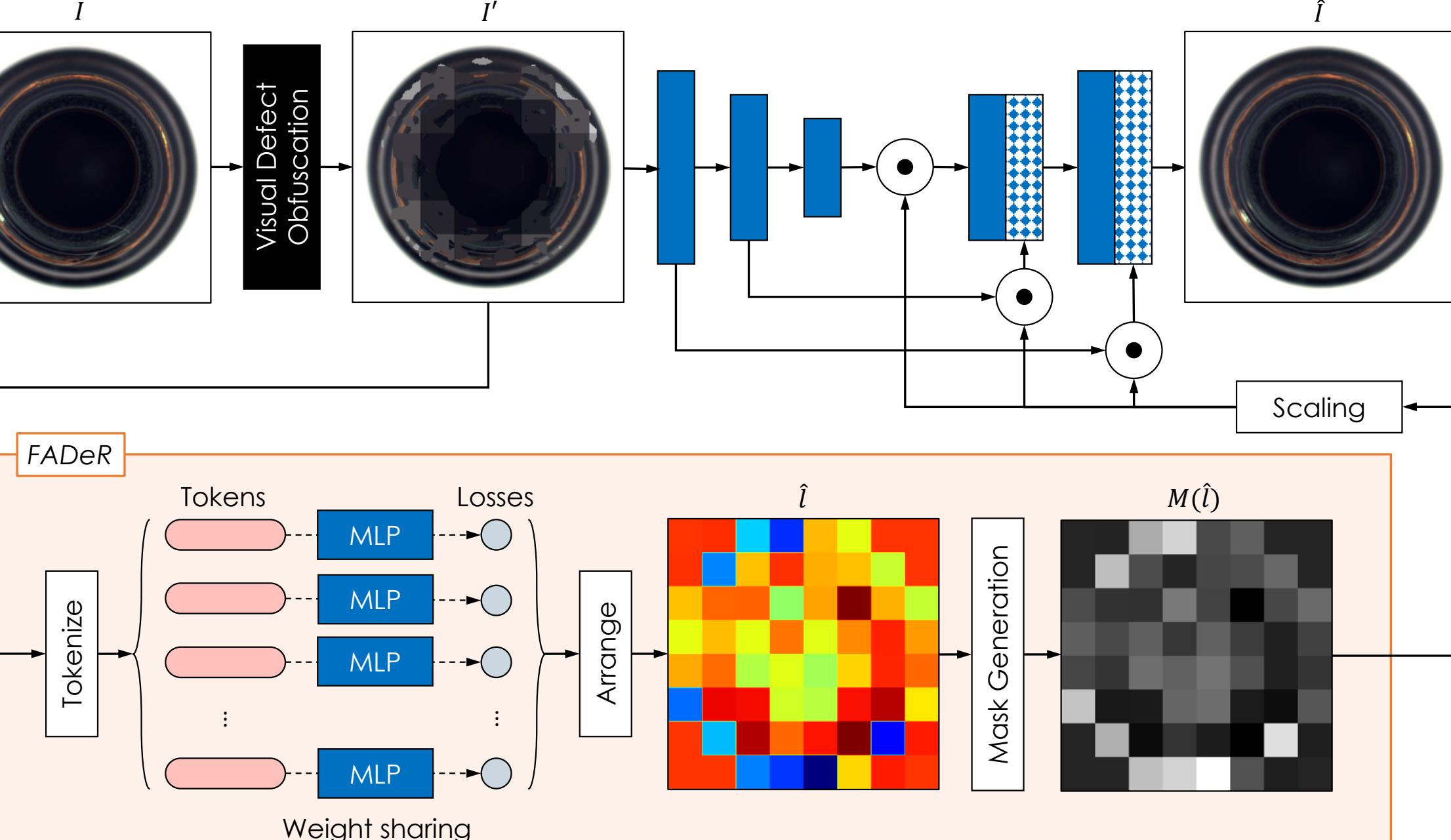


Feature Attenuation of Defective Representation

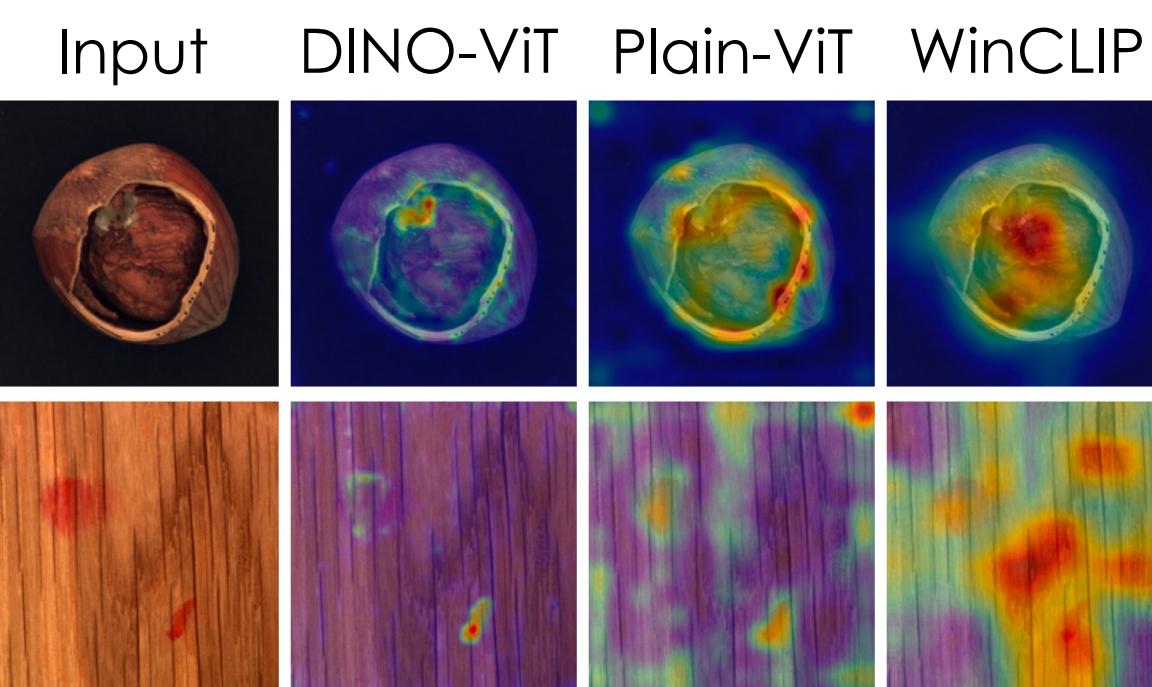
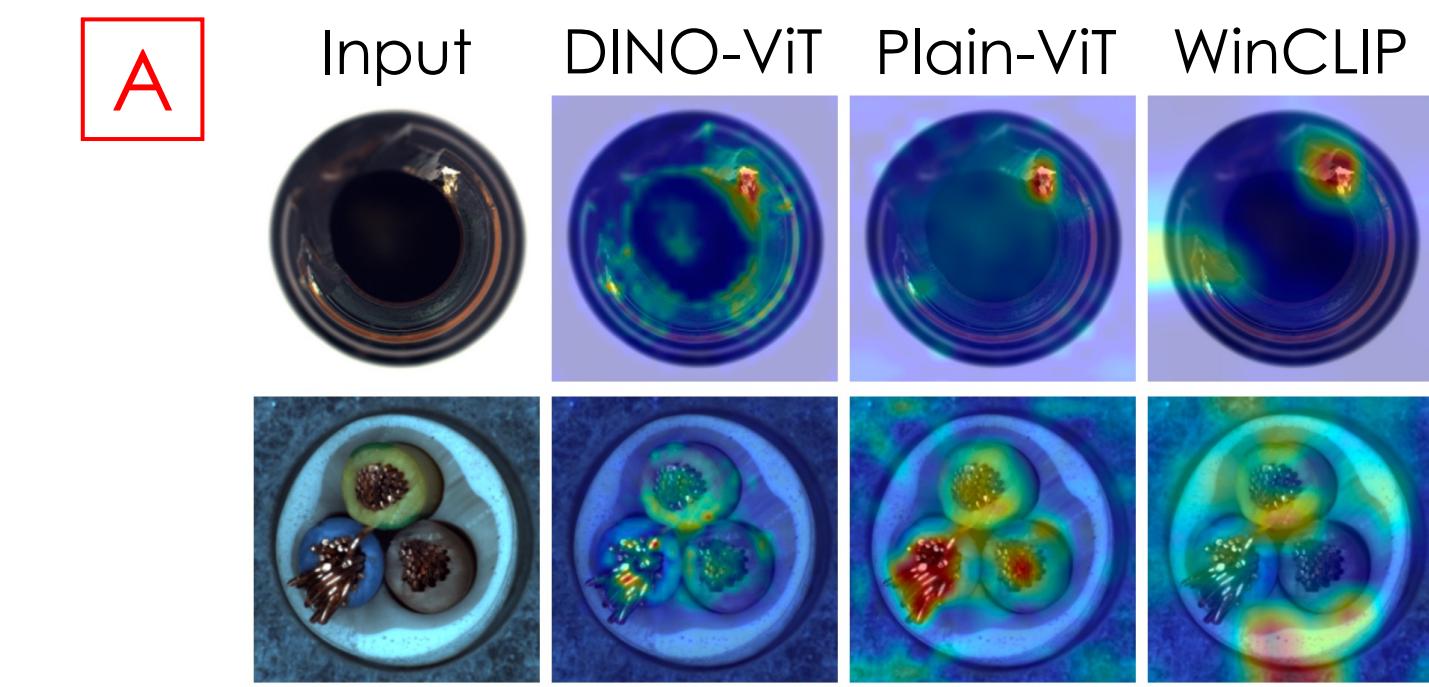
- Enables label-free training by leveraging active learning
- FADeR is trained to predict the rank \hat{l} of path-wise reconstruction errors l by ranking loss



- Generates a soft mask only with a simple two-layered MLP to attenuate defective representations

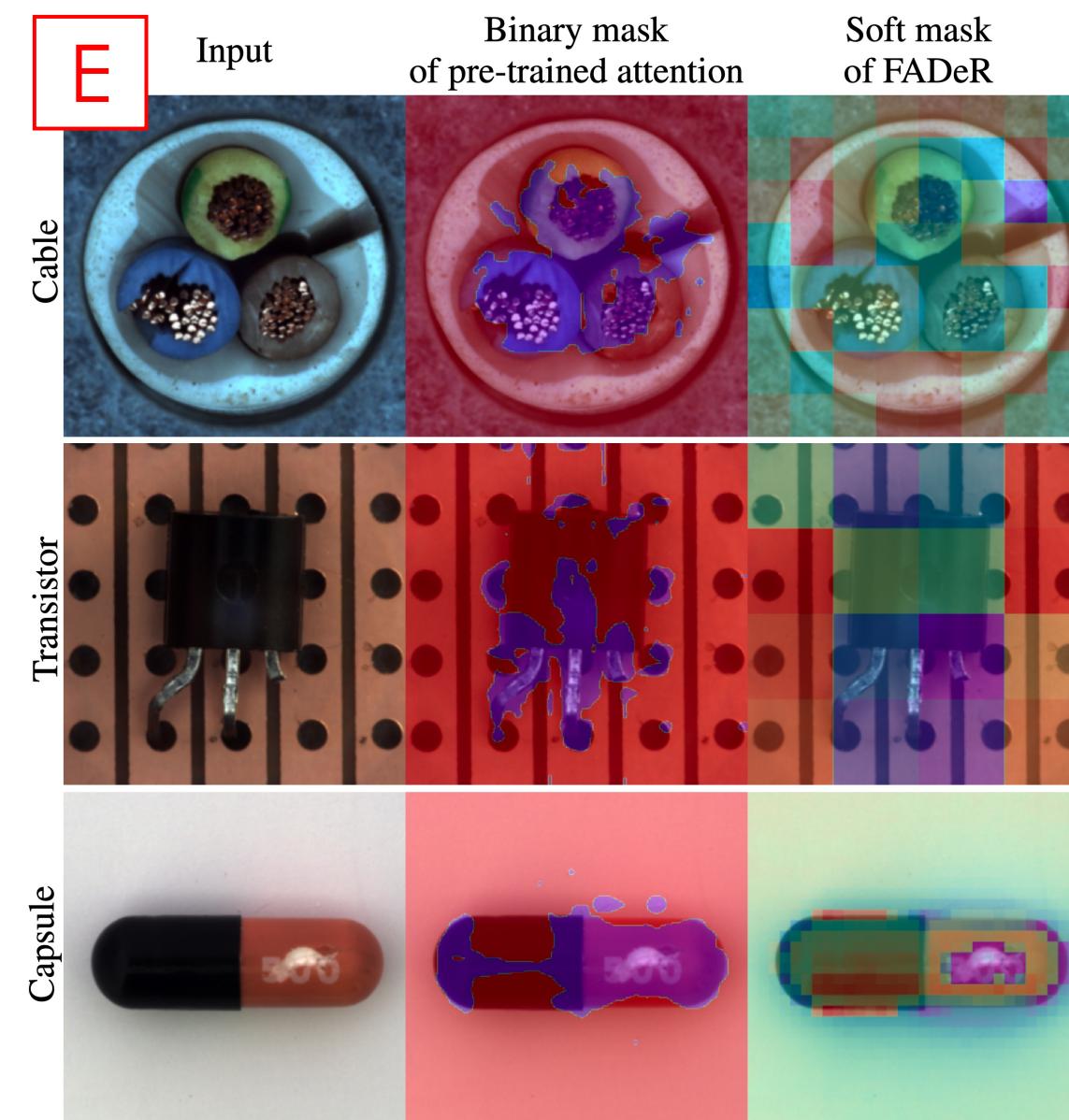


Results



Model	FADeR _{DINO-EAR}	FADeR _{ViT-EAR}	FADeR _{WinCLIP-EAR}
Bottle	0.997 / 0.914 → 0.998 / 0.951	0.983 / 0.930 → 0.993 / 0.950	0.992 / 0.939 → 0.992 / 0.936
Cable	0.870 / 0.775 → 0.887 / 0.856	0.817 / 0.798 → 0.825 / 0.872	0.838 / 0.550 → 0.794 / 0.612
Capsule	0.870 / 0.944 → 0.947 / 0.980	0.863 / 0.965 → 0.933 / 0.977	0.867 / 0.935 → 0.930 / 0.968
Carpet	0.899 / 0.974 → 0.971 / 0.992	0.701 / 0.945 → 0.756 / 0.981	0.679 / 0.909 → 0.746 / 0.955
Grid	0.959 / 0.974 → 0.983 / 0.986	0.763 / 0.919 → 0.805 / 0.901	0.866 / 0.940 → 0.861 / 0.939
Hazelnut	0.997 / 0.957 → 0.988 / 0.976	0.954 / 0.952 → 0.973 / 0.977	0.946 / 0.947 → 0.959 / 0.976
Leather	1.000 / 0.992 → 1.000 / 0.996	1.000 / 0.981 → 1.000 / 0.993	1.000 / 0.971 → 1.000 / 0.990
Metal nut	0.876 / 0.793 → 0.876 / 0.828	0.880 / 0.767 → 0.903 / 0.804	0.775 / 0.780 → 0.821 / 0.779
Pill	0.922 / 0.875 → 0.976 / 0.945	0.884 / 0.914 → 0.957 / 0.967	0.879 / 0.898 → 0.956 / 0.951
Screw	0.886 / 0.975 → 0.918 / 0.991	0.883 / 0.977 → 0.905 / 0.993	0.862 / 0.953 → 0.897 / 0.968
Tile	0.962 / 0.857 → 1.000 / 0.950	0.961 / 0.853 → 1.000 / 0.940	0.960 / 0.816 → 0.986 / 0.921
Toothbrush	1.000 / 0.953 → 1.000 / 0.987	1.000 / 0.953 → 0.994 / 0.986	1.000 / 0.959 → 1.000 / 0.986
Transistor	0.947 / 0.745 → 0.933 / 0.825	0.891 / 0.679 → 0.908 / 0.740	0.788 / 0.699 → 0.835 / 0.642
Wood	0.985 / 0.875 → 0.996 / 0.818	0.931 / 0.818 → 0.964 / 0.730	0.997 / 0.691 → 0.997 / 0.751
Zipper	0.955 / 0.930 → 0.987 / 0.988	0.932 / 0.909 → 0.938 / 0.951	0.924 / 0.895 → 0.975 / 0.967
Average	0.942 / 0.902 → 0.964 / 0.938	0.896 / 0.891 → 0.924 / 0.918	0.892 / 0.859 → 0.917 / 0.889

Model	FADeR _{DSR-EAR}	FADeR _{MSFlow-EAR}	FADeR _{AMI-EAR}
Bottle	0.991 / 0.953 → 0.984 / 0.938	0.971 / 0.931 → 0.973 / 0.951	0.886 / 0.910 → 0.987 / 0.978
Cable	0.891 / 0.908 → 0.834 / 0.947	0.920 / 0.898 → 0.939 / 0.943	0.879 / 0.794 → 0.856 / 0.928
Capsule	0.834 / 0.943 → 0.927 / 0.976	0.861 / 0.957 → 0.938 / 0.976	0.911 / 0.773 → 0.902 / 0.970
Carpet	0.806 / 0.982 → 0.935 / 0.993	0.983 / 0.970 → 0.984 / 0.982	0.983 / 0.932 → 0.785 / 0.903
Grid	0.930 / 0.984 → 0.984 / 0.989	0.971 / 0.971 → 0.960 / 0.984	0.934 / 0.809 → 0.908 / 0.847
Hazelnut	0.989 / 0.954 → 0.975 / 0.964	0.903 / 0.946 → 0.901 / 0.963	0.729 / 0.958 → 0.895 / 0.950
Leather	1.000 / 0.989 → 1.000 / 0.996	1.000 / 0.978 → 1.000 / 0.993	0.816 / 0.823 → 0.998 / 0.956
Metal nut	0.817 / 0.804 → 0.851 / 0.893	0.763 / 0.915 → 0.767 / 0.939	0.918 / 0.545 → 0.933 / 0.835
Pill	0.824 / 0.917 → 0.977 / 0.957	0.855 / 0.924 → 0.974 / 0.963	0.995 / 0.938 → 0.903 / 0.936
Screw	0.752 / 0.987 → 0.751 / 0.993	0.837 / 0.975 → 0.896 / 0.993	0.883 / 0.927 → 0.786 / 0.920
Tile	0.942 / 0.878 → 0.999 / 0.977	0.937 / 0.875 → 0.999 / 0.980	0.934 / 0.840 → 0.948 / 0.867
Toothbrush	0.992 / 0.979 → 1.000 / 0.991	0.964 / 0.964 → 1.000 / 0.986	0.770 / 0.883 → 0.919 / 0.957
Transistor	0.857 / 0.685 → 0.840 / 0.779	0.876 / 0.764 → 0.891 / 0.839	0.821 / 0.950 → 0.915 / 0.884
Wood	0.943 / 0.917 → 0.977 / 0.817	0.955 / 0.900 → 0.943 / 0.904	0.875 / 0.856 → 0.887 / 0.715
Zipper	0.939 / 0.965 → 0.993 / 0.989	0.947 / 0.929 → 0.947 / 0.982	0.970 / 0.967 → 0.902 / 0.934
Average	0.900 / 0.923 → 0.935 / 0.946	0.916 / 0.926 → 0.941 / 0.959	0.887 / 0.860 → 0.902 / 0.905



- Attention maps of saliency/defective regions (w/o FADeR)
- Pre-trained attention-based masking methods on the MVTec AD
- Latent masking methods on the MVTec AD
- Comparison with two-stage model on the VisA
- Original binary mask and soft mask for feature attenuation