



FOOD RECOGNITION CHALLENGE

Score: 69% | Best Rank: 5th | Final Rank: 10th

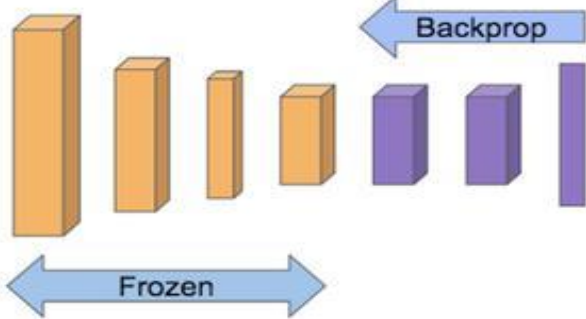
INTRODUCTION

Generate a neural network able to perform food classification.



TRANSFER LEARNING

Selectively updating pre-trained layers with backpropagation.



MODEL OPTIMIZATION

MODEL ARCHITECTURES

X Inception **X** ResNet101 **✓** ResNet50

HYPER PARAMETER TUNING

LEARNING RATE

- ✓** Stepwise unfreezing + lowering LR
- ✓** Different learning rates per layer
- ✓** Scheduler

REGULARIZATION

- ✓** Data augmentation
- ✓** Weight Decay (WD)
- ✓** Dropout

RETRAINING SCHEDULE

- ✓** 1 epoch FC only → include conv layers
- ✓** Layer 4
- ✓** Layer 3 and 4

OPTIMIZER

- X** Adam
- X** Adam + WD
- ✓** AdamW + WD

FULLY CONNECTED LAYER ARCHITECTURE

- ✓** Average pooling
- ✓** Average pooling + max pooling

DATA OPTIMIZATION

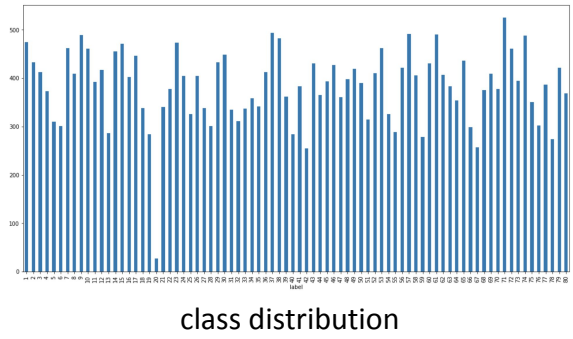
CLASS IMBALANCE

UNDER SAMPLING

- X** Only selecting 250 images per class

OVER SAMPLING

- Selecting 500 images per class
- X** by inserting duplicates
- ✓** by data augmentation



DATA AUGMENTATION

STATIC DATA AUGMENTATION

- X** Horizontal flip
- ✓** Gaussian blur

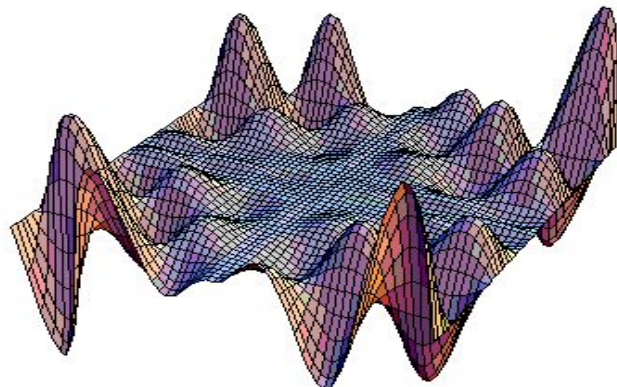
DYNAMIC DATA AUGMENTATION

- ✓** RandomResizedCrop
- ✓** RandomRotation
- ✓** RandomHorizontalFlip
- X** CenterCrop
- ✓** RandomCrop

ENSEMBLING

We tried different ways to combine multiple models:

- ✓** Committee of networks
- ✓** Combining different models by majority vote
- ✓** Combining different models by output probabilities



Fitness landscape

OTHER TRIES

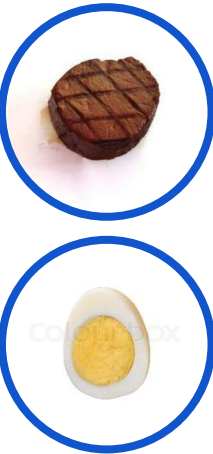
- Data augmentation using-GANs
- Implement triplet loss
- PCA colour augmentation



GAN output: lasagna



Two often confused classes



FURTHER IMPROVEMENTS

- Train final models on all data
- Clean wrongly labeled/ garbage data



- Dynamic class imbalance correction
- Ensemble of models trained on different parts of the data
- Ensemble of models with more extreme differences in hyperparameters
- Use probabilities instead of majority vote for stacking