
MSc. Data Science & Artificial Intelligence

Advanced Learning

Marco GORI

# Learning without Data Collection

*Author:* Joris LIMONIER
joris.limonier@gmail.com
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# 1 Introduction

"Learning without data collection" is a provocative way to describe the process of learning from a single, or very few example. Humans however, are able to learn in such a way. Algorithms on the other hand, especially deep learning ones, are very data-hungry even for simple tasks such as recognising a cat from a dog.

# 2 Context of Learning without Data Collection

Learning without data collection can be applied to many fields within machine learning. One notable example is the field of computer vision. When humans see a object moving, they are almost imidiately able to recognise it. We do not require hundreds of thousands of examples in order to identify it. One iteresting thing however is that, when we see a paused video, on a phone or a computer screen for instance, we are sometimes incapable of recognising objects. Think of a paused video about a jaguar in the jungle. The jaguar may be partially, or almost completely hidden. In this case, it may be difficult to identify it. When we turn the video on, it may still be challenging to see the jaguar if he is immobile. However, as soon as the jaguar starts moving, we are able to identify it. This is because of motion invariance [1], which informs us of the consistency of an object (the jaguar in this case) through time. Indeed, we know that the paws, the ears, the tail and all other body parts of the jaguar will not start splitting up or drastically changing shape as time goes. We also do not need to classify each pixel of the image we see in order to identify the boundaries of the body of the jaguar.
Furthermore, we do not even need labels in order to understand the consistency of one class. In that sense, Humans are good unsupervised machines.

# 3 Critical comments on the notion of motion invariance

# 4 Related articles

# References

[1] Betti, A., Gori, M. and Melacci, S., 2022. Deep Learning to See: Towards New Foundations of Computer Vision. arXiv preprint arXiv:2206.15351.