Figure S1. Normalized performance comparison between zero-shot inference and few-shot finetuning of UniSO-T across three tasks (RobotPush, Rover, and LunarLander). The light blue bars represent zero-shot performance, while the dark blue bars show the improved performance after few-shot finetuning, with error bars indicating performance variance. The red dashed line ($\mathcal{D}$(best)) denotes the best score in the few-shot offline dataset.
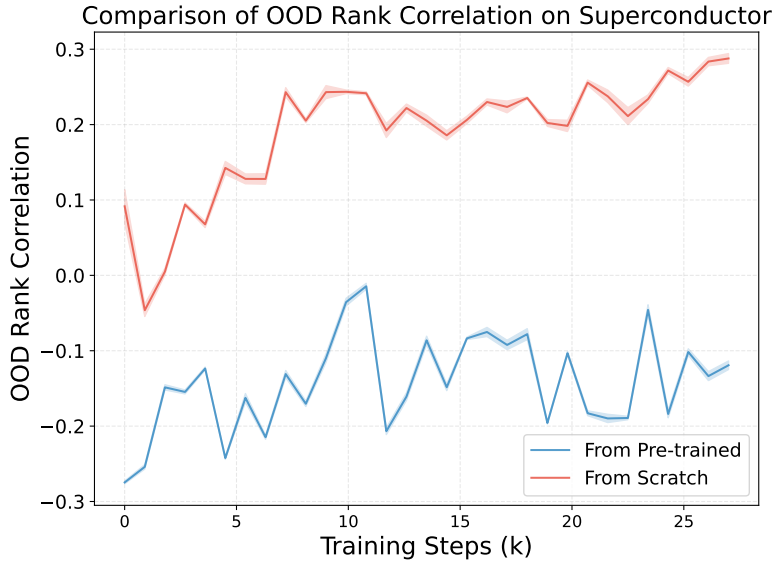

Figure S2. Comparison of OOD Spearman rank correlation on Superconductor task between UniSO-N from pre-trained embedder (blue) and from scratch (red). The OOD dataset is constructed following Chen et al. (2023). Higher correlation indicates better surrogate model for offline BBO (Tan et al., 2025).
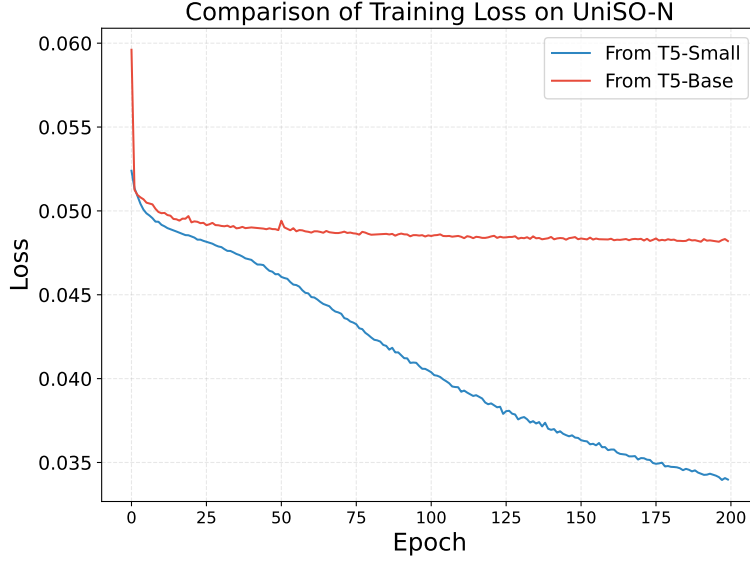
Figure S3. Training loss curves comparing UniSO-N with T5-Small versus T5-Base embedders during training.

Table S1. Performance comparison between UniSO-N with pre-trained and randomly initialized embedders on Design-Bench and SOO-Bench unconstrained tasks, where the better one is **Bold**. $\mathcal{D}$(best) denotes the best score in the offline dataset.

Task	$\mathcal{D}$(best)	UniSO-N from scratch	UniSO-N from pre-trained
Ant	165.326	**305.576 ± 120.465**	269.691 ± 77.425
D'Kitty	199.363	**223.104 ± 23.838**	173.911 ± 46.662
Superconductor	74.000	**101.754 ± 6.972**	67.333 ± 10.838
TF Bind 8	0.439	**0.883 ± 0.048**	0.833 ± 0.005
TF Bind 10	0.005	0.578 ± 0.108	**0.959 ± 0.115**
GTOPX 2	-195.586	**-102.632 ± 22.635**	-124.995 ± 56.170
GTOPX 3	-151.190	**-55.743 ± 7.490**	-62.622 ± 22.261
GTOPX 4	-215.716	**-102.684 ± 19.227**	-110.284 ± 17.559
GTOPX 6	-112.599	**-56.469 ± 10.337**	-57.435 ± 18.832
Avg. Rank	/	**1.111 ± 0.314**	1.889 ± 0.314

Table S2. Comparison of UniSO-N equipped with embedders of different scales (e.g., T5-Small and T5-Base) on unconstrained tasks from Design-Bench and SOO-Bench, where the better one is **Bold**. $\mathcal{D}$(best) denotes the best score in the offline dataset.

Task	$\mathcal{D}$(best)	UniSO-N + T5-Small	UniSO-N + T5-Base
Ant	165.326	**269.691 ± 77.425**	255.336 ± 209.169
D'Kitty	**199.363**	173.911 ± 46.662	199.186 ± 0.000
Superconductor	74.000	67.333 ± 10.838	**93.816 ± 11.763**
TF Bind 8	0.439	**0.833 ± 0.005**	0.597 ± 0.081
TF Bind 10	0.005	**0.959 ± 0.115**	0.394 ± 0.140
GTOPX 2	-195.586	**-124.995 ± 56.170**	-163.866 ± 74.375
GTOPX 3	-151.190	**-62.622 ± 22.261**	-71.990 ± 11.158
GTOPX 4	-215.716	-110.284 ± 17.559	**-96.400 ± 39.728**
GTOPX 6	-112.599	**-57.435 ± 18.832**	-88.123 ± 20.223
Avg. Rank	/	**1.333 ± 0.471**	1.667 ± 0.471