Multi-Task Knowledge Distillation for Eye Disease Prediction

Our implementation of knowledge distillation on multi task learning

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Table of Contents

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Paper

Given a fundus image, authors of [Chelaramani et al., 2021] aim to evaluate various solutions for learning deep neural classifiers using small labeled data for three tasks related to eye disease prediction.The problem is challenging because of small data size, need for predictions across multiple tasks, handling image variations, and large number of hyper-parameter choices. Their solution is to create MTL-based teacher ensemble method for knowledge distillation.

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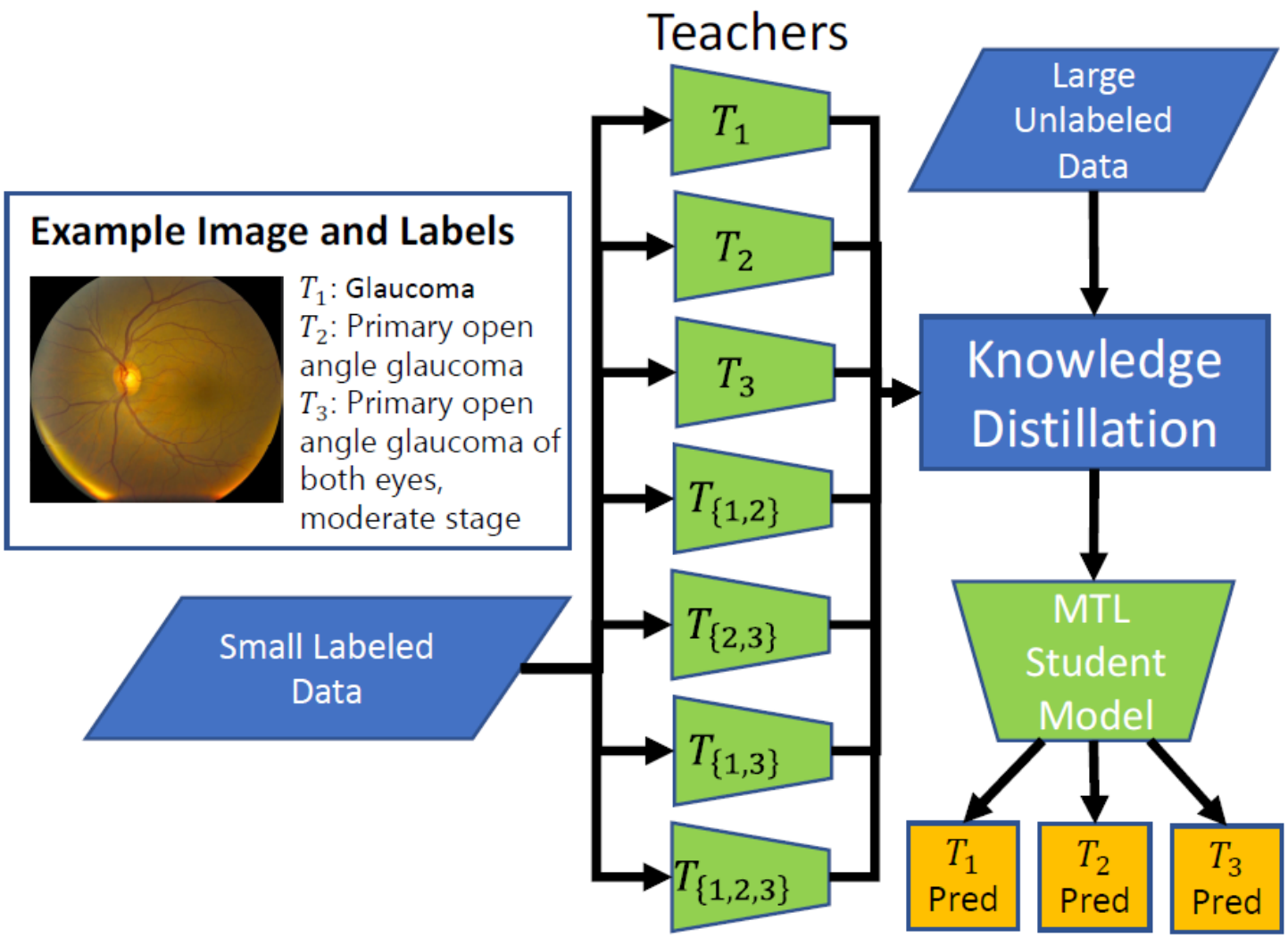
Architecture



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Literature Review

- Overviews of Computer Vision application in the medical field [Shen et al., 2017] and [Razzak et al., 2018]
- Multi Task Learning: first article on the topic [Caruana, 1997]. Current day overview and a glimpse into the future [Ruder, 2017].
- Survey covering knowledge distilation [Gou et al., 2021] from many different perspectives and approaches.
- First papers on combinations of these transfer learning methods appear around 2016. [Li and Bilen, 2020] propose another approach to this problem and [Liu et al., 2019] propose usage of those methods in NLP task.

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Division of work

- Selecting datasets
- Data processing
- Creating MTL teachers models
- Distill knowledge to student model
- Evaluate results

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Software and data

Software:

- PyTorch and Jupyter Notebooks - neural network development and data processing
- GitHub - code versioning and collaboration
- Google Colab - neural network training

Data:

- Fundus images from paper
- Chest x-ray
- CT scans

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Planned Experiments

Testing datasets from different background, as in medical and from another field.
Comparing results from this architecture to baseline models and further testing, experiments depending on the implementation results.

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POLITECHNIKA WARSZAWSKA

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