

Machine learning

an introduction

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The fundamentals

$$y = mx + b$$

predicts some value of y given values of x

Predictive models are not always 100% correct. The measure of how incorrect it is the loss

The goal of machine learning is to take a training set to minimize the loss function

For example, suppose $m = 2$, $x = 3$, and $b = 2$. Then our predicted value of $y = 2 * 3 + 2 = 8$. But our actual observed value is 10. The loss is $10 - 8 = 2$.

Michael Nielsen, <http://neuralnetworksanddeeplearning.com/>

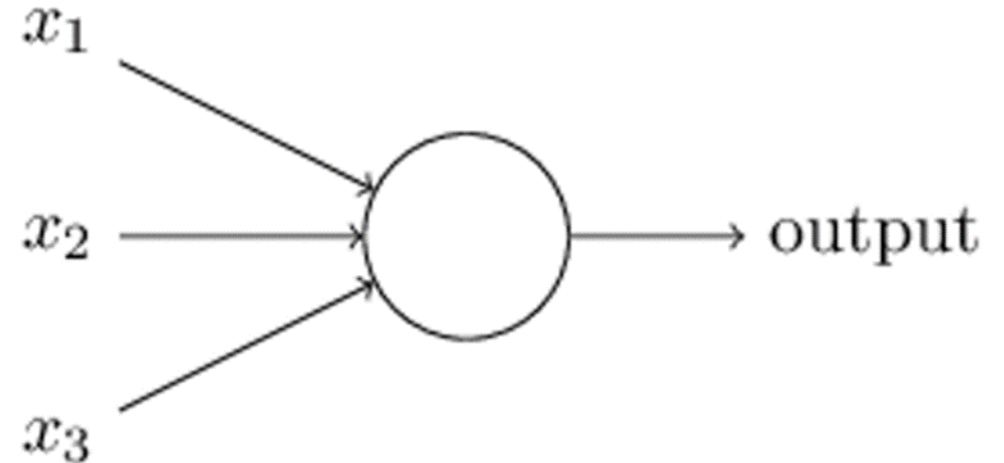
The fundamentals

In a neural network, we have the same basic principle, except the inputs are binary and the outputs are binary. The objects that do the calculations are perceptrons.

They adjust themselves to minimize the loss function until the model is very accurate

All of these inputs (x_1 , x_2 , x_3) are fed into a perceptron. That then makes a yes or no decision and passes it onto the next perceptron for the next decision. This process repeats until the final perceptron. At which point we know what the handwriting is or whose face we are looking at.

Michael Nielsen, <http://neuralnetworksanddeeplearning.com/>



Machine learning and NOVA environmental engineering students

Input

Environmental Engineering students 1982-2019

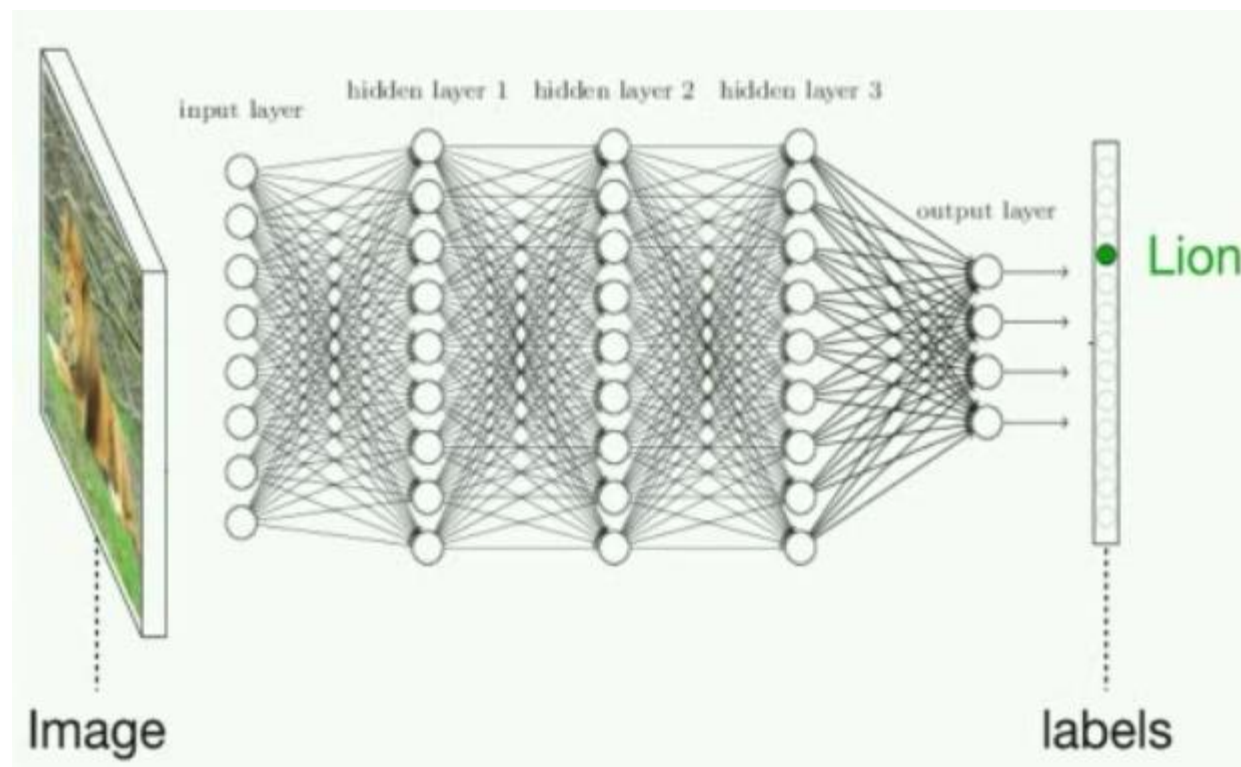
Output

Success (conventional, craftsmanship, societal) 1982-2019

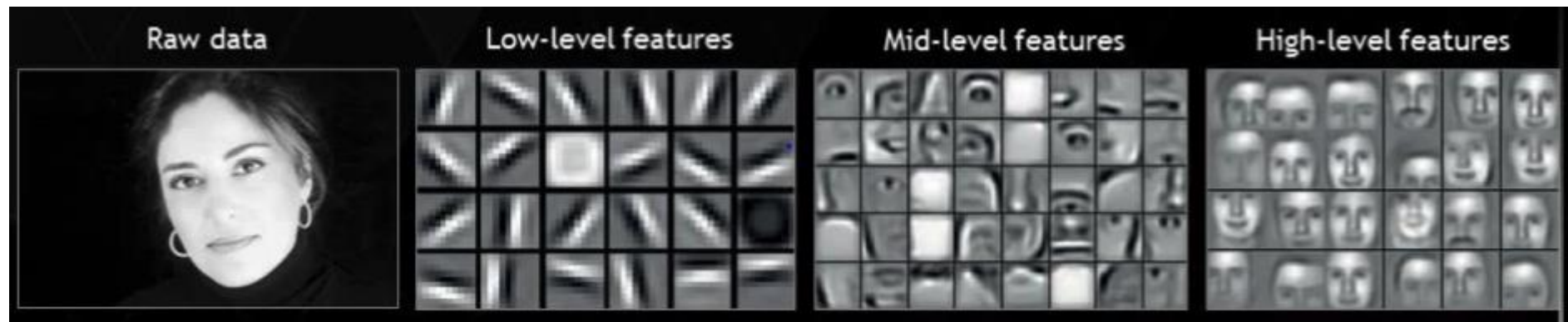
Hidden nodes

Accounting for F in $Output = F(Input)$

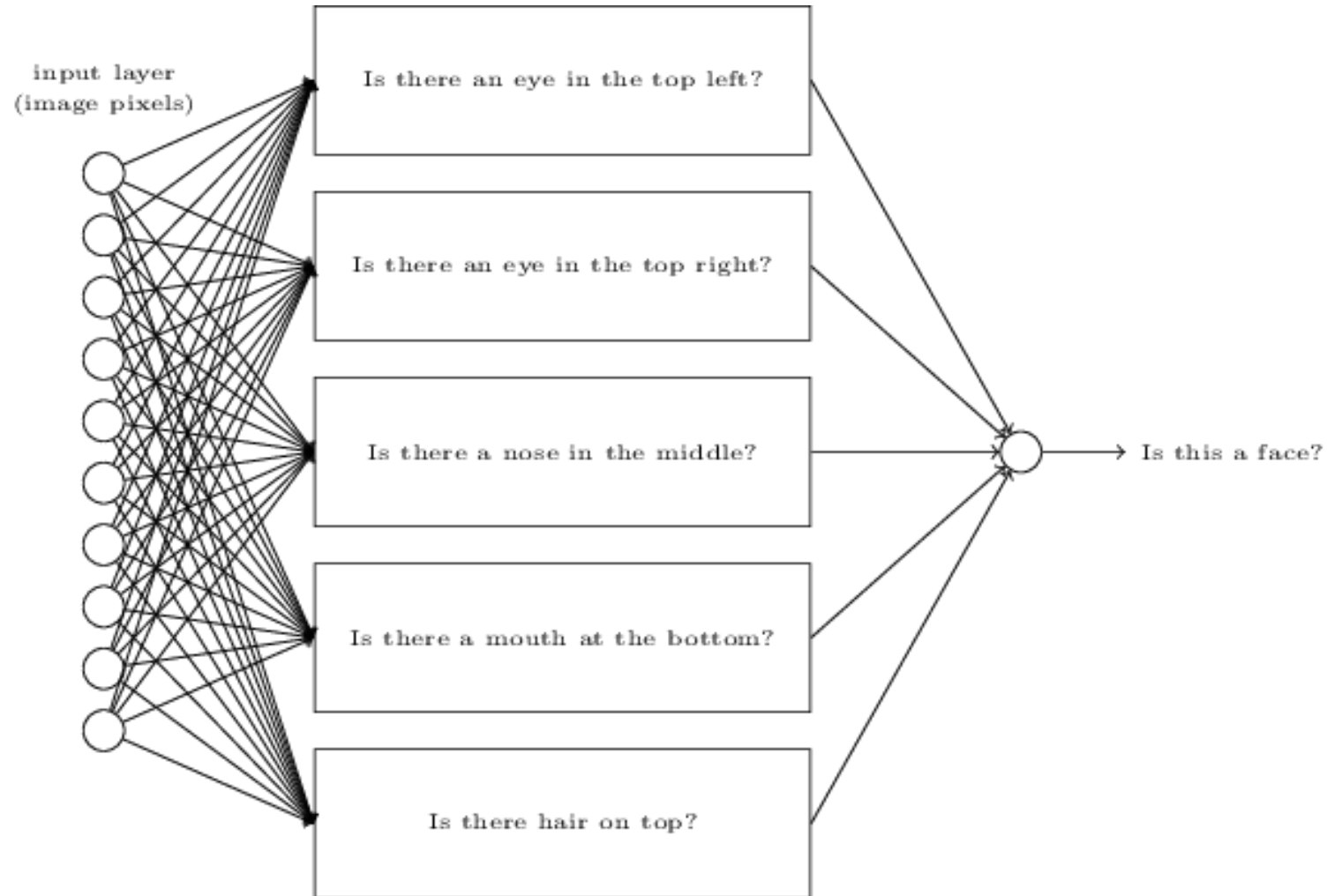
Neural networks



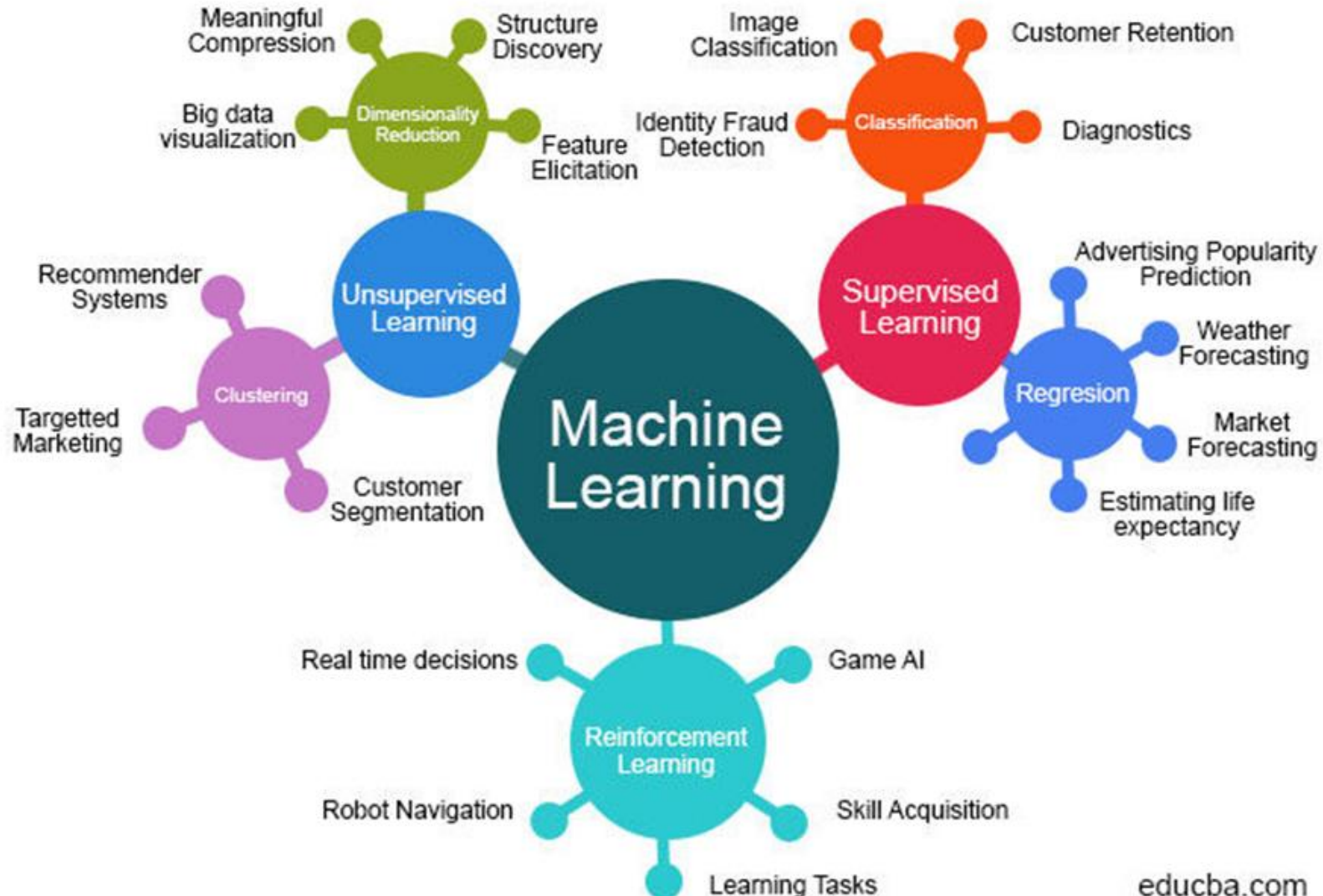
Neural networks



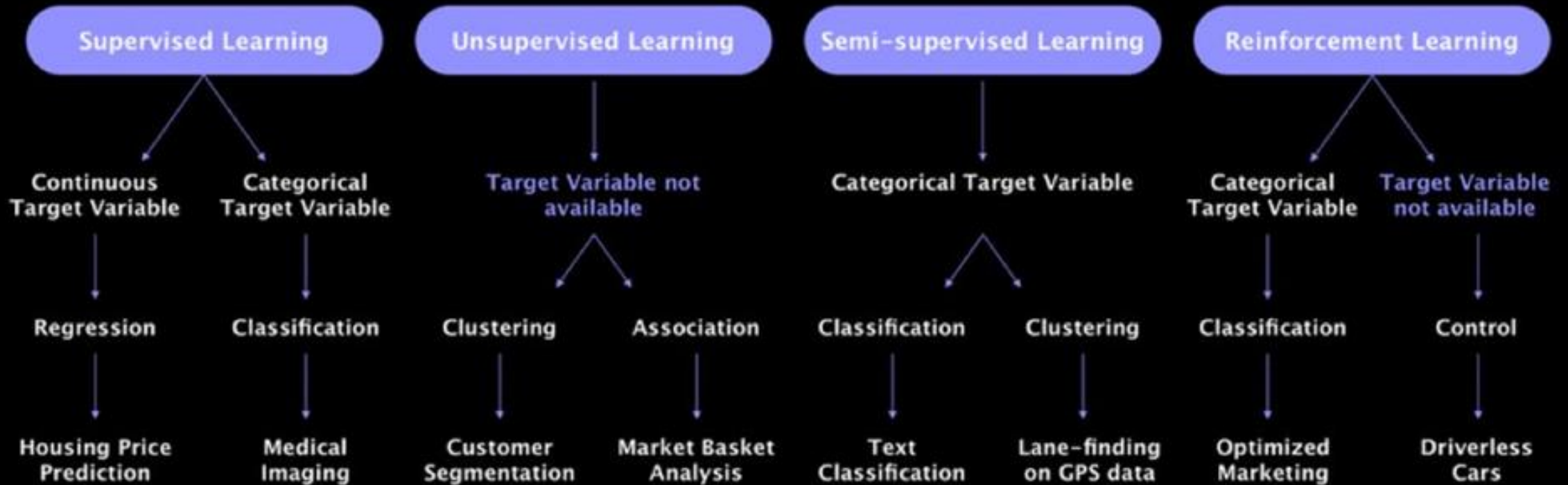
Neural networks



Machine Learning Algorithms



Machine Learning Types



Explore Machine Learning fundamentals

[Machine learning at Stanford- cheat sheet](#)

[One stop shop for educational resources](#)

[JP Morgan's Machine Learning Guide](#)

Useful links

[Which machine learning algorithm?](#)

[Machine learning for humans](#)

[A neural network playground](#)

Environmental applications

[A learning surrogate LCA model for integrated product design](#). a pioneer example of machine learning as applied to ecological design by Inês Sousa, a former Environmental Engineering student at NOVA, when she was at MIT. She is now a senior environmental manager at Google

[Intelligent Waste Sorting Using Deep Neural Networks](#)

[AI and environmental modelling](#)

[Tensor Flow and air quality](#)

[Tensor Flow and water quality](#)

Environmental applications

[Tackling Air Pollution with Urban AI](#)

[Machine learning and SNIRH](#)

[Machine learning and traffic forecast](#)

[Study on pollutant emissions of mixed traffic flow in cellular automaton](#)

[Collective Intelligence for Deep Learning: A Survey of Recent Developments](#)

A review of interactive sites on machine learning

<https://medium.com/@dreamferus/18-interactive-machine-learning-and-data-science-websites-faf52eea8181>

Generative AI

A review

<https://unchartedterritories.tomaspuoyo.com/p/generative-ai-everything-you-need> (Generative AI tools)

Use

<https://www.midjourney.com/>

<https://chat.openai.com/chat>

To understand Generative AI tools, see thread [here](#)