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

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## Sprites Results

Table 1: **M-Swap** on the **Sprites** dataset for **Sparse-AE**.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.99 \pm 2e-03$	$0.20 \pm 1e-02$	$0.28 \pm 8e-03$	$0.93 \pm 2e-03$	$0.19 \pm 1e-02$
	Body	$0.14 \pm 1e-02$	$0.39 \pm 1e-02$	$0.18 \pm 7e-03$	$0.20 \pm 6e-03$	$0.21 \pm 8e-03$
	Bottom	$0.14 \pm 1e-02$	$0.20 \pm 1e-02$	$0.18 \pm 1e-02$	$0.20 \pm 6e-03$	$0.21 \pm 8e-03$
	Top	$0.14 \pm 1e-02$	$0.18 \pm 1e-02$	$0.17 \pm 1e-02$	$0.20 \pm 5e-03$	$0.21 \pm 8e-03$
	Hair	$0.14 \pm 1e-02$	$0.21 \pm 1e-02$	$0.23 \pm 6e-03$	$0.20 \pm 6e-03$	$0.52 \pm 1e-02$
Two-factor	Dynamic	$0.99 \pm 2e-03$	$0.20 \pm 5e-03$	$0.28 \pm 1e-02$	$0.93 \pm 4e-03$	$0.19 \pm 1e-02$
	Static	$0.14 \pm 7e-03$	$0.47 \pm 1e-02$	$0.25 \pm 8e-03$	$0.20 \pm 8e-03$	$0.53 \pm 7e-03$

Table 2: **M-Swap** on the **Sprites** dataset for **VAE**.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.82 \pm 1e-02$	$0.16 \pm 5e-03$	$0.16 \pm 7e-03$	$0.18 \pm 4e-03$	$0.17 \pm 2e-03$
	Body	$0.14 \pm 1e-02$	$0.17 \pm 3e-03$	$0.16 \pm 5e-03$	$0.18 \pm 7e-03$	$0.17 \pm 1e-02$
	Bottom	$0.14 \pm 1e-02$	$0.16 \pm 6e-03$	$0.16 \pm 5e-03$	$0.18 \pm 6e-03$	$0.17 \pm 1e-02$
	Top	$0.14 \pm 1e-02$	$0.16 \pm 4e-03$	$0.16 \pm 4e-03$	$0.18 \pm 6e-03$	$0.17 \pm 1e-02$
	Hair	$0.14 \pm 1e-02$	$0.17 \pm 3e-03$	$0.16 \pm 4e-03$	$0.18 \pm 7e-03$	$0.17 \pm 1e-02$
Two-factor	Dynamic	$0.82 \pm 1e-02$	$0.16 \pm 6e-03$	$0.16 \pm 8e-03$	$0.18 \pm 8e-03$	$0.18 \pm 6e-03$
	Static	$0.23 \pm 3e-03$	$0.17 \pm 6e-03$	$0.16 \pm 1e-02$	$0.18 \pm 1e-02$	$0.17 \pm 1e-02$

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\*Equal contribution

Table 3: **M-Swap** on the **Sprites** dataset for  $\beta$ -VAE.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$1.00 \pm 7e-04$	$0.16 \pm 8e-04$	$0.16 \pm 1e-03$	$0.18 \pm 2e-03$	$0.17 \pm 2e-03$
	Body	$0.14 \pm 1e-02$	$0.17 \pm 7e-03$	$0.16 \pm 9e-03$	$0.18 \pm 1e-02$	$0.16 \pm 4e-03$
	Bottom	$0.14 \pm 1e-02$	$0.17 \pm 7e-03$	$0.16 \pm 9e-03$	$0.18 \pm 2e-02$	$0.16 \pm 4e-03$
	Top	$0.14 \pm 1e-02$	$0.17 \pm 7e-03$	$0.16 \pm 9e-03$	$0.18 \pm 2e-02$	$0.16 \pm 5e-03$
	Hair	$0.14 \pm 1e-02$	$0.17 \pm 6e-03$	$0.16 \pm 1e-02$	$0.18 \pm 2e-02$	$0.16 \pm 4e-03$
Two-factor	Dynamic	$1.00 \pm 1e-03$	$0.16 \pm 2e-03$	$0.16 \pm 2e-03$	$0.18 \pm 2e-03$	$0.17 \pm 1e-03$
	Static	$0.14 \pm 1e-02$	$0.17 \pm 4e-03$	$0.16 \pm 8e-03$	$0.18 \pm 7e-03$	$0.17 \pm 5e-03$

Table 4: **M-Swap** on the **Sprites** dataset for **MGP-VAE**.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.40 \pm 8e-03$	$0.19 \pm 7e-03$	$0.19 \pm 9e-03$	$0.19 \pm 6e-03$	$0.19 \pm 1e-02$
	Body	$0.14 \pm 7e-03$	$0.96 \pm 7e-03$	$0.19 \pm 1e-02$	$0.19 \pm 6e-03$	$0.22 \pm 5e-03$
	Bottom	$0.20 \pm 1e-02$	$0.19 \pm 8e-03$	$0.75 \pm 3e-03$	$0.19 \pm 6e-03$	$0.19 \pm 1e-02$
	Top	$0.23 \pm 1e-02$	$0.19 \pm 6e-03$	$0.29 \pm 1e-02$	$1.00 \pm 9e-04$	$0.19 \pm 6e-03$
	Hair	$0.14 \pm 7e-03$	$0.19 \pm 8e-03$	$0.19 \pm 1e-02$	$0.19 \pm 6e-03$	$0.71 \pm 5e-03$
Two-factor	Dynamic	$0.39 \pm 1e-02$	$0.19 \pm 8e-03$	$0.20 \pm 9e-03$	$0.19 \pm 7e-03$	$0.19 \pm 9e-03$
	Static	$0.33 \pm 8e-03$	$0.94 \pm 4e-03$	$0.98 \pm 1e-03$	$1.00 \pm 1e-03$	$0.93 \pm 5e-03$

Table 5: **M-Swap** on the **Sprites** dataset for **SKD**.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.87 \pm 8e-02$	$0.17 \pm 1e-02$	$0.17 \pm 9e-03$	$0.16 \pm 9e-03$	$0.17 \pm 7e-03$
	Body	$0.12 \pm 2e-02$	$0.30 \pm 3e-02$	$0.28 \pm 3e-02$	$0.28 \pm 3e-02$	$0.24 \pm 2e-02$
	Bottom	$0.12 \pm 1e-02$	$0.22 \pm 2e-02$	$0.29 \pm 3e-02$	$0.19 \pm 2e-02$	$0.23 \pm 2e-02$
	Top	$0.12 \pm 1e-02$	$0.25 \pm 2e-02$	$0.19 \pm 1e-02$	$0.53 \pm 1e-02$	$0.20 \pm 6e-03$
	Hair	$0.12 \pm 1e-02$	$0.19 \pm 1e-02$	$0.17 \pm 1e-02$	$0.15 \pm 9e-03$	$0.21 \pm 1e-02$
Two-factor	Dynamic	$0.86 \pm 7e-02$	$0.17 \pm 1e-02$	$0.16 \pm 2e-02$	$0.17 \pm 8e-03$	$0.16 \pm 1e-02$
	Static	$0.15 \pm 2e-02$	$0.98 \pm 2e-02$	$0.95 \pm 2e-02$	$0.97 \pm 3e-02$	$0.98 \pm 2e-02$

Table 6: **M-Swap** on the **Sprites** dataset for **SSM-SKD**.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.98 \pm 3e-03$	$0.19 \pm 8e-03$	$0.18 \pm 8e-03$	$0.17 \pm 8e-03$	$0.17 \pm 7e-03$
	Body	$0.12 \pm 1e-02$	$0.71 \pm 1e-02$	$0.16 \pm 7e-03$	$0.17 \pm 8e-03$	$0.17 \pm 7e-03$
	Bottom	$0.12 \pm 1e-02$	$0.18 \pm 9e-03$	$0.76 \pm 2e-02$	$0.17 \pm 8e-03$	$0.17 \pm 7e-03$
	Top	$0.11 \pm 1e-02$	$0.18 \pm 9e-03$	$0.16 \pm 7e-03$	$0.97 \pm 5e-03$	$0.17 \pm 7e-03$
	Hair	$0.11 \pm 1e-02$	$0.17 \pm 9e-03$	$0.16 \pm 7e-03$	$0.17 \pm 8e-03$	$0.99 \pm 2e-03$
Two-factor	Dynamic	$0.98 \pm 5e-03$	$0.19 \pm 1e-02$	$0.18 \pm 8e-03$	$0.16 \pm 9e-03$	$0.16 \pm 1e-02$
	Static	$0.12 \pm 8e-03$	$0.89 \pm 5e-03$	$0.91 \pm 8e-03$	$0.99 \pm 2e-03$	$1.00 \pm 5e-04$

Table 7: **M-GSample** on the **Sprites** dataset for **Sparse-AE**.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.97 \pm 4e-03$	$0.17 \pm 4e-03$	$0.25 \pm 1e-02$	$0.85 \pm 4e-03$	$0.17 \pm 1e-02$
	Body	$0.10 \pm 1e-02$	$0.28 \pm 7e-03$	$0.17 \pm 3e-03$	$0.17 \pm 3e-03$	$0.17 \pm 1e-02$
	Bottom	$0.10 \pm 9e-03$	$0.17 \pm 8e-03$	$0.18 \pm 7e-03$	$0.17 \pm 4e-03$	$0.17 \pm 1e-02$
	Top	$0.11 \pm 9e-03$	$0.16 \pm 3e-03$	$0.17 \pm 9e-03$	$0.17 \pm 1e-03$	$0.17 \pm 9e-03$
	Hair	$0.11 \pm 1e-02$	$0.18 \pm 7e-03$	$0.23 \pm 1e-02$	$0.17 \pm 7e-03$	$0.55 \pm 4e-03$
Two-factor	Dynamic	$0.97 \pm 3e-03$	$0.17 \pm 8e-03$	$0.25 \pm 8e-03$	$0.86 \pm 2e-03$	$0.17 \pm 9e-03$
	Static	$0.11 \pm 9e-03$	$0.43 \pm 6e-03$	$0.27 \pm 7e-03$	$0.17 \pm 7e-03$	$0.56 \pm 3e-03$

Table 8: M-GSample on the Sprites dataset for VAE.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.93 \pm 1e-02$	$0.16 \pm 2e-03$	$0.16 \pm 4e-03$	$0.18 \pm 5e-03$	$0.17 \pm 6e-03$
	Body	$0.14 \pm 9e-03$	$0.16 \pm 1e-02$	$0.16 \pm 7e-03$	$0.17 \pm 5e-03$	$0.17 \pm 6e-03$
	Bottom	$0.17 \pm 9e-03$	$0.16 \pm 9e-03$	$0.16 \pm 8e-03$	$0.18 \pm 1e-02$	$0.17 \pm 4e-03$
	Top	$0.17 \pm 7e-03$	$0.17 \pm 1e-02$	$0.16 \pm 7e-03$	$0.18 \pm 1e-02$	$0.16 \pm 9e-03$
	Hair	$0.15 \pm 1e-02$	$0.16 \pm 6e-03$	$0.16 \pm 7e-03$	$0.17 \pm 5e-03$	$0.16 \pm 8e-03$
Two-factor	Dynamic	$0.93 \pm 6e-03$	$0.17 \pm 4e-03$	$0.16 \pm 5e-03$	$0.18 \pm 4e-03$	$0.17 \pm 5e-03$
	Static	$0.37 \pm 2e-02$	$0.17 \pm 9e-03$	$0.16 \pm 7e-03$	$0.17 \pm 9e-03$	$0.18 \pm 8e-03$

Table 9: M-GSample on the Sprites dataset for  $\beta$ -VAE.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$1.00 \pm 5e-04$	$0.16 \pm 1e-03$	$0.16 \pm 1e-03$	$0.18 \pm 1e-03$	$0.17 \pm 1e-03$
	Body	$0.12 \pm 5e-03$	$0.17 \pm 8e-03$	$0.16 \pm 6e-03$	$0.18 \pm 1e-02$	$0.17 \pm 6e-03$
	Bottom	$0.11 \pm 1e-02$	$0.16 \pm 5e-03$	$0.16 \pm 3e-03$	$0.18 \pm 1e-02$	$0.17 \pm 1e-02$
	Top	$0.11 \pm 1e-02$	$0.17 \pm 6e-03$	$0.16 \pm 4e-03$	$0.18 \pm 4e-03$	$0.17 \pm 8e-03$
	Hair	$0.12 \pm 7e-03$	$0.17 \pm 8e-03$	$0.16 \pm 5e-03$	$0.18 \pm 5e-03$	$0.17 \pm 7e-03$
Two-factor	Dynamic	$1.00 \pm 1e-03$	$0.16 \pm 2e-03$	$0.16 \pm 1e-03$	$0.18 \pm 3e-03$	$0.17 \pm 1e-03$
	Static	$0.13 \pm 9e-03$	$0.17 \pm 1e-02$	$0.16 \pm 5e-03$	$0.17 \pm 1e-02$	$0.17 \pm 7e-03$

Table 10: M-GSample on the Sprites dataset for MGP-VAE.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.13 \pm 9e-03$	$0.17 \pm 5e-03$	$0.17 \pm 7e-03$	$0.17 \pm 8e-03$	$0.16 \pm 1e-02$
	Body	$0.11 \pm 3e-03$	$0.25 \pm 6e-03$	$0.17 \pm 8e-03$	$0.16 \pm 1e-02$	$0.17 \pm 6e-03$
	Bottom	$0.12 \pm 7e-03$	$0.16 \pm 1e-02$	$0.24 \pm 1e-02$	$0.17 \pm 2e-02$	$0.16 \pm 8e-03$
	Top	$0.13 \pm 7e-03$	$0.16 \pm 9e-03$	$0.19 \pm 1e-02$	$0.41 \pm 1e-02$	$0.17 \pm 6e-03$
	Hair	$0.10 \pm 5e-03$	$0.17 \pm 6e-03$	$0.16 \pm 5e-03$	$0.16 \pm 1e-02$	$0.24 \pm 2e-02$
Two-factor	Dynamic	$0.13 \pm 5e-03$	$0.17 \pm 1e-02$	$0.17 \pm 6e-03$	$0.17 \pm 7e-03$	$0.16 \pm 7e-03$
	Static	$0.35 \pm 6e-03$	$0.78 \pm 5e-03$	$0.84 \pm 6e-03$	$0.86 \pm 6e-03$	$0.81 \pm 9e-03$

Table 11: M-GSample on the Sprites dataset for SKD.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.90 \pm 8e-02$	$0.17 \pm 1e-02$	$0.18 \pm 1e-02$	$0.17 \pm 1e-02$	$0.18 \pm 1e-02$
	Body	$0.12 \pm 6e-03$	$0.32 \pm 3e-02$	$0.30 \pm 3e-02$	$0.32 \pm 2e-02$	$0.25 \pm 4e-02$
	Bottom	$0.14 \pm 1e-02$	$0.22 \pm 2e-02$	$0.30 \pm 4e-02$	$0.20 \pm 2e-02$	$0.23 \pm 5e-03$
	Top	$0.12 \pm 2e-02$	$0.27 \pm 1e-02$	$0.19 \pm 8e-03$	$0.58 \pm 2e-02$	$0.20 \pm 1e-02$
	Hair	$0.12 \pm 1e-02$	$0.19 \pm 1e-02$	$0.17 \pm 1e-02$	$0.14 \pm 8e-03$	$0.22 \pm 2e-02$
Two-factor	Dynamic	$0.87 \pm 1e-01$	$0.17 \pm 3e-03$	$0.18 \pm 8e-03$	$0.17 \pm 2e-02$	$0.17 \pm 8e-03$
	Static	$0.21 \pm 6e-02$	$0.99 \pm 1e-02$	$0.96 \pm 3e-02$	$0.97 \pm 3e-02$	$0.98 \pm 2e-02$

Table 12: M-GSample on the Sprites dataset for SSM-SKD.

Category	Type	Movement	Body	Bottom	Top	Hair
Uni-factor	Movement	$0.99 \pm 1e-03$	$0.21 \pm 2e-02$	$0.22 \pm 8e-03$	$0.18 \pm 2e-02$	$0.18 \pm 2e-02$
	Body	$0.12 \pm 6e-03$	$0.74 \pm 1e-02$	$0.19 \pm 8e-03$	$0.17 \pm 1e-02$	$0.18 \pm 2e-02$
	Bottom	$0.12 \pm 1e-02$	$0.19 \pm 1e-02$	$0.78 \pm 2e-02$	$0.16 \pm 1e-02$	$0.17 \pm 2e-02$
	Top	$0.11 \pm 7e-03$	$0.17 \pm 1e-02$	$0.19 \pm 6e-03$	$0.99 \pm 4e-03$	$0.17 \pm 2e-02$
	Hair	$0.12 \pm 8e-03$	$0.18 \pm 9e-03$	$0.18 \pm 3e-03$	$0.16 \pm 2e-02$	$1.00 \pm 1e-03$
Two-factor	Dynamic	$0.99 \pm 3e-03$	$0.21 \pm 9e-03$	$0.22 \pm 1e-02$	$0.19 \pm 1e-02$	$0.18 \pm 1e-02$
	Static	$0.15 \pm 7e-03$	$0.88 \pm 1e-02$	$0.93 \pm 1e-02$	$0.99 \pm 4e-03$	$1.00 \pm 0e+00$

Table 13: **DCI** on the **Sprites** dataset for **Sparse-AE**.

<b>None</b>	DCI-M $\uparrow$	DCI-C $\uparrow$	DCI-E $\uparrow$
Movement	$0.31 \pm 1\text{e-}02$	$0.91 \pm 7\text{e-}03$	$1.00 \pm 0\text{e+}00$
Body	$0.64 \pm 2\text{e-}02$	$0.81 \pm 3\text{e-}03$	$0.77 \pm 9\text{e-}03$
Bottom	$0.27 \pm 6\text{e-}03$	$0.80 \pm 6\text{e-}03$	$0.39 \pm 1\text{e-}02$
Top	$0.23 \pm 2\text{e-}02$	$0.79 \pm 2\text{e-}03$	$0.93 \pm 1\text{e-}02$
Hair	$0.47 \pm 8\text{e-}03$	$0.85 \pm 3\text{e-}03$	$0.91 \pm 9\text{e-}03$

Table 14: **DCI** on the **Sprites** dataset for **VAE**.

<b>None</b>	DCI-M $\uparrow$	DCI-C $\uparrow$	DCI-E $\uparrow$
Movement	$0.73 \pm 2\text{e-}02$	$0.97 \pm 1\text{e-}03$	$0.99 \pm 1\text{e-}02$
Body	$0.12 \pm 4\text{e-}03$	$0.74 \pm 2\text{e-}03$	$0.17 \pm 4\text{e-}02$
Bottom	$0.12 \pm 2\text{e-}03$	$0.74 \pm 1\text{e-}03$	$0.16 \pm 2\text{e-}02$
Top	$0.12 \pm 4\text{e-}03$	$0.74 \pm 2\text{e-}03$	$0.17 \pm 1\text{e-}02$
Hair	$0.12 \pm 4\text{e-}03$	$0.74 \pm 2\text{e-}03$	$0.17 \pm 1\text{e-}02$

Table 15: **DCI** on the **Sprites** dataset for  $\beta$ -**VAE**.

<b>None</b>	DCI-M $\uparrow$	DCI-C $\uparrow$	DCI-E $\uparrow$
Movement	$0.86 \pm 2\text{e-}02$	$0.98 \pm 8\text{e-}04$	$0.99 \pm 8\text{e-}03$
Body	$0.12 \pm 1\text{e-}03$	$0.74 \pm 3\text{e-}03$	$0.17 \pm 1\text{e-}02$
Bottom	$0.13 \pm 2\text{e-}03$	$0.74 \pm 1\text{e-}03$	$0.17 \pm 3\text{e-}02$
Top	$0.13 \pm 3\text{e-}03$	$0.74 \pm 3\text{e-}03$	$0.17 \pm 2\text{e-}02$
Hair	$0.12 \pm 2\text{e-}03$	$0.74 \pm 1\text{e-}03$	$0.16 \pm 2\text{e-}02$

Table 16: **DCI** on the **Sprites** dataset for **MGP-VAE**.

<b>None</b>	DCI-M $\uparrow$	DCI-C $\uparrow$	DCI-E $\uparrow$
Movement	$0.61 \pm 8\text{e-}03$	$0.48 \pm 2\text{e-}03$	$0.95 \pm 8\text{e-}03$
Body	$0.63 \pm 9\text{e-}03$	$0.83 \pm 6\text{e-}03$	$0.89 \pm 1\text{e-}02$
Bottom	$0.72 \pm 3\text{e-}03$	$0.63 \pm 8\text{e-}03$	$0.94 \pm 5\text{e-}03$
Top	$0.29 \pm 4\text{e-}03$	$1.00 \pm 2\text{e-}03$	$1.00 \pm 3\text{e-}03$
Hair	$0.89 \pm 4\text{e-}03$	$0.71 \pm 5\text{e-}03$	$0.90 \pm 2\text{e-}02$

Table 17: **DCI** on the **Sprites** dataset for **SKD**.

<b>None</b>	DCI-M $\uparrow$	DCI-C $\uparrow$	DCI-E $\uparrow$
Movement	$0.37 \pm 1\text{e-}02$	$0.88 \pm 6\text{e-}03$	$0.98 \pm 0\text{e+}00$
Body	$0.28 \pm 5\text{e-}03$	$0.65 \pm 2\text{e-}02$	$0.69 \pm 4\text{e-}03$
Bottom	$0.15 \pm 1\text{e-}02$	$0.60 \pm 2\text{e-}03$	$0.67 \pm 1\text{e-}02$
Top	$0.40 \pm 3\text{e-}03$	$0.84 \pm 1\text{e-}03$	$0.92 \pm 3\text{e-}03$
Hair	$0.14 \pm 2\text{e-}02$	$0.58 \pm 2\text{e-}03$	$0.62 \pm 4\text{e-}03$

Table 18: **DCI** on the **Sprites** dataset for **SSM-SKD**.

<b>None</b>	DCI-M $\uparrow$	DCI-C $\uparrow$	DCI-E $\uparrow$
Movement	$0.88 \pm 5\text{e-}03$	$0.91 \pm 1\text{e-}03$	$0.97 \pm 0\text{e+}00$
Body	$0.91 \pm 4\text{e-}03$	$0.91 \pm 8\text{e-}04$	$0.97 \pm 4\text{e-}03$
Bottom	$0.79 \pm 6\text{e-}03$	$0.97 \pm 1\text{e-}03$	$0.99 \pm 0\text{e+}00$
Top	$0.91 \pm 3\text{e-}03$	$0.98 \pm 3\text{e-}04$	$0.99 \pm 0\text{e+}00$
Hair	$0.98 \pm 7\text{e-}04$	$0.97 \pm 3\text{e-}03$	$1.00 \pm 0\text{e+}00$

Table 19: **Consistency** on the **Sprites** dataset for **Sparse-AE**.

Category	Type	Bottom	Hair	Body	Top
C-Swap $\uparrow$	Bottom	$0.18 \pm 1\text{e-}02$	$1.00 \pm 3\text{e-}04$	$0.70 \pm 6\text{e-}03$	$0.99 \pm 5\text{e-}04$
	Hair	$0.36 \pm 6\text{e-}03$	$0.52 \pm 1\text{e-}02$	$0.52 \pm 7\text{e-}03$	$0.96 \pm 1\text{e-}03$
	Body	$0.44 \pm 8\text{e-}03$	$1.00 \pm 2\text{e-}04$	$0.37 \pm 1\text{e-}02$	$0.97 \pm 1\text{e-}03$
	Top	$0.50 \pm 6\text{e-}04$	$1.00 \pm 0\text{e+}00$	$0.73 \pm 4\text{e-}04$	$0.19 \pm 1\text{e-}02$
C-Sample $\uparrow$	Bottom	$0.95 \pm 2\text{e-}03$	$0.97 \pm 2\text{e-}03$	$0.98 \pm 2\text{e-}03$	$0.99 \pm 3\text{e-}03$
	Hair	$0.95 \pm 3\text{e-}03$	$0.97 \pm 1\text{e-}03$	$0.98 \pm 1\text{e-}03$	$0.98 \pm 2\text{e-}03$
	Body	$0.95 \pm 3\text{e-}03$	$0.97 \pm 2\text{e-}03$	$0.98 \pm 3\text{e-}03$	$0.99 \pm 2\text{e-}03$
	Top	$0.95 \pm 3\text{e-}03$	$0.97 \pm 2\text{e-}03$	$0.98 \pm 2\text{e-}03$	$0.98 \pm 1\text{e-}03$
GC-Sample $\uparrow$	Bottom	$0.95 \pm 2\text{e-}03$	$0.98 \pm 1\text{e-}03$	$0.98 \pm 8\text{e-}04$	$0.99 \pm 2\text{e-}03$
	Hair	$0.95 \pm 3\text{e-}03$	$0.98 \pm 7\text{e-}04$	$0.98 \pm 3\text{e-}03$	$0.98 \pm 2\text{e-}03$
	Body	$0.95 \pm 4\text{e-}03$	$0.98 \pm 2\text{e-}03$	$0.98 \pm 1\text{e-}03$	$0.99 \pm 1\text{e-}03$
	Top	$0.95 \pm 2\text{e-}03$	$0.98 \pm 3\text{e-}03$	$0.98 \pm 3\text{e-}03$	$0.98 \pm 1\text{e-}03$

Table 20: **Consistency** on the **Sprites** dataset for **VAE**.

Category	Type	Top	Body	Hair	Bottom
C-Swap $\uparrow$	Top	$0.17 \pm 5\text{e-}03$	$0.17 \pm 2\text{e-}03$	$0.17 \pm 8\text{e-}04$	$0.16 \pm 1\text{e-}03$
	Body	$0.17 \pm 8\text{e-}04$	$0.17 \pm 5\text{e-}03$	$0.17 \pm 4\text{e-}04$	$0.16 \pm 2\text{e-}03$
	Hair	$0.17 \pm 2\text{e-}03$	$0.17 \pm 1\text{e-}03$	$0.17 \pm 6\text{e-}03$	$0.16 \pm 1\text{e-}03$
	Bottom	$0.17 \pm 1\text{e-}03$	$0.17 \pm 2\text{e-}03$	$0.17 \pm 9\text{e-}04$	$0.16 \pm 8\text{e-}03$
C-Sample $\uparrow$	Top	$0.83 \pm 5\text{e-}03$	$0.92 \pm 1\text{e-}03$	$0.92 \pm 2\text{e-}03$	$0.83 \pm 1\text{e-}02$
	Body	$0.82 \pm 2\text{e-}03$	$0.92 \pm 3\text{e-}03$	$0.92 \pm 4\text{e-}03$	$0.82 \pm 4\text{e-}03$
	Hair	$0.83 \pm 5\text{e-}03$	$0.92 \pm 3\text{e-}03$	$0.92 \pm 2\text{e-}03$	$0.83 \pm 6\text{e-}03$
	Bottom	$0.83 \pm 3\text{e-}03$	$0.92 \pm 3\text{e-}03$	$0.92 \pm 3\text{e-}03$	$0.83 \pm 6\text{e-}03$
GC-Sample $\uparrow$	Top	$0.79 \pm 5\text{e-}03$	$0.90 \pm 3\text{e-}03$	$0.91 \pm 5\text{e-}03$	$0.81 \pm 5\text{e-}03$
	Body	$0.78 \pm 1\text{e-}02$	$0.90 \pm 4\text{e-}03$	$0.92 \pm 7\text{e-}03$	$0.81 \pm 1\text{e-}03$
	Hair	$0.79 \pm 9\text{e-}03$	$0.90 \pm 4\text{e-}03$	$0.92 \pm 4\text{e-}03$	$0.81 \pm 4\text{e-}03$
	Bottom	$0.80 \pm 7\text{e-}03$	$0.90 \pm 4\text{e-}03$	$0.92 \pm 3\text{e-}03$	$0.81 \pm 5\text{e-}03$

Table 21: **Consistency** on the **Sprites** dataset for  $\beta$ -VAE.

Category	Type	Hair	Body	Bottom	Top
C-Swap $\uparrow$	Hair	$0.17 \pm 5\text{e-}03$	$0.16 \pm 6\text{e-}04$	$0.16 \pm 4\text{e-}04$	$0.17 \pm 6\text{e-}04$
	Body	$0.17 \pm 1\text{e-}03$	$0.17 \pm 6\text{e-}03$	$0.17 \pm 3\text{e-}04$	$0.17 \pm 9\text{e-}04$
	Bottom	$0.17 \pm 9\text{e-}04$	$0.16 \pm 6\text{e-}04$	$0.16 \pm 6\text{e-}03$	$0.17 \pm 8\text{e-}04$
	Top	$0.17 \pm 8\text{e-}04$	$0.16 \pm 1\text{e-}03$	$0.17 \pm 1\text{e-}03$	$0.17 \pm 3\text{e-}03$
C-Sample $\uparrow$	Hair	$0.92 \pm 7\text{e-}03$	$0.91 \pm 6\text{e-}04$	$0.85 \pm 3\text{e-}03$	$0.84 \pm 4\text{e-}03$
	Body	$0.91 \pm 6\text{e-}03$	$0.91 \pm 4\text{e-}03$	$0.85 \pm 3\text{e-}03$	$0.84 \pm 2\text{e-}03$
	Bottom	$0.91 \pm 7\text{e-}03$	$0.91 \pm 3\text{e-}03$	$0.85 \pm 5\text{e-}03$	$0.84 \pm 1\text{e-}03$
	Top	$0.91 \pm 5\text{e-}03$	$0.91 \pm 2\text{e-}03$	$0.85 \pm 2\text{e-}03$	$0.84 \pm 4\text{e-}03$
GC-Sample $\uparrow$	Hair	$0.90 \pm 3\text{e-}03$	$0.89 \pm 6\text{e-}03$	$0.83 \pm 1\text{e-}02$	$0.82 \pm 1\text{e-}02$
	Body	$0.90 \pm 5\text{e-}03$	$0.89 \pm 5\text{e-}03$	$0.83 \pm 6\text{e-}03$	$0.82 \pm 5\text{e-}03$
	Bottom	$0.90 \pm 9\text{e-}03$	$0.89 \pm 4\text{e-}03$	$0.83 \pm 3\text{e-}03$	$0.82 \pm 8\text{e-}03$
	Top	$0.90 \pm 5\text{e-}03$	$0.89 \pm 5\text{e-}03$	$0.83 \pm 4\text{e-}03$	$0.82 \pm 8\text{e-}03$

Table 22: **Consistency** on the **Sprites** dataset for MGP-VAE.

Category	Type	Hair	Body	Bottom	Top
C-Swap $\uparrow$	Hair	$0.71 \pm 1\text{e-}02$	$0.98 \pm 2\text{e-}03$	$0.99 \pm 2\text{e-}03$	$1.00 \pm 3\text{e-}04$
	Body	$0.80 \pm 8\text{e-}03$	$0.96 \pm 4\text{e-}03$	$0.99 \pm 3\text{e-}03$	$1.00 \pm 1\text{e-}03$
	Bottom	$0.96 \pm 4\text{e-}03$	$0.95 \pm 2\text{e-}03$	$0.75 \pm 4\text{e-}03$	$1.00 \pm 5\text{e-}04$
	Top	$0.81 \pm 5\text{e-}03$	$0.97 \pm 3\text{e-}03$	$0.76 \pm 3\text{e-}03$	$1.00 \pm 6\text{e-}04$
C-Sample $\uparrow$	Hair	$0.84 \pm 6\text{e-}03$	$0.79 \pm 3\text{e-}03$	$0.77 \pm 6\text{e-}03$	$0.78 \pm 2\text{e-}03$
	Body	$0.84 \pm 7\text{e-}03$	$0.79 \pm 6\text{e-}03$	$0.78 \pm 3\text{e-}03$	$0.78 \pm 9\text{e-}03$
	Bottom	$0.83 \pm 8\text{e-}03$	$0.77 \pm 4\text{e-}03$	$0.75 \pm 8\text{e-}03$	$0.78 \pm 6\text{e-}03$
	Top	$0.85 \pm 4\text{e-}03$	$0.78 \pm 6\text{e-}03$	$0.80 \pm 8\text{e-}03$	$0.78 \pm 4\text{e-}03$
GC-Sample $\uparrow$	Hair	$0.81 \pm 8\text{e-}03$	$0.75 \pm 1\text{e-}02$	$0.74 \pm 6\text{e-}03$	$0.75 \pm 4\text{e-}03$
	Body	$0.81 \pm 4\text{e-}03$	$0.75 \pm 9\text{e-}03$	$0.75 \pm 8\text{e-}03$	$0.75 \pm 4\text{e-}03$
	Bottom	$0.80 \pm 5\text{e-}03$	$0.73 \pm 4\text{e-}03$	$0.70 \pm 9\text{e-}03$	$0.73 \pm 4\text{e-}03$
	Top	$0.81 \pm 5\text{e-}03$	$0.75 \pm 6\text{e-}03$	$0.76 \pm 8\text{e-}03$	$0.76 \pm 7\text{e-}03$

Table 23: **Consistency** on the **Sprites** dataset for **SKD**.

Category	Type	Hair	Bottom	Top	Body
C-Swap $\uparrow$	Hair	$0.20 \pm 7\text{e-}03$	$0.70 \pm 7\text{e-}02$	$0.75 \pm 2\text{e-}02$	$0.71 \pm 3\text{e-}02$
	Bottom	$0.38 \pm 3\text{e-}02$	$0.30 \pm 4\text{e-}02$	$0.64 \pm 2\text{e-}02$	$0.47 \pm 4\text{e-}02$
	Top	$0.42 \pm 7\text{e-}03$	$0.59 \pm 1\text{e-}02$	$0.53 \pm 2\text{e-}02$	$0.44 \pm 1\text{e-}02$
	Body	$0.37 \pm 5\text{e-}02$	$0.40 \pm 5\text{e-}02$	$0.65 \pm 1\text{e-}01$	$0.29 \pm 1\text{e-}02$
C-Sample $\uparrow$	Hair	$0.95 \pm 4\text{e-}03$	$0.91 \pm 3\text{e-}03$	$0.97 \pm 4\text{e-}03$	$0.91 \pm 4\text{e-}03$
	Bottom	$0.98 \pm 2\text{e-}03$	$0.94 \pm 3\text{e-}03$	$0.98 \pm 1\text{e-}03$	$0.96 \pm 2\text{e-}03$
	Top	$0.97 \pm 3\text{e-}03$	$0.95 \pm 2\text{e-}03$	$0.96 \pm 3\text{e-}03$	$0.95 \pm 4\text{e-}03$
	Body	$0.96 \pm 3\text{e-}03$	$0.91 \pm 4\text{e-}03$	$0.97 \pm 7\text{e-}04$	$0.94 \pm 2\text{e-}03$
GC-Sample $\uparrow$	Hair	$0.95 \pm 1\text{e-}02$	$0.93 \pm 8\text{e-}03$	$0.98 \pm 2\text{e-}03$	$0.92 \pm 1\text{e-}02$
	Bottom	$0.99 \pm 2\text{e-}03$	$0.96 \pm 3\text{e-}03$	$0.98 \pm 2\text{e-}03$	$0.97 \pm 3\text{e-}03$
	Top	$0.98 \pm 1\text{e-}03$	$0.97 \pm 2\text{e-}03$	$0.97 \pm 9\text{e-}04$	$0.96 \pm 2\text{e-}03$
	Body	$0.96 \pm 1\text{e-}02$	$0.93 \pm 7\text{e-}03$	$0.98 \pm 6\text{e-}03$	$0.95 \pm 9\text{e-}03$

Table 24: **Consistency** on the **Sprites** dataset for **SSM-SKD**.

Category	Type	Top	Hair	Body	Bottom
C-Swap $\uparrow$	Top	$0.97 \pm 4\text{e-}03$	$1.00 \pm 0\text{e+}00$	$0.98 \pm 3\text{e-}03$	$0.98 \pm 2\text{e-}03$
	Hair	$1.00 \pm 0\text{e+}00$	$1.00 \pm 2\text{e-}03$	$0.97 \pm 3\text{e-}03$	$0.98 \pm 3\text{e-}03$
	Body	$1.00 \pm 6\text{e-}04$	$1.00 \pm 5\text{e-}04$	$0.70 \pm 1\text{e-}02$	$0.95 \pm 4\text{e-}03$
	Bottom	$1.00 \pm 4\text{e-}04$	$1.00 \pm 0\text{e+}00$	$0.91 \pm 4\text{e-}03$	$0.73 \pm 1\text{e-}02$
C-Sample $\uparrow$	Top	$0.99 \pm 9\text{e-}04$	$0.99 \pm 9\text{e-}04$	$0.95 \pm 2\text{e-}03$	$0.91 \pm 3\text{e-}03$
	Hair	$0.99 \pm 1\text{e-}03$	$1.00 \pm 3\text{e-}04$	$0.95 \pm 3\text{e-}03$	$0.91 \pm 2\text{e-}03$
	Body	$0.99 \pm 3\text{e-}03$	$0.99 \pm 2\text{e-}03$	$0.96 \pm 3\text{e-}03$	$0.91 \pm 1\text{e-}03$
	Bottom	$0.99 \pm 1\text{e-}03$	$0.99 \pm 2\text{e-}03$	$0.95 \pm 2\text{e-}03$	$0.91 \pm 5\text{e-}03$
GC-Sample $\uparrow$	Top	$1.00 \pm 5\text{e-}04$	$0.99 \pm 8\text{e-}04$	$0.97 \pm 2\text{e-}03$	$0.94 \pm 3\text{e-}03$
	Hair	$0.99 \pm 2\text{e-}03$	$1.00 \pm 2\text{e-}04$	$0.96 \pm 3\text{e-}03$	$0.94 \pm 3\text{e-}03$
	Body	$0.99 \pm 2\text{e-}03$	$0.99 \pm 6\text{e-}04$	$0.97 \pm 2\text{e-}03$	$0.93 \pm 2\text{e-}03$
	Bottom	$0.99 \pm 2\text{e-}03$	$0.99 \pm 1\text{e-}03$	$0.96 \pm 3\text{e-}03$	$0.94 \pm 2\text{e-}03$