Table S.1: Detailed retrieval results for 28x28/28x28x28 images.

Dataset	Feature Extraction	mAP@5	mMV@5	ACC@1	ACC@3	ACC@5
BreastMNIST	VGG19	83.18	83.33	79.48	92.94	98.71
	ResNet50	82.93	85.25	79.48	94.23	96.79
	DenseNet121	84.61	81.41	80.12	96.15	98.71
	EfficientNetV2M	79.05	75.64	78.20	90.38	93.58
	OpenCLIP	87.88	82.69	87.18	94.87	97.44
	CONCH	82.92	78.85	79.49	92.31	96.15
	UNI	83.65	76.28	78.21	94.87	96.79
	MedCLIP(ViT)	82.36	78.21	76.28	92.31	98.08
	BiomedCLIP	84.44	80.77	81.41	93.59	96.15
PneumoniaMNIST	VGG19	86.58	84.77	83.17	93.10	95.35
	ResNet50	86.29	83.33	82.85	93.91	95.51
	DenseNet121	87.52	86.53	83.49	94.23	96.95
	EfficientNetV2M	82.96	80.12	77.08	92.14	95.19
	OpenCLIP	87.11	85.26	82.53	92.79	95.83
	CONCH	87.29	84.94	83.01	93.27	95.83
	UNI	86.09	84.29	80.93	93.43	95.99
	MedCLIP (ViT)	85.67	83.01	80.61	94.55	97.12
	BiomedCLIP	88.26	85.58	85.74	93.43	95.67
RetinaMNIST	VGG19	57.13	57.50	46.25	69.5	80.25
	ResNet50	54.59	54.25	42.25	67.5	79.0
	DenseNet121	56.42	51.75	45.25	69.0	83.25
	EfficientNetV2M	55.28	54.5	42.75	69.25	78.25
	OpenCLIP	55.28	51.50	45.25	68.50	78.25
	CONCH	55.40	52.25	44.50	66.75	79.75
	UNI	55.05	54.25	43.00	69.00	78.50
	MedCLIP (ViT)	48.65	53.75	33.00	66.00	79.25
	BiomedCLIP	56.36	53.50	46.75	70.75	79.00
DermaMNIST	VGG19	73.91	74.26	67.73	84.33	88.77
	ResNet50	74.32	73.44	67.88	83.89	89.37
	DenseNet121	74.09	73.71	67.83	84.43	88.97
	EfficientNetV2M	70.53	70.77	64.13	81.04	86.03
	OpenCLIP	78.07	77.21	72.17	88.33	92.62
	CONCH	77.62	76.66	71.82	87.23	92.17
	UNI	75.69	75.11	68.93	85.74	91.57
	MedCLIP (ViT)	70.39	70.82	63.79	80.90	85.99
	BiomedCLIP	76.80	76.01	71.12	85.99	90.82
BloodMNIST	VGG19	79.24	81.08	73.07	89.27	93.53
	ResNet50	72.89	74.94	64.98	85.06	91.43
	DenseNet121	75.96	78.42	69.95	86.96	92.19
	EfficientNetV2M	65.30	67.64	56.47	79.21	86.46
	OpenCLIP	82.86	85.36	77.87	92.14	95.41
	CONCH	88.99	90.18	85.56	95.15	97.31
	UNI	83.89	85.79	79.48	92.63	95.79
	MedCLIP (ViT)	65.36	67.96	55.74	79.60	87.02
	BiomedCLIP	82.39	83.48	77.81	91.35	95.03
PathMNIST	VGG19	75.17	75.11	68.67	84.45	90.05
	ResNet50	75.85	77.22	69.74	84.87	90.00
	DenseNet121	77.94	79.95	71.43	87.45	92.18
	EfficientNetV2M	71.55	72.74	64.24	82.59	88.35
	OpenCLIP	85.44	86.48	81.25	92.38	95.38
	CONCH	87.83	88.33	84.72	92.65	94.74
	UNI	92.66	92.59	90.86	95.46	96.71
	MedCLIP (ViT)	73.94	74.03	67.56	83.77	88.87
	BiomedCLIP	85.61	85.89	81.69	92.13	94.65
AdrenalMNIST3D	VGG19	79.98	77.18	75.17	90.27	95.30
	ResNet50	79.07	75.50	71.48	92.62	95.97
	DenseNet121	79.18	77.52	71.81	89.93	93.62
	EfficientNetV2M	76.99	74.83	71.47	88.92	93.62
	OpenCLIP	77.88	75.17	71.14	89.26	94.63
	CONCH	79.19	73.49	72.48	91.61	94.97
	UNI	76.96	73.15	68.79	90.60	95.30
	MedCLIP (ViT)	78.09	78.19	69.13	91.64	95.64
	BiomedCLIP	77.74	75.84	69.13	89.26	93.96
SynapseMNIST3D	VGG19	76.14	71.59	65.62	92.61	97.16
	ResNet50	76.48	71.02	67.05	92.33	95.17
	DenseNet121	74.54	73.86	65.06	87.78	94.03
	EfficientNetV2M	74.71	70.45	69.32	86.08	92.05
	OpenCLIP	74.70	67.90	65.62	92.90	98.01
	CONCH	78.02	76.14	70.17	91.48	94.32
	UNI	73.13	71.59	61.65	88.35	96.31
	MedCLIP (ViT)	72.55	67.61	61.93	88.64	95.74
	BiomedCLIP	75.35	72.73	65.62	88.07	92.61

Table S.2: Detailed retrieval results for 64x64/64x64x64 images.

Dataset	Feature Extraction	mAP@5	mMV@5	ACC@1	ACC@3	ACC@5
BreastMNIST	VGG19	85.45	83.97	82.05	96.79	98.71
	ResNet50	83.84	82.05	80.76	92.94	96.15
	DenseNet121	83.87	82.05	82.05	93.58	98.71
	EfficientNetV2M	82.54	78.20	75.64	92.94	97.43
	OpenCLIP	87.36	83.97	85.90	96.15	99.36
	CONCH	80.92	74.36	75.64	93.59	96.15
	UNI	84.24	80.77	80.77	94.87	98.08
	BiomedCLIP	86.35	80.77	83.33	93.59	96.15
PneumoniaMNIST	VGG19	85.20	84.45	82.37	90.22	91.66
	ResNet50	88.61	86.69	86.21	93.58	95.67
	DenseNet121	88.26	86.69	84.77	93.42	95.35
	EfficientNetV2M	80.06	77.56	75.00	88.61	91.50
	OpenCLIP	88.14	86.54	84.94	93.43	95.35
	CONCH	87.99	85.26	83.97	94.55	96.31
	UNI	88.21	88.30	84.29	94.23	96.47
	MedCLIP (ViT)	88.18	87.02	84.78	94.07	96.63
	BiomedCLIP	90.21	89.58	88.46	95.03	96.63
RetinaMNIST	VGG19	55.46	55.75	44.25	66.5	78.75
	ResNet50	57.96	56.75	48.5	70.00	81.25
	DenseNet121	55.15	54.00	44.25	68.75	77.75
	EfficientNetV2M	56.55	59.00	45.00	71.25	82.75
	OpenCLIP	57.47	58.50	46.00	69.50	80.75
	CONCH	56.55	55.25	47.00	69.00	79.50
	UNI	57.11	54.50	46.75	69.75	78.75
	MedCLIP (ViT)	52.52	54.25	40.00	67.75	79.50
	BiomedCLIP	60.44	57.00	49.50	71.25	82.25
DermaMNIST	VGG19	75.31	75.01	70.72	84.13	89.12
	ResNet50	77.17	76.20	72.16	86.38	90.87
	DenseNet121	75.17	74.01	69.72	83.64	89.57
	EfficientNetV2M	71.21	71.02	64.93	79.75	85.18
	OpenCLIP	82.87	81.55	79.60	91.37	94.36
	CONCH	79.91	77.26	75.76	87.93	91.77
	UNI	81.76	79.55	78.65	90.32	93.62
	MedCLIP (ViT)	72.83	72.32	67.68	81.85	86.18
	BiomedCLIP	79.83	77.56	75.46	88.93	92.47
BloodMNIST	VGG19	76.85	78.92	71.03	88.33	92.72
	ResNet50	74.47	77.72	66.93	87.13	92.51
	DenseNet121	79.12	82.78	73.16	89.97	94.29
	EfficientNetV2M	71.68	73.86	63.98	85.12	91.69
	OpenCLIP	91.73	93.31	89.71	96.84	98.19
	CONCH	95.00	95.15	93.57	98.13	98.80
	UNI	95.76	96.20	95.09	98.19	98.77
	MedCLIP (ViT)	77.74	79.28	71.91	88.66	93.22
	BiomedCLIP	91.69	93.16	89.27	97.37	98.42
PathMNIST	VGG19	81.38	82.08	76.40	89.33	92.86
	ResNet50	83.98	84.05	79.83	90.87	94.10
	DenseNet121	85.63	85.84	81.89	92.79	95.34
	EfficientNetV2M	78.51	79.24	73.21	87.36	91.61
	OpenCLIP	91.84	92.16	89.76	96.00	97.35
	CONCH	93.63	93.31	92.48	95.45	96.30
	UNI	96.90	95.92	96.20	97.19	97.45
	MedCLIP (ViT)	80.84	81.20	75.72	88.90	92.63
	BiomedCLIP	92.59	93.04	90.50	96.35	97.56
AdrenalMNIST3D	VGG19	77.52	70.81	72.48	89.60	95.30
	ResNet50	77.47	76.17	69.80	88.59	94.97
	DenseNet121	79.02	77.85	72.82	89.60	92.62
	EfficientNetV2M	73.63	71.14	62.75	87.24	94.63
	OpenCLIP	77.58	74.83	70.13	90.27	94.97
	CONCH	77.82	75.17	72.48	90.94	94.63
	UNI	74.68	69.80	63.67	89.60	95.30
	MedCLIP (ViT)	77.38	75.50	68.46	89.26	95.97
	BiomedCLIP	76.07	74.16	64.09	91.61	94.97
SynapseMNIST3D	VGG19	76.33	73.58	64.49	93.47	96.31
	ResNet50	76.64	75.85	67.05	89.77	93.75
	DenseNet121	78.11	73.58	73.01	89.49	95.74
	EfficientNetV2M	72.71	68.75	62.21	90.90	97.15
	OpenCLIP	78.14	76.99	67.90	96.02	98.58
	CONCH	80.40	75.28	75.57	90.34	94.03
	UNI	78.98	77.27	71.31	92.61	95.74
	MedCLIP (ViT)	75.77	71.59	68.18	88.07	93.75
	BiomedCLIP	73.54	71.59	62.78	89.49	96.59

Table S.3: Detailed retrieval results for 128x128 images.

Dataset	Feature Extraction	mAP@5	mMV@5	ACC@1	ACC@3	ACC@5
BreastMNIST	VGG19	84.08	82.05	80.76	93.58	94.87
	ResNet50	87.45	85.25	83.97	97.43	98.71
	DenseNet121	88.52	85.89	87.82	95.51	97.43
	EfficientNetV2M	82.50	75.64	78.84	91.66	94.23
	OpenCLIP	87.60	83.33	84.62	97.44	98.72
	CONCH	85.30	85.90	83.97	94.87	97.44
	UNI	86.14	85.90	83.97	94.87	98.72
	MedCLIP (ViT)	84.96	85.26	82.69	94.23	96.15
	BiomedCLIP	88.69	83.33	87.18	94.87	98.08
PneumoniaMNIST	VGG19	84.87	81.25	81.25	89.90	92.94
	ResNet50	88.15	84.45	84.29	94.07	95.67
	DenseNet121	88.30	86.37	84.29	93.42	95.83
	EfficientNetV2M	82.64	80.76	78.04	90.54	93.75
	OpenCLIP	87.75	85.10	84.13	93.11	95.67
	CONCH	89.13	89.26	86.70	94.07	95.99
	UNI	90.18	88.78	87.02	95.19	97.12
	MedCLIP (ViT)	94.31	94.87	92.63	97.92	98.40
	BiomedCLIP	91.80	91.83	88.94	97.12	97.92
RetinaMNIST	VGG19	58.52	57.5	47.75	72.00	81.75
	ResNet50	57.30	59.50	46.75	70.50	81.75
	DenseNet121	59.89	58.75	50.00	72.50	82.75
	EfficientNetV2M	55.63	55.75	44.25	71.25	80.75
	OpenCLIP	60.23	59.50	49.00	73.75	84.00
	CONCH	57.70	56.50	46.25	69.00	79.25
	UNI	59.10	57.75	48.25	71.00	82.25
	MedCLIP (ViT)	53.93	55.00	42.50	69.00	80.00
	BiomedCLIP	60.90	58.50	50.75	72.75	85.50
DermaMNIST	VGG19	77.12	74.96	71.82	86.73	90.77
	ResNet50	80.39	78.00	76.40	89.02	92.76
	DenseNet121	77.62	76.25	73.11	86.98	90.77
	EfficientNetV2M	75.21	74.21	69.57	84.08	89.37
	OpenCLIP	83.70	81.95	81.30	91.27	94.56
	CONCH	80.13	78.70	76.46	88.83	92.87
	UNI	82.40	80.40	79.30	90.27	94.16
	MedCLIP (ViT)	73.83	72.62	68.23	82.79	87.23
	BiomedCLIP	81.09	79.15	77.36	89.78	93.57
BloodMNIST	VGG19	80.08	82.84	74.86	90.67	94.79
	ResNet50	83.99	86.37	79.50	93.39	96.25
	DenseNet121	83.28	86.17	78.74	92.86	96.25
	EfficientNetV2M	82.06	84.82	76.90	92.04	95.58
	OpenCLIP	91.72	93.25	89.51	96.73	98.01
	CONCH	95.52	95.67	94.36	98.51	99.09
	UNI	96.71	96.67	96.11	98.42	99.04
	MedCLIP (ViT)	85.07	86.26	81.29	92.49	95.47
	BiomedCLIP	92.98	93.77	90.88	97.31	98.51
PathMNIST	VGG19	84.55	84.34	80.52	91.10	94.10
	ResNet50	87.54	87.21	84.40	92.81	94.98
	DenseNet121	87.23	87.52	84.19	92.64	94.94
	EfficientNetV2M	83.49	83.21	79.33	90.27	93.16
	OpenCLIP	91.96	92.58	89.65	96.06	97.31
	CONCH	95.73	95.43	94.96	96.73	97.27
	UNI	96.61	96.71	96.36	97.20	97.42
	MedCLIP (ViT)	80.13	80.35	75.06	88.20	92.13
	BiomedCLIP	93.92	94.21	92.34	96.69	97.70

Table S.4: Detailed retrieval results for 224x224 images.

Dataset	Feature Extraction	mAP@5	mMV@5	ACC@1	ACC@3	ACC@5
BreastMNIST	VGG19	88.26	84.61	86.53	95.51	1.00
	ResNet50	87.04	87.17	83.33	94.87	98.71
	DenseNet121	85.98	82.69	84.61	94.23	97.43
	EfficientNetV2M	84.16	80.12	81.41	91.66	96.15
	OpenCLIP	87.34	82.69	85.90	96.15	98.72
	CONCH	87.97	82.69	87.18	95.51	98.72
	UNI	84.84	81.41	82.05	92.31	96.79
	MedCLIP(ViT)	82.44	82.05	77.56	92.95	96.15
	BiomedCLIP	88.12	87.18	86.54	95.51	97.44
PneumoniaMNIST	VGG19	84.61	80.76	82.37	89.74	91.34
	ResNet50	89.89	87.98	87.01	94.23	96.31
	DenseNet121	89.58	87.33	87.5	94.23	96.31
	EfficientNetV2M	86.10	85.41	81.08	93.26	96.47
	OpenCLIP	89.69	87.34	86.06	94.39	96.15
	CONCH	87.91	87.02	84.46	92.63	95.19
	UNI	91.38	91.35	89.90	95.51	97.12
	MedCLIP (ViT)	94.44	94.55	93.59	96.47	97.44
	BiomedCLIP	92.40	92.31	89.74	96.96	98.24
RetinaMNIST	VGG19	57.97	57.25	46.00	68.75	82.00
	ResNet50	61.40	60.00	48.00	75.50	86.75
	DenseNet121	60.53	62.00	49.75	74.5	84.00
	EfficientNetV2M	58.01	53.75	48.75	70.25	82.25
	OpenCLIP	61.13	58.00	51.50	75.25	83.25
	CONCH	58.37	55.75	44.75	71.25	82.50
	UNI	59.18	56.00	47.75	70.75	83.00
	MedCLIP(ViT)	55.42	55.50	43.50	70.25	80.50
	BiomedCLIP	63.01	60.75	54.00	76.00	85.75
DermaMNIST	VGG19	79.04	77.10	74.71	88.37	92.46
	ResNet50	81.08	79.65	77.75	89.57	93.21
	DenseNet121	78.24	77.35	74.36	87.33	92.01
	EfficientNetV2M	76.25	75.16	70.92	84.73	89.92
	OpenCLIP	84.31	83.24	81.55	92.52	95.51
	CONCH	80.86	79.50	77.16	89.43	93.77
	UNI	82.94	80.30	80.15	90.92	94.21
	MedCLIP (ViT)	75.62	73.92	70.57	84.54	88.33
	BiomedCLIP	81.39	79.55	77.41	89.93	93.97
BloodMNIST	VGG19	85.46	87.92	81.58	93.94	96.60
	ResNet50	90.47	92.19	87.69	96.31	98.09
	DenseNet121	87.43	89.82	84.41	94.82	97.13
	EfficientNetV2M	84.59	86.43	81.29	92.95	95.84
	OpenCLIP	92.22	93.54	90.44	97.05	98.25
	CONCH	95.16	95.64	93.92	97.98	98.80
	UNI	97.05	96.90	96.78	98.74	99.01
	MedCLIP (ViT)	89.28	90.35	86.20	95.94	97.69
	BiomedCLIP	93.15	93.89	91.49	96.87	98.42
PathMNIST	VGG19	85.13	84.30	81.10	91.55	94.28
	ResNet50	88.46	88.44	85.18	93.70	95.75
	DenseNet121	87.99	87.35	85.01	93.46	95.64
	EfficientNetV2M	82.93	82.11	79.61	88.84	91.93
	OpenCLIP	89.81	90.04	86.78	95.06	96.59
	CONCH	95.82	95.82	95.29	96.78	97.16
	UNI	96.42	96.56	96.04	97.10	97.26
	MedCLIP (ViT)	79.28	79.48	73.75	87.63	91.60
	BiomedCLIP	93.83	93.98	92.14	96.99	97.94

Effect of feature reduction on the performance for sample CNN and foundation models.

Table S.5: Comparison between feature reduction methods for the VGG19 model (Size: 64x64x64). The best results are shown in bold.

Dataset	Feature reduction	mAP(5)	mMV(5)	ACC@1	ACC@3	ACC@5
AdrenalMNIST3D	None	**77.52**	70.81	**72.48**	**89.60**	**95.30**
	PCA	74.97	69.80	67.11	88.93	94.63
	Autoencoder	76.80	68.46	71.48	87.25	93.96
	TSNE	73.93	68.12	67.79	882.6	93.96
	UMAP	74.54	**75.84**	65.10	86.91	90.60
SynapseMNIST3D	None	**76.33**	**73.58**	64.49	**93.47**	**96.31**
	PCA	70.00	64.77	59.94	86.65	92.05
	Autoencoder	75.93	74.72	**68.75**	88.35	94.03
	TSNE	72.77	71.88	67.33	80.97	84.09
	UMAP	72.82	71.88	71.88	88.64	95.74

Table S.6: Comparison between feature reduction methods for the UNI model (Size: 64x64x64). The best results are shown in bold.

Dataset	Feature reduction	mAP(5)	mMV(5)	ACC@1	ACC@3	ACC@5
AdrenalMNIST3D	None	74.68	69.80	63.76	**89.60**	**95.30**
	PCA	74.51	73.83	67.45	86.58	92.95
	Autoencoder	75.64	70.81	69.46	86.58	89.93
	TSNE	**76.03**	**75.84**	**69.80**	88.26	93.29
	UMAP	74.67	72.82	60.74	88.26	91.95
SynapseMNIST3D	None	**78.98**	**77.27**	**71.31**	**92.61**	**95.74**
	PCA	75.29	74.15	66.19	88.64	93.47
	Autoencoder	70.47	64.77	60.80	85.23	92.90
	TSNE	65.80	61.93	57.67	77.84	85.80
	UMAP	39.15	26.99	26.99	60.40	80.40