# Learning Data Augmentation with Bilevel Optimization For Image Classification

ELEMENT AI

ElementAI/bilevel_augment

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# The team

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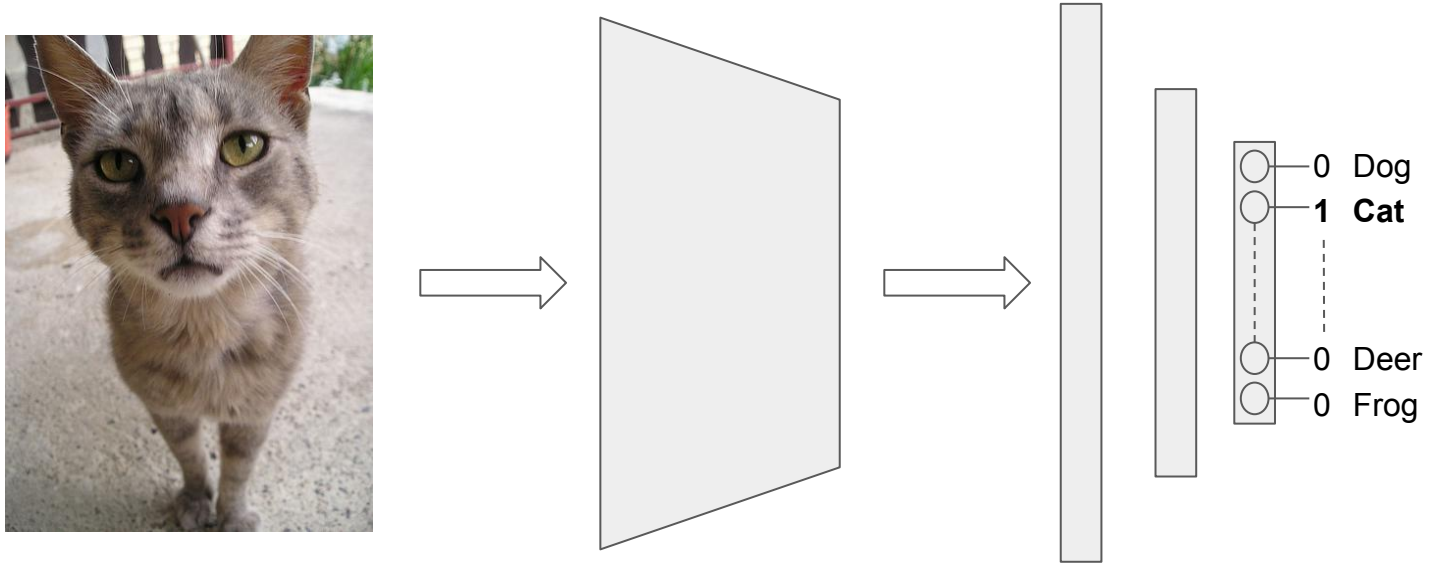
# Introduction

## Research Task




**Objective**: train an image classifier

**Problem**: CNN require large training datasets

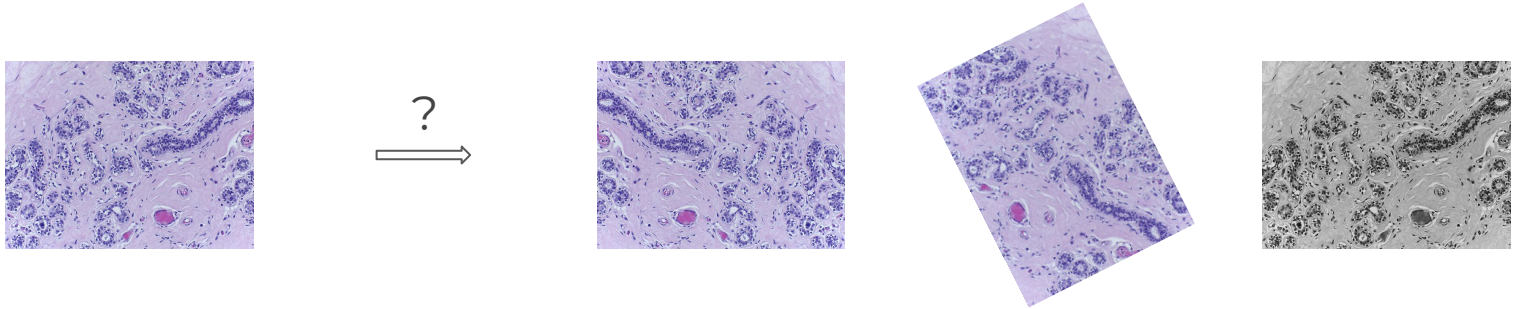
## Introduction

**Data Augmentation**: create new images from existing ones

## Introduction

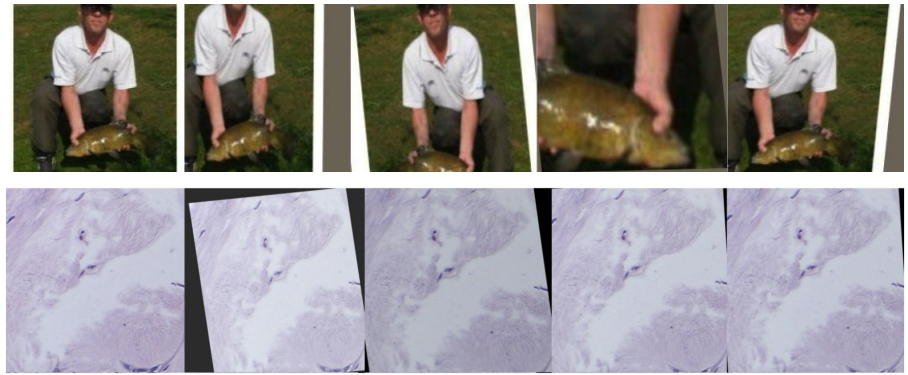
**Problem**: Data Augmentation is dataset dependent

And requires prior knowledge



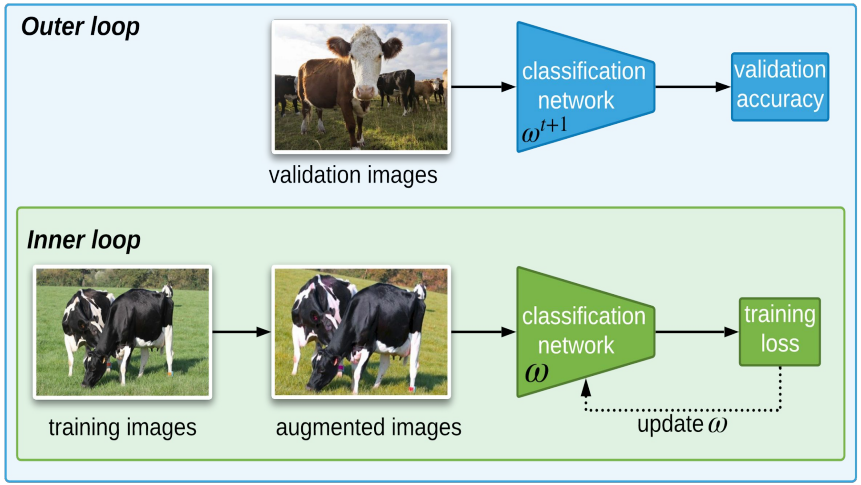
## Research Problem

For a given dataset, how to select the best data augmentation transformations and define their best parameters ?



# Our approach

## Data augmentation hyperparameters definition by grid search

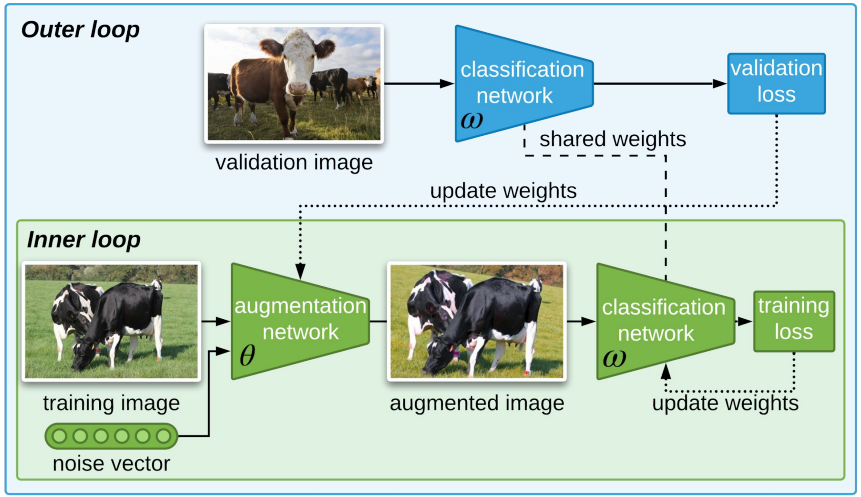



Data augmentation hyperparameters definition using grid search

The augmentation parameters giving the best model performance are kept.

Issues : choice of transformations and training speed

# Our approach




Data augmentation hyperparameters definition using the gradient on the validation loss and backpropagation

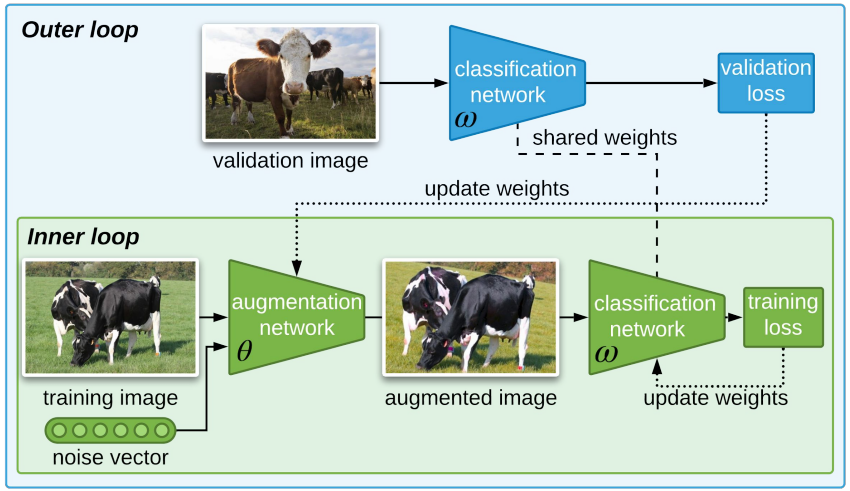
Issues : Training speed and memory required to save the gradient at each inner loop step → Solved by using truncated back propagation

## Our model

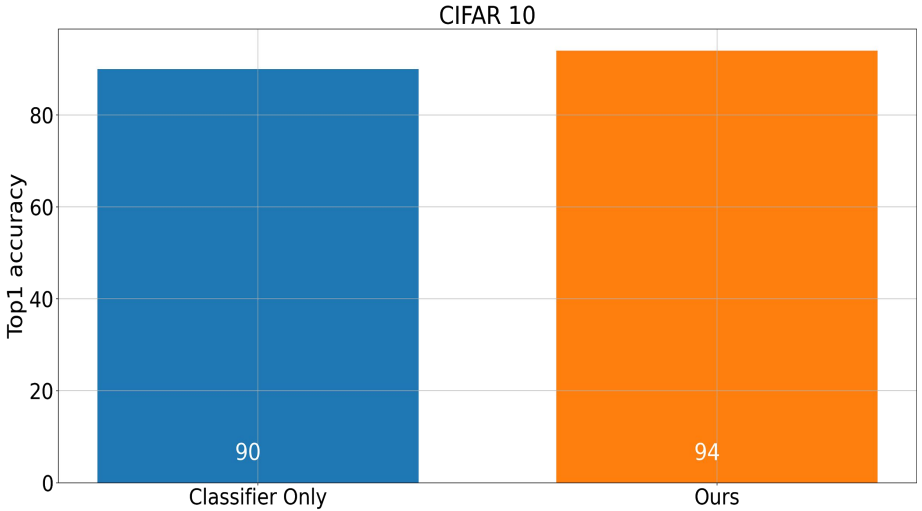
- Trains an augmenter network to efficiently learn augmentations
  - Avoids manual selection and grid search
- Uses the gradient of the validation loss
  - Trains the augmenter network end-to-end
- Uses truncated back propagation to make the training faster
  - Estimates the gradient of the validation loss with few gradient descent steps

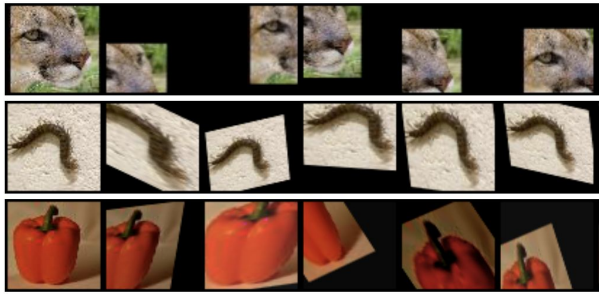
# Results

# CIFAR10 Results

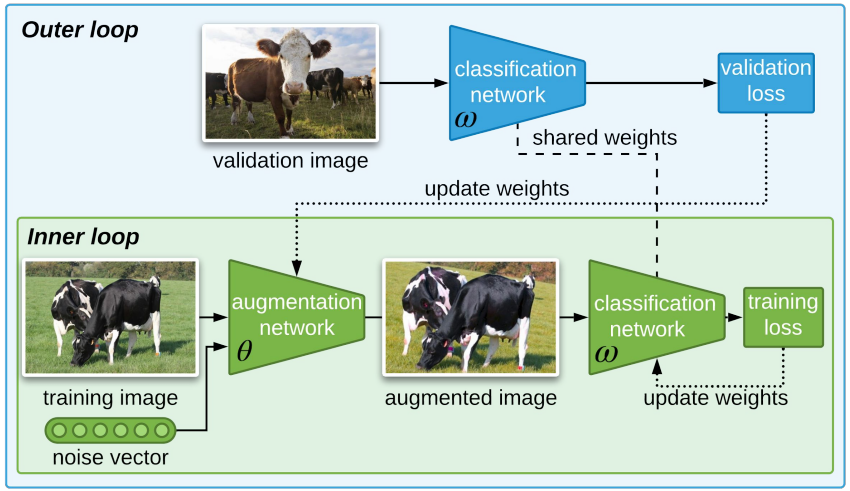



Classifier + augmentation network

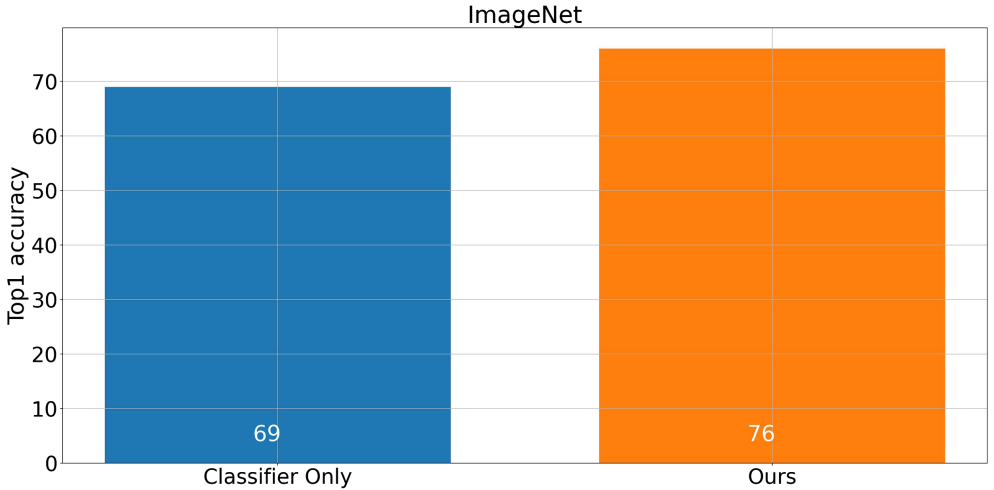


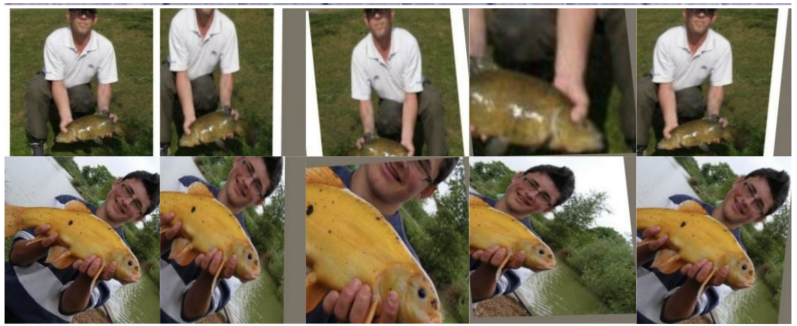



# BACH Results (Medical Dataset)




Classifier + augmentation network



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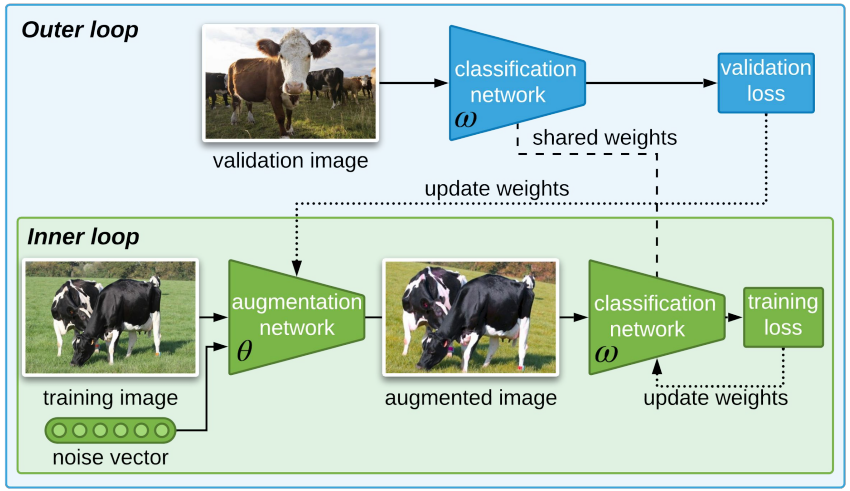
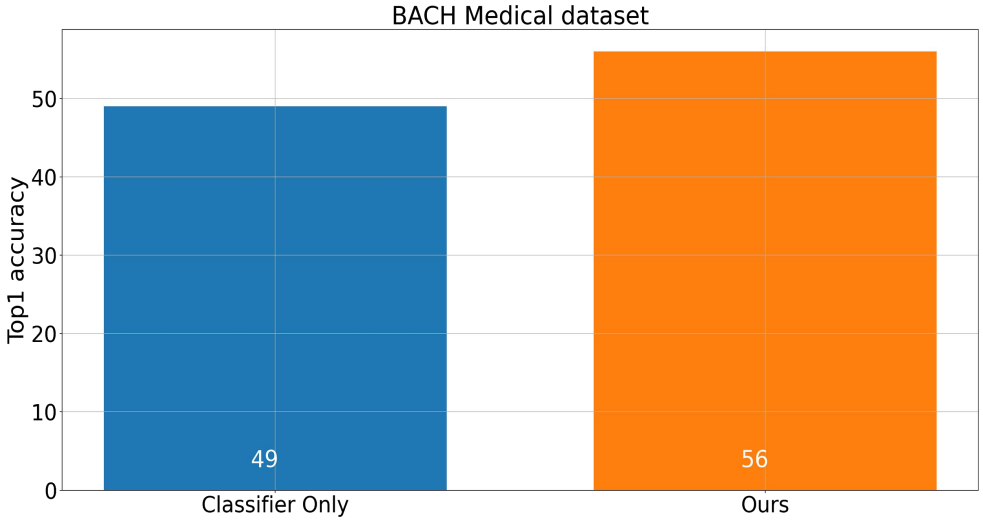
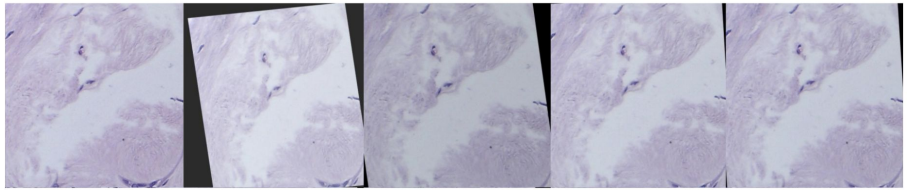



Classifier + augmentation network



# Live Coding

# Link:

https://github.com/ElementAI/bilevel_augment/blob/master/docs/webinar_demo.ipynb

# Thank you.

FOR MORE INFORMATION

Contact us!

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