Table 5: Detection accuracy in the AUC measure. The distance-based metrics, denoted by DISTANCE, are further categorized depending on whether the Euclidean distance or the cosine similarity is used. RECURVE adopts the curvature-based metric. If the inter-class embedding distance between two classes is shorter than a certain threshold, the change between the two classes is categorized as *gradual*. Here, the threshold is set so that gradual changes constitute 20% of all changes. Abrupt changes are excluded when measuring AUC-Gradual, and vice versa. In conclusion, RECURVE can support both gradual and abrupt changes, and it is more effective in handling gradual changes.

Methods	Repr.	p	AUC-Gradual ↑				AUC-Abrupt ↑			
			WISDM	HAPT	mHealth	50salads	WISDM	HAPT	mHealth	50salads
DISTANCE (Euclidean)	TPC	5	0.690±0.008	0.516±0.029	0.519±0.005	0.596±0.005	0.694±0.009	0.716±0.010	0.696±0.010	0.622±0.027
		10	0.690±0.008	0.520±0.029	0.521±0.005	0.599±0.005	0.695±0.009	0.717±0.010	0.699±0.010	0.624±0.027
		20	0.691±0.009	0.527±0.028	0.521±0.005	0.603±0.005	0.696±0.008	0.718±0.009	0.700±0.010	0.628±0.027
	TNC	5	0.715±0.012	0.692±0.022	0.706±0.017	0.556±0.057	0.720±0.008	0.846±0.007	0.839±0.028	0.630±0.011
		10	0.724±0.014	0.698±0.022	0.708±0.017	0.558±0.056	0.735±0.009	0.849±0.007	0.847±0.028	0.632±0.011
		20	0.734±0.017	0.708±0.022	0.709±0.017	0.561±0.056	0.754±0.011	0.854±0.007	0.849±0.029	0.636±0.011
DISTANCE (Cosine)	TPC (=TS-CP^2)	5	0.807±0.014	0.602±0.023	0.546±0.015	0.671±0.010	0.838±0.009	0.746±0.021	0.631±0.011	0.703±0.039
		10	0.811±0.014	0.606±0.023	0.548±0.014	0.674±0.010	0.845±0.010	0.747±0.021	0.636±0.011	0.706±0.035
		20	0.814±0.015	0.613±0.022	0.550±0.011	0.677±0.009	0.847±0.010	0.747±0.020	0.637±0.010	0.714±0.037
	TNC	5	0.779±0.013	0.774±0.013	0.789±0.017	0.594±0.022	0.794±0.012	**0.945±0.006**	0.892±0.023	0.681±0.010
		10	0.787±0.012	0.783±0.012	0.803±0.015	0.594±0.032	0.808±0.011	0.946±0.004	0.901±0.022	0.685±0.010
		20	0.814±0.013	0.799±0.014	0.846±0.009	0.601±0.032	0.846±0.011	0.950±0.004	0.928±0.017	0.687±0.010
RECURVE	TPC	5	**0.888±0.004**	**0.886±0.009**	0.939±0.003	**0.712±0.006**	**0.923±0.003**	**0.945±0.002**	0.985±0.004	**0.729±0.055**
		10	**0.893±0.005**	**0.891±0.009**	0.940±0.003	**0.715±0.006**	**0.927±0.002**	0.948±0.002	0.988±0.004	**0.731±0.054**
		20	**0.894±0.005**	**0.896±0.009**	0.941±0.003	**0.722±0.006**	**0.927±0.002**	0.955±0.002	0.988±0.004	**0.734±0.051**
	TNC	5	0.867±0.007	0.773±0.038	**0.975±0.003**	0.551±0.034	0.901±0.006	0.931±0.002	**0.988±0.006**	0.600±0.016
		10	0.875±0.007	0.779±0.038	**0.977±0.003**	0.553±0.034	0.910±0.006	0.933±0.002	**0.989±0.006**	0.602±0.016
		20	0.890±0.008	0.791±0.038	**0.977±0.004**	0.558±0.033	**0.927±0.006**	0.939±0.002	**0.990±0.006**	0.606±0.015

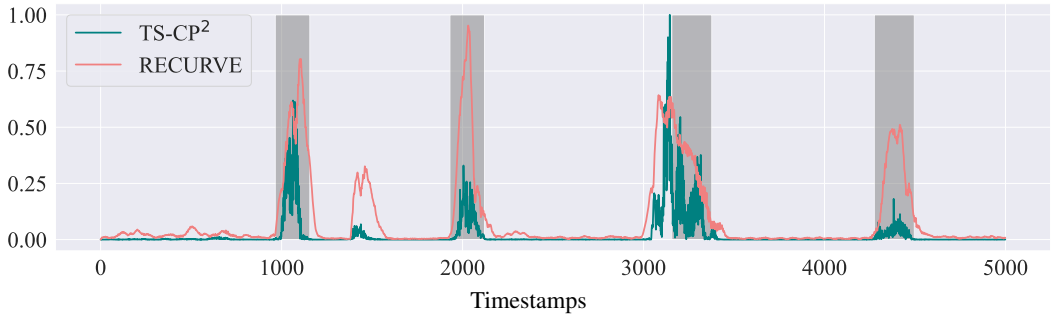
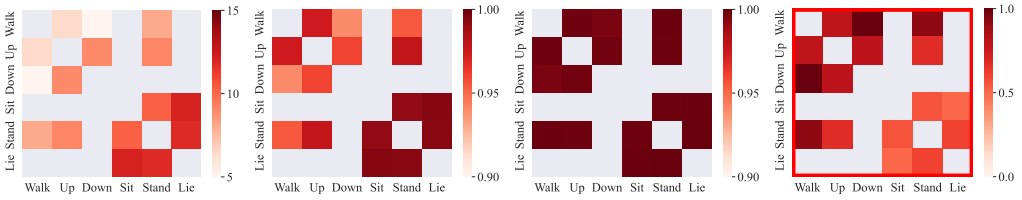


Figure 8: Change metric score from the HAPT dataset with the default configuration. A grey-shaded area represents inter-segment points between two class segments. Note that TS-CP^2 fluctuates rapidly during the changes and seems to have many false negatives at the rightmost boundary area. On the other hand, RECURVE indicates the inter-segment points much more clearly than TS-CP^2.



(a) Embedding distance. (b) Averaged $\hat{y}_t^{\text{dist}}$ (TS-CP^2). (c) Averaged $\hat{y}_t^{\text{curv}}$ (**RECURVE**). (d) Averaged $\hat{y}_t^{\theta}$ (only turning angle).

Figure 9: Heatmaps of the inter-class distances and values of the change metrics between the classes in the HAPT dataset. A grey box indicates no transition between two classes. Compared to Figure 6, Figure 9**(d)** is added here to investigate the *sole effect* of the turning angle θ_t. For (d), $\hat{y}_t^{\theta} = \texttt{MA}(\texttt{NORM}(2\pi - \theta_t))$, where θ_t is defined as Eq. (4). Interestingly, $\hat{y}_t^{\theta}$ is greater for the transitions with smaller inter-class embedding distances. This additional result in (d) validates the rationale behind the effectiveness of RECURVE in handling gradual changes.