CONSTRAINED HARMONIZATION ALGORITHM FOR POOLING MULTI-SITE DATASETS

POSTER

Vishnu Lokhande, Akshay Mishra, Kersten Diers, Emrah Düzel, Martin Reuter, Barbara B Bendlin and Vikas Singh

We discuss novel datasets pooling methods for the analysis of AD imaging datasets using harmonization constraint techniques.

INTRODUCTION

- **Pooling datasets** from multiple studies can significantly improve **statistical power**.
- Deep learning in scientific / biomedical problems suffer from small **sample sizes** at individual sites/institutions.
- Off-the-shelf models may utilize **site-specific artifacts** rather than disease-specific features in making predictions
- **Fairness constraints** can be adopted to harmonize the performance of models across scanners/sites.

METHODS

(a) Pooling across Sites

Freesurfer summaries of **Wisconsin ADRC** and **German DZNE**

(b) Pooling across Scanners

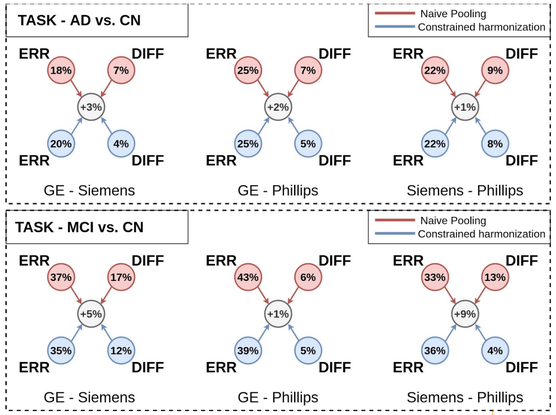
MR images **ADNI** on scanners – **Phillips**, **GE** and **Siemens.**

A **constraint** to equalize the performance of the **trained classifier** across the domains added to the **optimization objective.**

Naïve pooling method and harmonization constraint approach are compared.

RESULTS

	TASK - AD vs. CN			TASK - MCI vs. CN		
	#AD Samples ADRC / DZNE	Overall Error rate	Difference in Error rates	#MCI Samples ADRC / DZNE	Overall Error rate	Difference in Error rates
Naive Pooling	30 / 60	13%	15%	56 / 92	7%	11%
Constrained Harmonization		9%	7% (**8% gain**)		9%	4% (**7% gain**)



CONCLUSIONS

We provide a **harmonization constraint** based algorithm to mitigate **site specific differences** when performing analysis of pooled brain imaging datasets in AD studies

REFERENCES

Lokhande, V. S., Akash, A. K., Ravi, S. N., & Singh, V. (2020, August). Fairalm: Augmented lagrangian method for training fair models with little regret. In European Conference on Computer Vision (pp. 365-381). Springer, Cham.

Moyer, D., Ver Steeg, G., Tax, C. M., & Thompson, P. M. (2020). Scanner invariant representations for diffusion MRI harmonization. Magnetic resonance in medicine, 84(4), 2174-2189.

Research supported by NIH R01 AG062336

CONTACT

Vishnu Lokhande,
lokhande@cs.wisc.edu

Vikas Singh,
vsingh@biostat.wisc.edu

alzheimer's association® AAIC 21 ALZHEIMER'S ASSOCIATION INTERNATIONAL CONFERENCE®