

- according to the scene distance to the training set
- Measure OSAR performance on each 4. subset

SOAR: Scene-debiasing Open-set Action Recognition Yuanhao Zhai¹, Ziyi Liu², Zhenyu Wu², Yi Wu², Chunluan Zhou², David Doermann¹, Junsong Yuan¹, Gang Hua² PARIS ¹University at Buffalo ²Wormpex AI Research Results SOTA OSAR results on UCF101, unfamiliar closed-set test scene lowest scene bias familiar open-set test scen (surfing) Slope SoftMax 41.17 ----BNN SV 41.34 BNN SVI [36] 51.80 ----DEAR 38.81 SOAR (Ours) (flyboard) Ablation study etween Closed-Set Test Set and Training Se *d*: Scene Distance between Open-Set Test Set and Training Set Unknown action in familiar scene Known action in unfamiliar scene AdRecon AdaScls AUC ↑ FAR@9 93.58 **94.60** Our method Qualitative results Adversarial scene reconstruction *Feature extraction* Spatio-temporal Adversarial Backgroun Uncertainty ma Raw video feature map $\mathcal{L}_{\mathrm{recon}}$ reconstruction 0.00 0.25 0.50 0.75 1.00 Gradient reversal Decoder Ride horse Evidential deep learning $H_e(\cdot)$ Pool $\mathcal{L}_{ ext{EDL}}$ $D(\boldsymbol{p}|\boldsymbol{lpha})$ Evidence EDL head Backbone Walk Adaptive adversarial scene classification $F \longrightarrow$ $\mathcal{L}_{s_{guide}}$ $H_s(\cdot)$ $R_{\lambda_{\alpha}}(\cdot)$ Input video Feature vector $\mathcal{L}_{\mathrm{s_cls}}$ Scene cls. head Gradient reversal Apply eye makeup Evidential deep learning for uncertainty estimation Adversarial scene median filter Handstand reconstruction K Background estimation for still Recon. target Adversarial scene reconstruction background $\mathcal{L}_{\text{rocon}}$ Uncertainty-weighted **Open source** Gradient reversal reconstruction for dynamic Recon. weight background Adaptive adversarial scene classification Uncertainty map Adversarially classify the scene type Spatial uncertainty guidance to apply more weight on the scene regions Adaptive adversarial scene classification Project Code Paper $R_{\lambda_s}(\cdot)$ $H_{s}(\cdot)$ $\mathcal{L}_{n,cls}$ Gradient reversal Scene cls. head





JCF101	[<mark>63]+MiTv2</mark> [4	45]		Closed-set			
R@95 ↓	TPR@10 ↑	Open maF1 ↑	AUC ↑	FAR@95 ↓	TPR@10 ↑	Open maF1 ↑	Accuracy
6.93	8.85	55.50 ± 0.45	44.34	97.91	3.66	73.13 ± 0.12	94.10
5.89	3.78	66.21 ± 0.16	63.67	80.53	6.54	67.81 ± 0.12	56.54
5.43	85.72	68.12 ± 0.20	86.11	77.50	70.13	71.13 ± 0.15	94.13
5.88	79.36	67.96 ± 0.19	85.63	71.52	66.14	71.57 ± 0.17	93.89
9.53	84.03	75.12 ± 0.27	87.12	71.32	72.21	88.07 ± 0.20	93.97
5.33	86.47	76.22 ± 0.32	88.10	69.57	72.75	89.55 ± 0.22	95.24

01 [63]+MiTv2 [45]			UCF101 [63]+HMDB51 [38]				KAUS		UAFS	
\downarrow	TPR@10 ↑	Open maF1 ↑	AUC ↑	FAR@95↓	TPR@10 ↑	Open maF1 ↑	Var↓	Slope ↓	Var ↓	Slope ↓
	78.96	68.55 ± 0.34	85.63	78.59	68.10	87.73 ± 0.22	6.12	75.51	6.17	75.52
	85.72	73.49 ± 0.35	87.49	69.41	72.31	89.52 ± 0.21	3.82	59.20	4.16	49.20
	83.16	72.16 ± 0.30	87.22	71.45	69.80	87.47 ± 0.19	4.43	63.62	4.49	63.63
	86.47	76.22 ± 0.32	88.10	69.57	72.75	89.55 ± 0.22	2.56	48.92	3.99	38.81