

Cancer Classification Challenge 2023

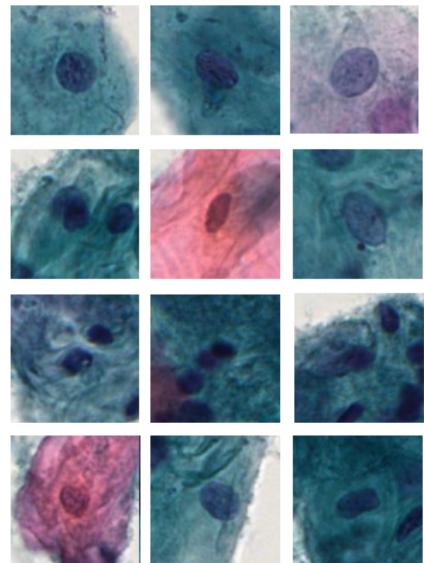
DL4IA - Group 3

Linus Falk, Teng-Sung Yu

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Outline

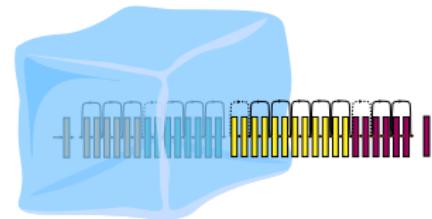
- What worked - Transfer learning
- What didn't work - Contrastive learning
- Results



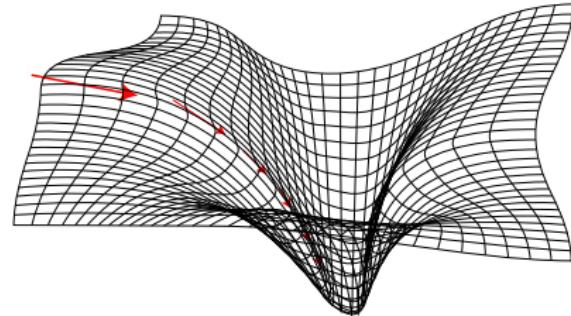
Benign or malignant?

Transfer learning

- Pre-trained on ImageNet
 - ResNet50
 - Freeze & unfreeze layers
- Learning rate strategy
 - Decrease step-size 90% every 5th epoch
- Regularization
 - Data augmentation
 - L2



Freezing parts of ResNet



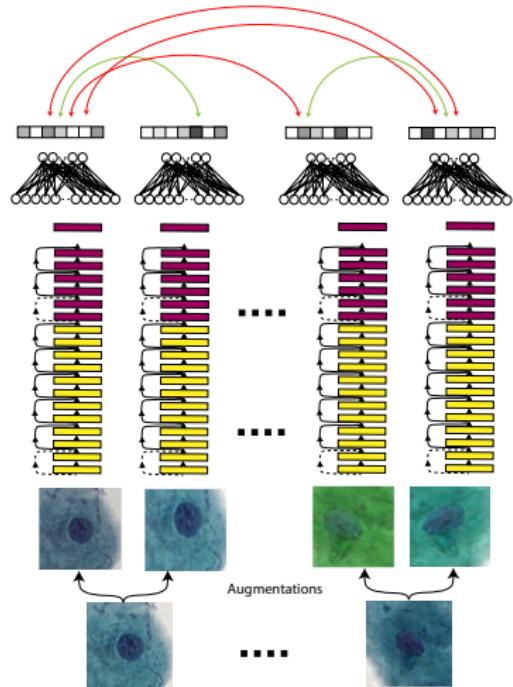
Changing Learning Rate

Hyperparameters

| Hyperparameter | Value |
|--------------------------------|--------------------|
| Batch Size | 32 |
| Random Rotation Range | -45 to 45 degrees |
| Random Resize Crop Scale Range | 0.5 to 3 |
| Loss Function | Cross-Entropy Loss |
| Optimizer | Adam |
| Learning Rate | 0.1 |
| Scheduler Step Size | 5 |
| Scheduler Gamma | 0.1 |
| Regularization Strength | 0.01 |
| Number of Epochs | 20 |

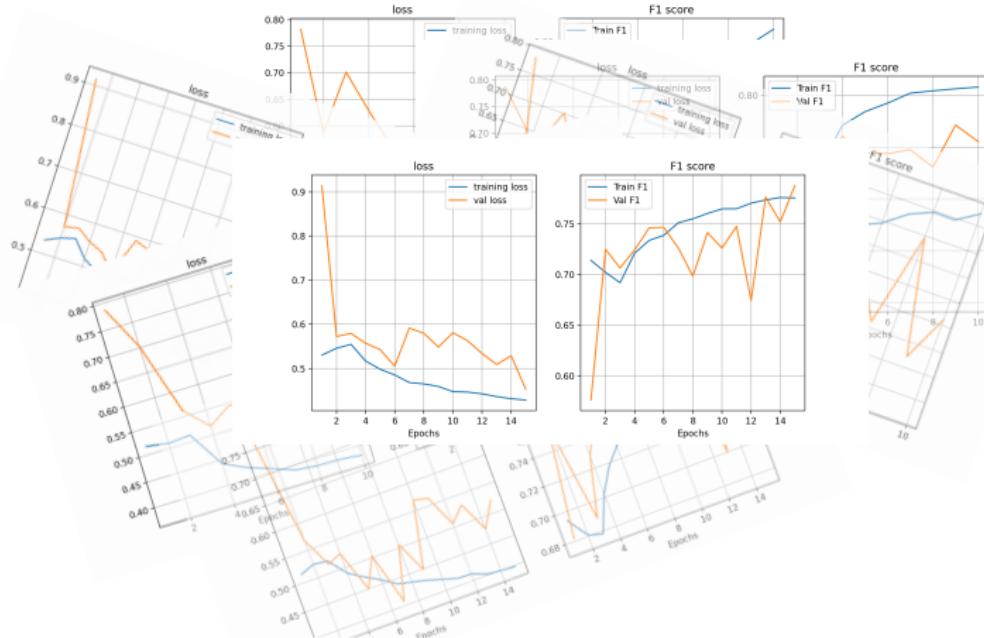
Contrastive learning

- SimCLR
 - ResNet 50 architecture
 - Remove FC classification layer
 - Replace with Projection head [1]
- Train on unlabeled data
 - InfoNCE loss [3]
- Transfer learning
 - Classification head
 - Layer-wise unfreezing
 - Early stopping



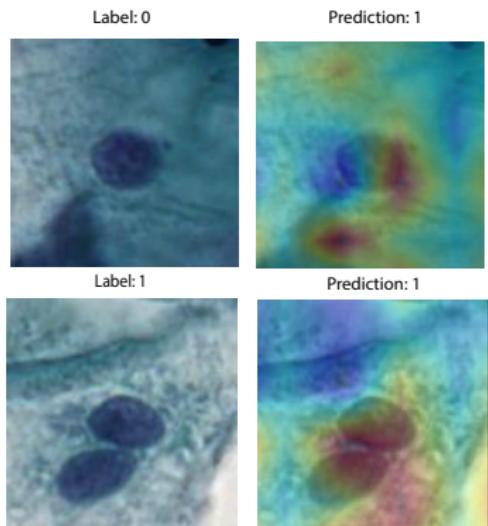
| Hyperparameter | Value |
|--------------------------------------|--|
| Batch Size (train, validation, test) | 16 |
| Number of Epochs | 15 |
| Initial Learning Rate | 5e-4 |
| Step Size (LR scheduler) | 3 |
| Gamma (LR scheduler) | 0.8 |
| Optimizer | Adam |
| Weight Decay (Optimizer) | 1e-3 |
| Class Weights | [0.33, 0.67] |
| Loss Function | CrossEntropyLoss |
| Transformations | HorizontalFlip, GaussianBlur, Rotation ColorJitter |

A lot of training later ...



Results

| Model | AUC score |
|----------------------|-----------|
| Transfer Learning | 0.904 |
| Contrastive learning | 0.848 |



CAM generated with the best model

References I

- [1] Ting Chen and Simon Kornblith and Mohammad Norouzi and Geoffrey E. Hinton (2020). A Simple Framework for Contrastive Learning of Visual Representations
- [2] Santisudha Panigrahi and Bhabani Sankar Nanda and Ruchi Bhuyan and Kundan Kumar and Susmita Ghosh and Tripti Swarnkar (2023). Classifying histopathological images of oral squamous cell carcinoma using deep transfer learning
- [3] Aaron van den Oord and Yazhe Li and Oriol Vinyals (2019). Representation Learning with Contrastive Predictive Coding