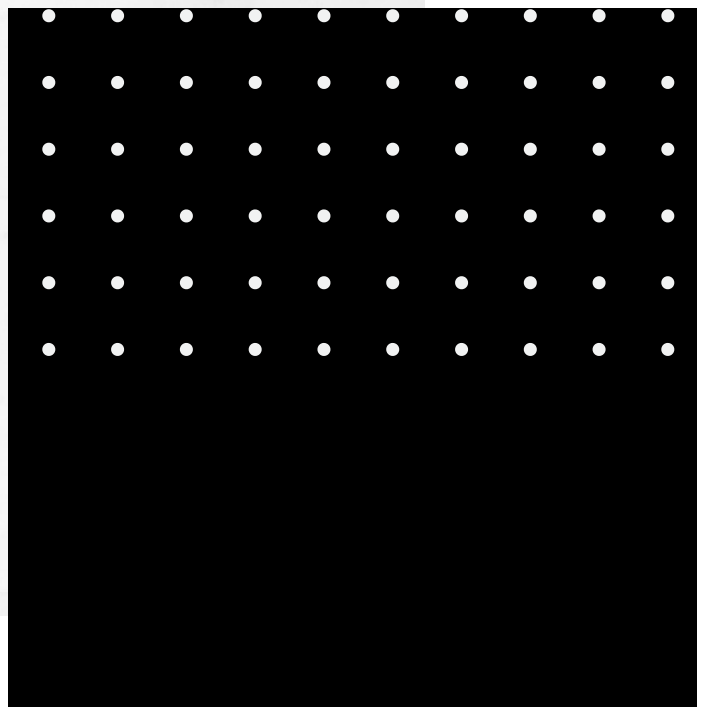
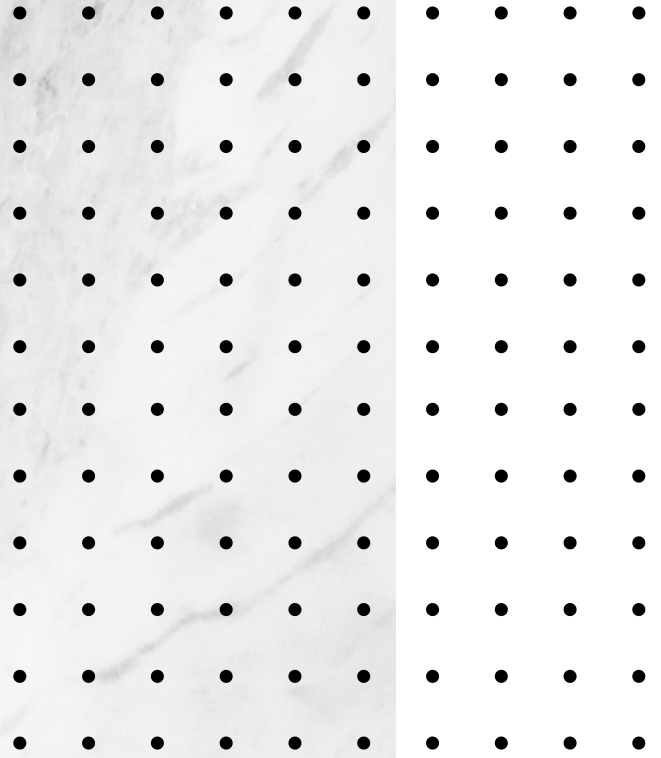


# DEEP LEARNING

SARA CAROLINA GÓMEZ DELGADO  
0226594



# Deep Learning

Deep learning is based on how our brain works when recognizing patterns. The very interesting part is that it can be applied to any area, for example, in the article was mentioned the improving state-of-the-art in speech recognition, visual object recognition (this could be used in ATMs for example, to recognize coins and bills), drug discovery and genomics. Today, work continues to improve deep learning techniques, however, a few decades ago things were very different since machine learning techniques required people with a lot of knowledge in order to convert raw data into a classifier that could detect patterns from the input.

There are three types of Machine Learning: supervised, unsupervised and reinforcement learning. In the article just Supervised learning is mentioned. Supervised Learning consists of comparing the results of our model and the correct answers for example on labeling an image. Then creating an objective function to decide if our output corresponds to the correct labeling. After some iterations, our model must improve its results by modifying what it's called "adjustable parameters".

Stochastic Gradient Descent (SGD) is a procedure that adjusts the parameters accordingly to the computed error. This is repeated as long as the average of objective function stops decreasing. A useful analogy could be throwing a ball into a bowl or a hole and watching it fall until it finds a minimum and stops falling.

Convolutional Neural Networks or ConvNets is a type of network that processes multiple arrays data. An example given in the article is a colour image of three 2D arrays with pixel intensities in the three colour channels (RGB). There are many data modalities that are in the form of multiple arrays, such as:

- **1D**: for signals and sequences.
- **2D**: for images or audio spectrograms.
- **3D**: for video or volumetric images.

According to the article, ConvNets are typically structured as a series of stages. The first few stages are composed of two types of layers (convolutional layers and pooling layers). A recent application of CNN in technology is face recognition. Another application could be converting an image to text. This last application should detect the most important things shown in an image to give emphasis to them.

Recurrent Neural Networks (RNN) was another topic mentioned in the article. RNNs are better for tasks that involve sequential inputs (speech and language). RNNs are powerful dynamic systems but training them gives several problems because the backpropagated gradients grow or shrink at each time step, this causes them to disappear.

## **Conclusion**

To conclude, I think this article was incredible since it didn't just make me realize deep learning is important but it also helped me learning more about CNN and RNN which I had heard about, but never understood so well. I think deep learning has a great future for Artificial Intelligence since it could not just make our lives easier, but also help many people regarding the medicine area and not just recognize and differentiate a cat from a dog as many people think.

## **References**

- LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. *Nature*, 521(7553), 436-444. <https://doi.org/10.1038/nature14539>