
Disentanglement Beyond Static vs. Dynamic: A Benchmark and Evaluation Framework for Multi-Factor Sequential Representations

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BMS Air-Quality Results

Table 1: DCI on the **BMS Air-Quality** dataset for **Sparse-AE**.

None	DCI-M \uparrow	DCI-C \uparrow	DCI-E \uparrow
Station	$0.03 \pm 5e-03$	$0.72 \pm 1e-03$	$0.10 \pm 2e-02$
Year	$0.04 \pm 5e-03$	$0.72 \pm 2e-03$	$0.26 \pm 7e-03$
Month	$0.01 \pm 3e-03$	$0.73 \pm 2e-03$	$0.30 \pm 4e-02$
Day	$0.03 \pm 9e-03$	$0.72 \pm 2e-03$	$0.04 \pm 9e-03$
Season	$0.12 \pm 7e-03$	$0.80 \pm 3e-03$	$0.74 \pm 8e-03$

Table 2: DCI on the **BMS Air-Quality** dataset for **VAE**.

None	DCI-M \uparrow	DCI-C \uparrow	DCI-E \uparrow
Station	$0.07 \pm 6e-03$	$0.76 \pm 3e-03$	$0.10 \pm 2e-02$
Year	$0.06 \pm 8e-03$	$0.75 \pm 2e-03$	$0.28 \pm 7e-03$
Month	$0.04 \pm 2e-02$	$0.75 \pm 2e-03$	$0.37 \pm 1e-02$
Day	$0.07 \pm 2e-03$	$0.77 \pm 1e-03$	$0.04 \pm 6e-03$
Season	$0.39 \pm 5e-03$	$0.87 \pm 3e-03$	$0.81 \pm 8e-03$

*Equal contribution

Table 3: DCI on the BMS Air-Quality dataset for β -VAE.

None	DCI-M \uparrow	DCI-C \uparrow	DCI-E \uparrow
Station	$0.07 \pm 4e-03$	$0.77 \pm 2e-03$	$0.11 \pm 7e-03$
Year	$0.07 \pm 2e-03$	$0.75 \pm 3e-03$	$0.26 \pm 2e-02$
Month	$0.08 \pm 2e-02$	$0.75 \pm 2e-03$	$0.36 \pm 1e-02$
Day	$0.07 \pm 7e-03$	$0.77 \pm 2e-03$	$0.04 \pm 1e-02$
Season	$0.38 \pm 3e-03$	$0.88 \pm 4e-03$	$0.79 \pm 5e-03$

Table 4: DCI on the BMS Air-Quality dataset for MGP-VAE.

None	DCI-M \uparrow	DCI-C \uparrow	DCI-E \uparrow
Station	$0.00 \pm 9e-04$	$0.32 \pm 3e-03$	$0.08 \pm 5e-03$
Year	$0.00 \pm 1e-03$	$0.32 \pm 2e-03$	$0.25 \pm 1e-02$
Month	$0.00 \pm 1e-03$	$0.33 \pm 3e-03$	$0.11 \pm 8e-03$
Day	$0.00 \pm 1e-03$	$0.33 \pm 2e-03$	$0.04 \pm 9e-03$
Season	$0.00 \pm 1e-03$	$0.35 \pm 7e-03$	$0.39 \pm 3e-02$

Table 5: DCI on the BMS Air-Quality dataset for SKD.

None	DCI-M \uparrow	DCI-C \uparrow	DCI-E \uparrow
Station	$0.03 \pm 6e-03$	$0.67 \pm 1e-02$	$0.18 \pm 1e-02$
Year	$0.02 \pm 7e-03$	$0.66 \pm 1e-02$	$0.31 \pm 2e-02$
Month	$0.06 \pm 5e-02$	$0.66 \pm 2e-02$	$0.39 \pm 3e-02$
Day	$0.04 \pm 4e-03$	$0.68 \pm 1e-02$	$0.04 \pm 1e-02$
Season	$0.18 \pm 7e-03$	$0.71 \pm 3e-02$	$0.74 \pm 1e-02$

Table 6: **DCI** on the **BMS Air-Quality** dataset for **SSM-SKD**.

None	DCI-M \uparrow	DCI-C \uparrow	DCI-E \uparrow
Station	$0.10 \pm 8\text{e-}03$	$0.70 \pm 4\text{e-}03$	$0.27 \pm 1\text{e-}02$
Year	$0.09 \pm 6\text{e-}03$	$0.67 \pm 2\text{e-}03$	$0.44 \pm 7\text{e-}03$
Month	$0.10 \pm 2\text{e-}03$	$0.67 \pm 1\text{e-}03$	$0.53 \pm 7\text{e-}03$
Day	$0.08 \pm 7\text{e-}03$	$0.68 \pm 3\text{e-}03$	$0.06 \pm 2\text{e-}03$
Season	$0.19 \pm 2\text{e-}02$	$0.76 \pm 4\text{e-}03$	$0.87 \pm 2\text{e-}03$