The perceptron

TEAM POTATO CLOCK

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ICS 635
University of Hawai'i
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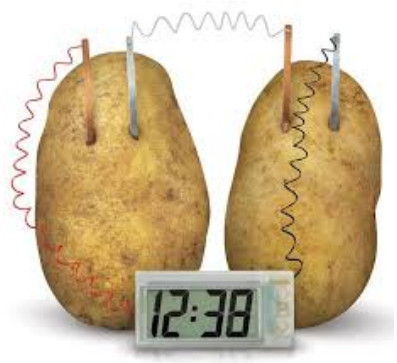

The Perceptron Algorithm

Our Perceptron program classifies of a set of N *two-dimensional* points (x_j, y_j) with label $l_j = \pm 1$ by using a *learning rate* $< c \leq 1$ (0.5 by default).

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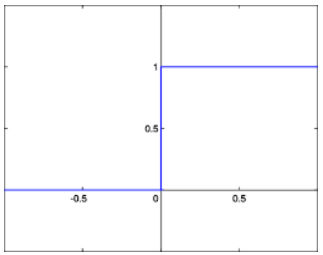

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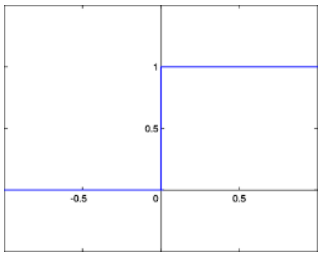

- While the classification is not achieved
  - Initialize `wrong`$= 0$
  - For each point P_j, calculate the *new label* $y_j = \theta(w \cdot P_j)$
  - If $y_j \neq l_j$, *update the weight* $w+ = c * y_j * P_J$ and `wrong`$+ = 1$

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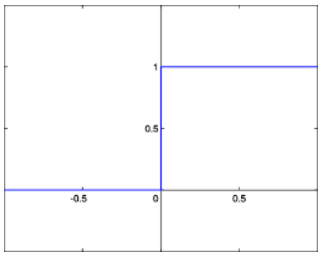

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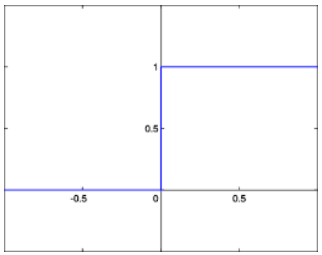

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  Remark : to guarantee that the algorithm stops, we *limit the while loop loops* (at most 50 iterations by default).

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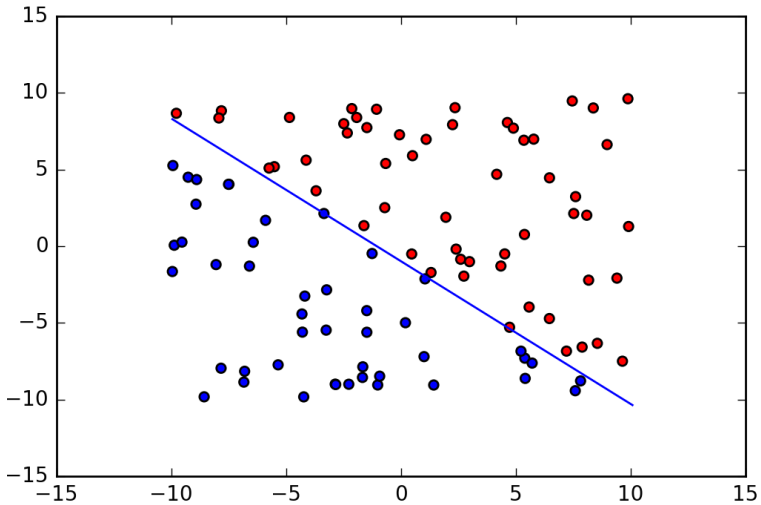
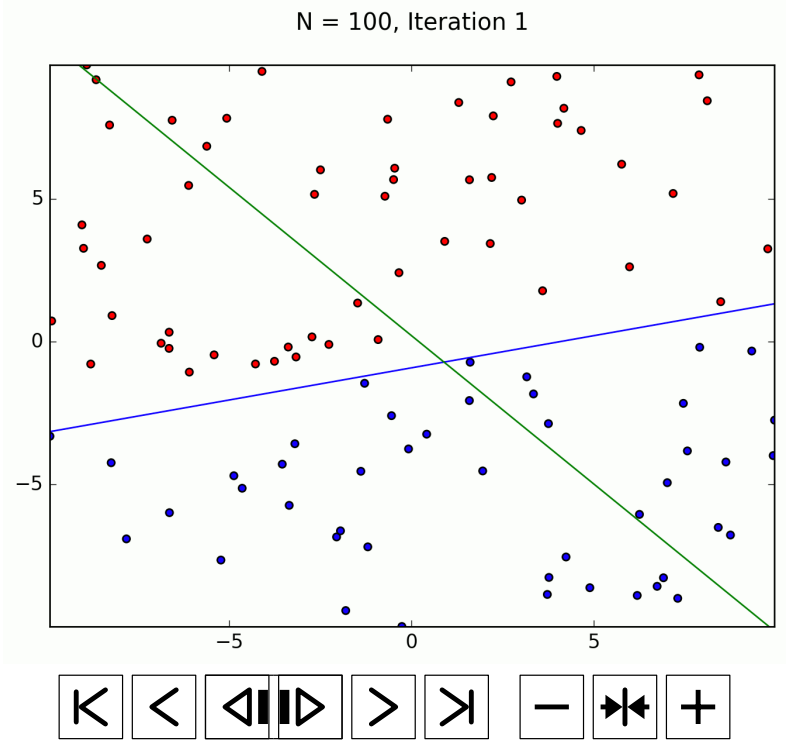


Figure : A collection 100 points linearly separated

Convergence of the algorithm : the linearly separable case

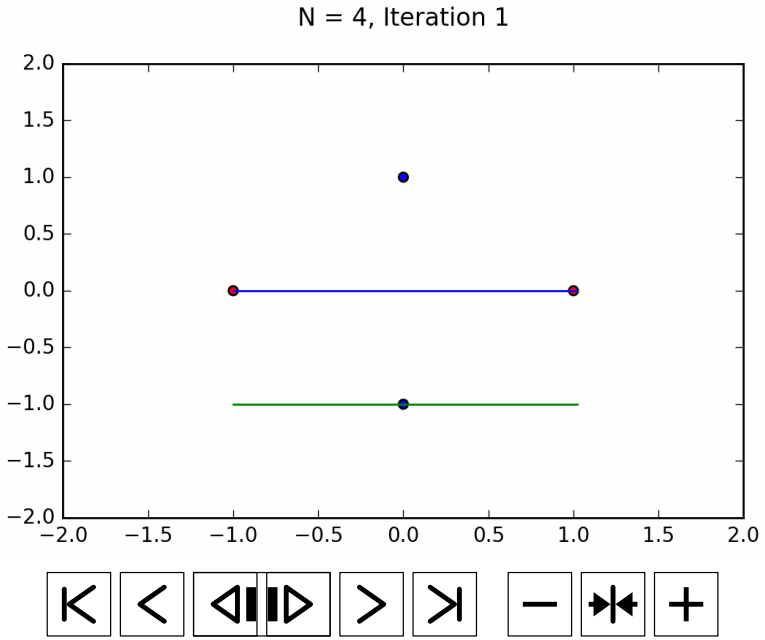
The algorithm *converges* when the classified datas can be separated by a line.



In this animation, the *green line* shows the line defined by the weight vector w. Through the execution of the algorithm, the line *stabilizes* $\iff$ the weight vector is *no longer* updated $\iff$ the algorithm *converges*.

Divergence of the algorithm : the non linearly separable case

The algorithm *diverges* when the classified datas can not be separated by a line.



In this animation, the *green line* shows the line defined by the weight vector w. Through the execution of the algorithm, the line *does not stabilize* $\iff$ the weight vector *keeps being updated* $\iff$ the algorithm *diverges*.

Thank you...

...Mister Rosenblatt !