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**tmeasures**

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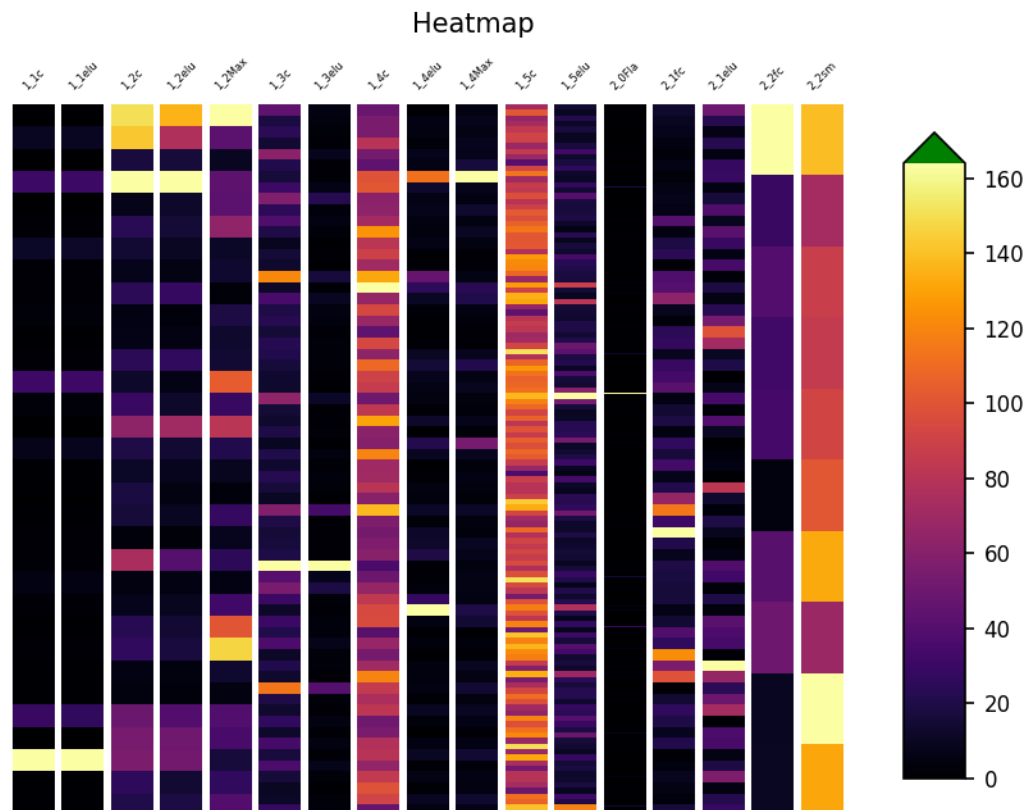


## VISUALIZATIONS

`tmeasures` allows computing invariance, same-equivariance and other transformational measures, and contains helpful functions to visualize these. The following are some examples of the results you can obtain with the library:

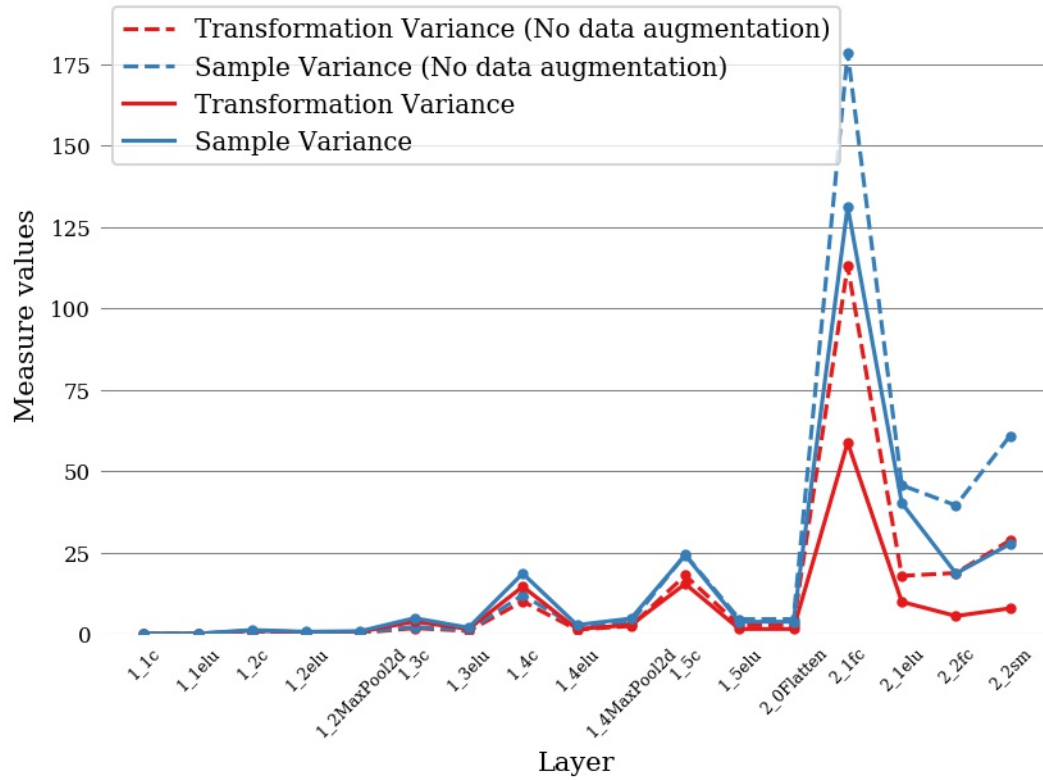
## 1.1 Invariance heatmap

Each column shows the invariance to rotation of a layer of a Neural Network. Each row/block inside each column indicates the invariance of a feature map or single neuron, depending on the layer.



## 1.2 Average Invariance vs layer, same model

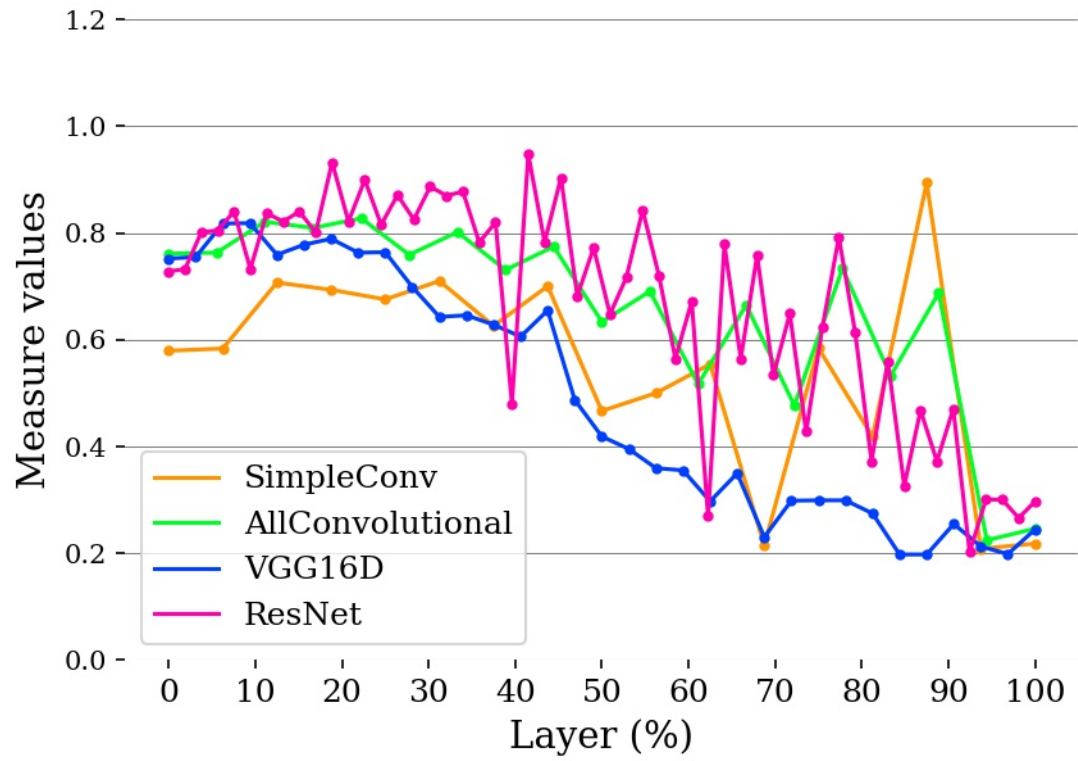
Plot the transformational and sample invariance to rotations of a simple neural network trained on MNIST, with and without data augmentation. The X axis indicates the layer, while the Y axis shows the average invariance of the layer.



## 1.3 Average invariance by layer, different models:

Plot of the invariance to rotations of several well-known models trained on CIFAR10. The number of layers of each model is stretched on a percentage scale, so that different models can be compared.







## PYTORCH API

The following notebook contains a step-by-step to measure invariance to rotations in a PyTorch neural network that was trained with the MNIST dataset. You can execute it directly from [google colab](#).

[Measuring invariance to rotations for a simple CNN on MNIST \(google colab\)](#)

Other examples with multiple measures and pretrained models can be found in the [doc](#) folder of this repository.



## TENSORFLOW API

We are still developing the Tensorflow API.



## **EXAMPLES**

You can find many uses of this library in the [repository with the code](#) for the article [Measuring \(in\)variances in Convolutional Networks](#), where this library was first presented. Also, in the code for the experiments of the PhD Thesis “Invariance and Same-Equivariance Measures for Convolutional Neural Networks” (spanish).





## CITING

If you use this library in your research, we kindly ask you to cite [Invariance and Same-Equivariance Measures for Convolutional Neural Networks](#).

```
@article{quiroya20,  
  author    = {Facundo Quiroga and  
               Laura Lanzarini},  
  title     = {Invariance and Same-Equivariance Measures for Convolutional Neural  
↪ Networks},  
  journal   = {J. Comput. Sci. Technol.},  
  volume    = {20},  
  number    = {1},  
  pages     = {06},  
  year      = {2020},  
  url       = {https://doi.org/10.24215/16666038.20.e06},  
  doi       = {10.24215/16666038.20.e06},  
}
```

### 5.1 PyTorch

### 5.2 Numpy

Coming soon

### 5.3 Tensorflow

Coming soon.

## 5.4 Visualization

## 5.5 How to contribute

## INDICES AND TABLES

- `genindex`
- `modindex`
- `search`