Parametric Dimension Reduction by Preserving Local Structure – Supplemental Material

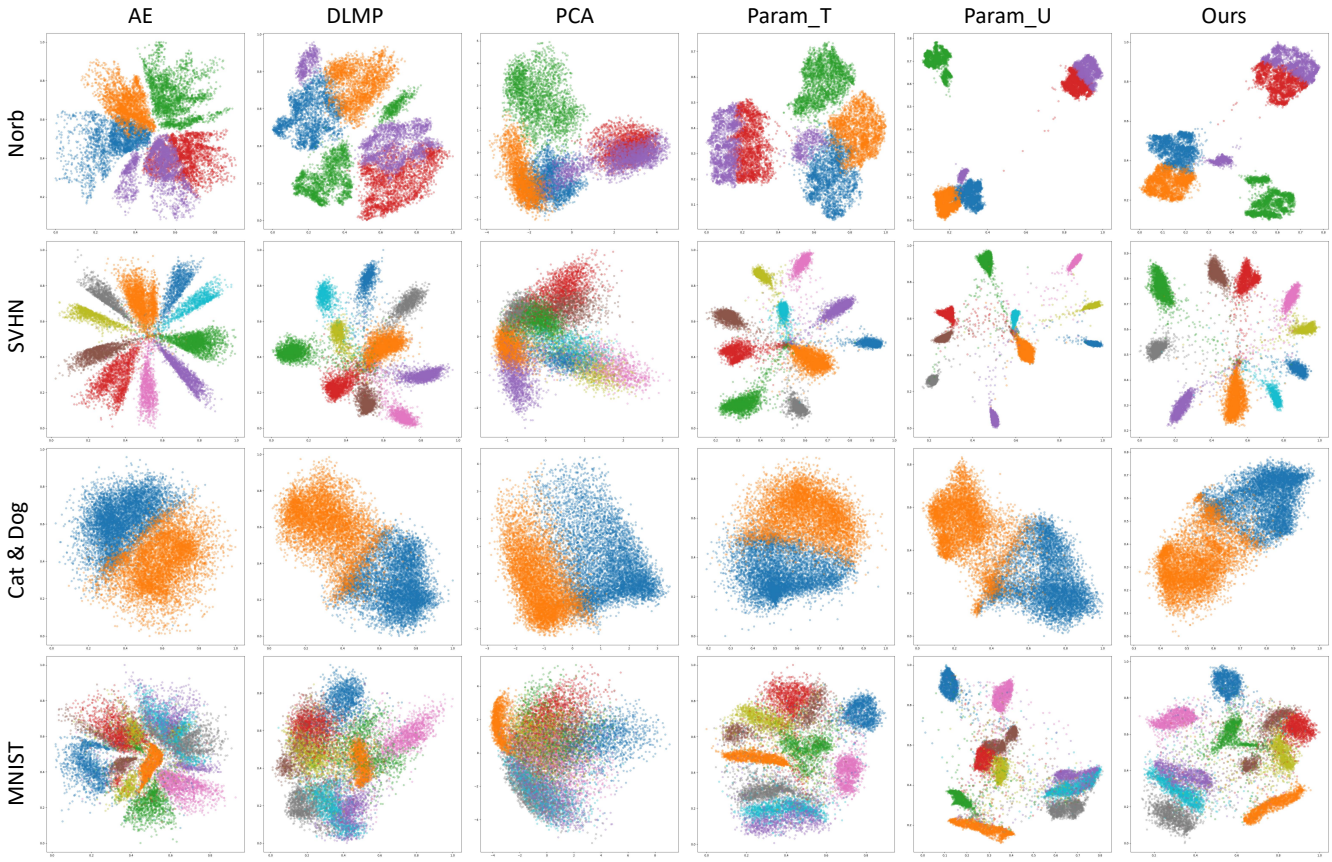

Figure 3: We project high dimensional data to planar space for visual comparison. Each dot is a sample and each distinct color indicates a class.

Width Comparison												
Architecture	Bank	Cat & Dog	Cifar10	Cifar100	F_MNIST	Hatespeech	IMDB	Letter	MNIST	Norb	SVHN	Mean
D → 2048 → 1024 → 512 → 256 → 2	0.933	0.894	0.966	0.688	0.883	0.866	0.632	0.851	0.906	0.969	0.974	0.869
D → 1024 → 512 → 256 → 128 → 2	0.933	0.895	0.964	0.683	0.882	0.864	0.633	0.844	0.909	0.967	0.974	0.868
D → 512 → 256 → 128 → 64 → 2	0.934	0.894	0.962	0.677	0.881	0.861	0.633	0.82	0.895	0.967	0.973	0.863
D → 256 → 128 → 64 → 32 → 2	0.934	0.894	0.957	0.667	0.879	0.86	0.633	0.795	0.881	0.964	0.97	0.858

Depth Comparison												
Architecture	Bank	Cat & Dog	Cifar10	Cifar100	F_MNIST	Hatespeech	IMDB	Letter	MNIST	Norb	SVHN	Mean
D → 1024 → 512 → 512 → 256 → 256 → 128 → 2	0.933	0.894	0.965	0.689	0.882	0.862	0.642	0.845	0.91	0.969	0.973	0.869
D → 1024 → 512 → 256 → 128 → 2	0.933	0.894	0.963	0.685	0.882	0.864	0.632	0.84	0.904	0.97	0.974	0.867
D → 1024 → 512 → 128 → 2	0.933	0.894	0.961	0.677	0.882	0.867	0.633	0.839	0.894	0.968	0.974	0.866
D → 1024 → 512 → 2	0.933	0.893	0.954	0.66	0.88	0.863	0.63	0.808	0.882	0.965	0.971	0.858

Table 2: We compared the dimension reduction results achieved using different network architectures. The numbers are determined using Equation **??** in our main paper. We use background colors, where green to white show the low values to high values, to help readers interpret the results. As can be seen, deeper and wider networks can slightly achieve better results, although with the higher computational costs.

		Method	Bank	Cat & Dog	Cifar10	Cifar100	F_MNIST	Hatespeech	IMDB	Letter	MNIST	Norb	SVHN	Mean
By dataset	Continuity	AE	0.941	0.920	0.970	0.899	0.982	0.881	0.532	0.977	0.948	0.989	0.984	0.911
		DLMP	0.955	0.919	0.964	0.886	0.981	0.926	0.669	0.986	0.953	0.990	0.974	0.928
		PCA	0.947	0.914	0.944	0.864	0.979	0.850	0.414	0.974	0.942	0.973	0.955	0.887
		Param_T	0.959	0.933	0.977	0.923	0.988	0.935	0.769	0.987	0.971	0.992	0.983	0.947
		Param_U	0.966	0.925	0.976	0.919	0.988	0.926	0.733	0.989	0.969	0.991	0.983	0.942
		Ours	0.963	0.932	0.975	0.923	0.987	0.936	0.722	0.989	0.970	0.993	0.983	0.943
		t-SNE	0.968	0.931	0.979	0.936	0.988	0.959	0.814	0.995	0.980	0.997	0.986	0.958
	Trustworthiness	AE	0.982	0.824	0.957	0.855	0.966	0.897	0.617	0.951	0.913	0.961	0.972	0.900
		DLMP	0.892	0.804	0.925	0.748	0.946	0.757	0.553	0.931	0.819	0.951	0.950	0.843
		PCA	0.900	0.798	0.849	0.683	0.913	0.815	0.607	0.822	0.734	0.873	0.810	0.800
		Param_T	0.967	0.816	0.946	0.830	0.962	0.856	0.600	0.946	0.905	0.942	0.970	0.885
		Param_U	0.941	0.821	0.950	0.838	0.964	0.857	0.596	0.960	0.916	0.950	0.969	0.887
		Ours	0.980	0.825	0.953	0.846	0.965	0.861	0.605	0.954	0.913	0.957	0.970	0.894
		t-SNE	0.995	0.951	0.990	0.974	0.992	0.989	0.807	0.999	0.992	0.999	0.991	0.971
	Neighborhood hit	AE	0.862	0.932	0.925	0.332	0.678	0.810	0.605	0.470	0.717	0.907	0.968	0.746
		DLMP	0.857	0.934	0.862	0.233	0.664	0.786	0.609	0.519	0.711	0.939	0.934	0.732
		PCA	0.849	0.925	0.452	0.176	0.530	0.804	0.596	0.283	0.470	0.784	0.635	0.591
		Param_T	0.861	0.936	0.906	0.290	0.694	0.796	0.617	0.582	0.788	0.941	0.963	0.761
		Param_U	0.860	0.934	0.959	0.318	0.693	0.801	0.630	0.606	0.835	0.951	0.970	0.778
		Ours	0.865	0.937	0.962	0.327	0.701	0.809	0.595	0.645	0.854	0.967	0.970	0.785
		t-SNE	0.863	0.939	0.976	0.631	0.803	0.819	0.649	0.925	0.940	0.999	0.980	0.866
By method	Continuity	AE	0.941	0.920	0.970	0.899	0.982	0.881	0.532	0.977	0.948	0.989	0.984	0.911
		DLMP	0.954	0.907	0.962	0.868	0.973	0.926	0.658	0.986	0.950	0.990	0.971	0.922
		PCA	0.947	0.914	0.944	0.864	0.979	0.850	0.414	0.974	0.942	0.973	0.955	0.887
		Param_T	0.959	0.933	0.977	0.922	0.987	0.935	0.769	0.987	0.971	0.992	0.982	0.947
		Param_U	0.958	0.925	0.976	0.919	0.988	0.924	0.733	0.989	0.969	0.991	0.982	0.941
		Ours	0.963	0.932	0.975	0.923	0.987	0.936	0.722	0.987	0.967	0.993	0.981	0.942
		t-SNE	0.967	0.931	0.976	0.934	0.986	0.959	0.796	0.995	0.979	0.997	0.984	0.955
	Trustworthiness	AE	0.982	0.824	0.957	0.855	0.966	0.897	0.617	0.951	0.913	0.961	0.972	0.900
		DLMP	0.878	0.781	0.919	0.730	0.946	0.756	0.553	0.931	0.819	0.951	0.950	0.838
		PCA	0.900	0.798	0.849	0.683	0.913	0.815	0.607	0.822	0.734	0.873	0.810	0.800
		Param_T	0.967	0.815	0.944	0.814	0.961	0.856	0.600	0.941	0.905	0.942	0.969	0.883
		Param_U	0.941	0.821	0.950	0.838	0.963	0.857	0.594	0.960	0.916	0.946	0.969	0.887
		Ours	0.976	0.825	0.953	0.846	0.965	0.849	0.599	0.949	0.913	0.957	0.970	0.891
		t-SNE	0.995	0.951	0.990	0.974	0.992	0.989	0.807	0.999	0.992	0.999	0.991	0.971
	Neighborhood hit	AE	0.862	0.932	0.925	0.332	0.678	0.810	0.605	0.470	0.717	0.907	0.968	0.746
		DLMP	0.853	0.930	0.857	0.229	0.664	0.778	0.606	0.519	0.651	0.913	0.934	0.721
		PCA	0.849	0.925	0.452	0.176	0.530	0.804	0.596	0.283	0.470	0.784	0.635	0.591
		Param_T	0.851	0.933	0.888	0.290	0.686	0.796	0.602	0.582	0.754	0.894	0.963	0.749
		Param_U	0.860	0.934	0.952	0.314	0.693	0.801	0.630	0.600	0.813	0.935	0.970	0.773
		Ours	0.862	0.937	0.962	0.313	0.701	0.800	0.595	0.645	0.816	0.967	0.968	0.779
		t-SNE	0.863	0.935	0.969	0.624	0.803	0.819	0.642	0.925	0.940	0.999	0.978	0.863

Table 3: We compared our method with baselines on a variety of datasets in terms of continuity, trustworthiness, and neighborhood hit. Similarly, we use background colors, where green to white show the low values to the high values, to help readers interpret the results.