Domain Shifts in Dermoscopic Datasets

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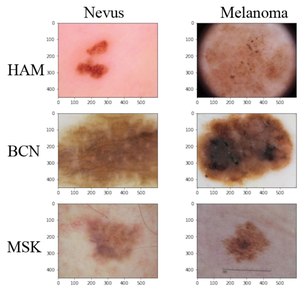
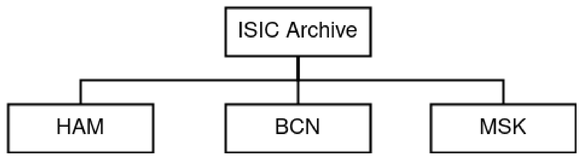
Objective

- Adapt models to different domains in dermoscopic datasets.
- Possible domain shifts may arise due to image acquisition system and/or patient skin and lesion areas.
- Quantify domain shifts on the datasets of ISIC archive [1].



Domain shifts in the datasets

Technical shifts HAM, BCN, MSK datasets were acquired in different clinics with varying image acquisition systems



Biological shifts Dataset collected from patients from a diverse range of age and location of the lesions.

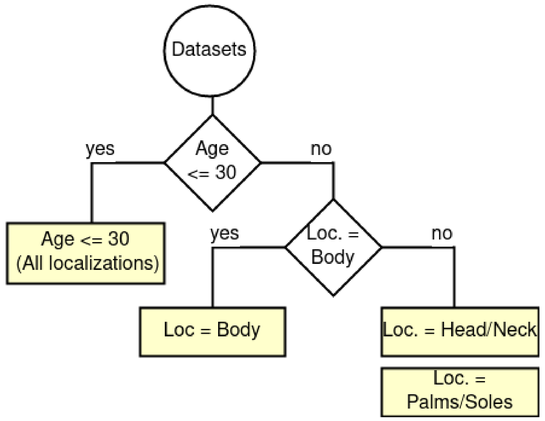


Table 1 Sampled domain adaptation dataset sizes and class distributions (melanoma : nevi (total)). Columns represent technical shift. Rows represent biological shift.

		Technical Shift		
		HAM	BCN	MSK
Biological shift	Age > 30, Loc. = Body (default)	465:4234 (4699)	1918 : 2721 (4639)	565 : 1282 (1847)
	Age <= 30	25 : 532 (557)	71 : 808 (879)	37 : 427 (464)
	Loc. = Head/Neck	99 : 121 (220)	612 : 320 (932)	175 : 117 (292)
	Loc. = Palms/Soles	15 : 203 (218)	192 : 105 (297)	-
	Total	5694	6747	2603

Quantification of domain shifts

Methodology

- Different dataset size in each domain (See Table 1)
- Bootstrap 250 samples for each domain to compare the similarity between the images
- Divergence metrics are computed pairwise and for melanoma and nevus separately
- Repeat the experiment for 10 runs

Jensen–Shannon divergence Histogram based image similarity metrics

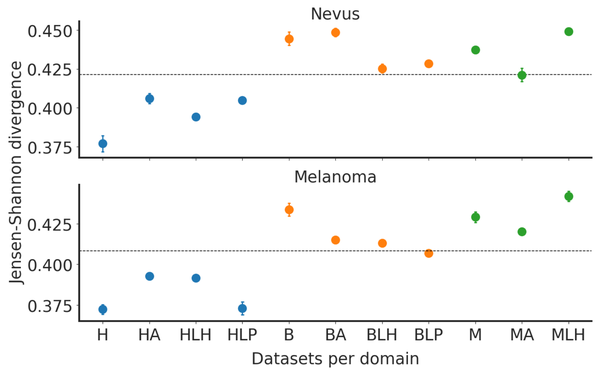


Figure 1: JS divergence for each domain for Nevus and Melanoma. Dashed line is the mean of the runs.

Cosine similarity Feature space divergence between the images

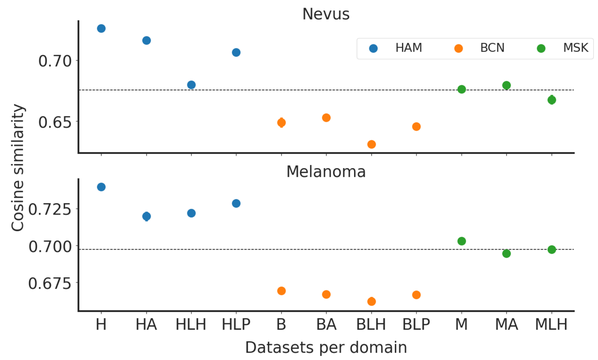


Figure 2: Cosine similarity for each domain for Nevus and Melanoma. Dashed line is the mean of the runs.

Domain discriminator

- Comparison of a basic (ResNet50) classifier performance for different datasets of domains
- HAM default dataset is compared with datasets from other domains
- Different images from HAM default dataset are compared to estimate the in-distribution
- BCN datasets are more distinct than MSK datasets ?

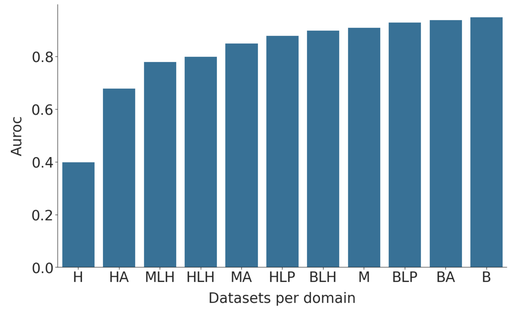


Figure 3: AUROC scores of the classifier for each domain w.r.t HAM default

References

[1] Veronica Rotemberg and et.al. A patient-centric dataset of images and metadata for identifying melanomas using clinical context. *Scientific Data*, 8(1):34, January 2021.

Future Research

- Compare the performance of the Unsupervised Domain Adaptation (UDA) methods when tested on these multiple domains
- Evaluate which UDA algorithm performs better with which domain shifted dataset (why ?)

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