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ALOPEX

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ALOPEX (an acronym from "**AL**gorithms **O**f **P**attern **EX**traction") is a correlation based machine learning algorithm first proposed by [Tzanakou](#) and Harth in 1974.

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Principle [\[edit\]](#)

In [machine learning](#), the goal is to train a system to minimize a cost function or (referring to ALOPEX) a response function. Many training algorithms, such as [backpropagation](#), have an inherent susceptibility to getting "stuck" in local minima or maxima of the response function. ALOPEX uses a cross-correlation of differences and a stochastic process to overcome this in an attempt to reach the absolute minimum (or maximum) of the response function.

Method [\[edit\]](#)

ALOPEX, in its simplest form is defined by an updating equation:

$$\Delta W_{ij}(n) = \gamma \Delta W_{ij}(n-1) \Delta R(n) + r_i(n)$$

Where:

- $n \geq 0$ is the iteration or time-step.
- $\Delta W_{ij}(n)$ is the difference between the current and previous value of system variable W_{ij} at iteration n .
- $\Delta R(n)$ is the difference between the current and previous value of the response function R , at iteration n .
- γ is the learning rate parameter ($\gamma < 0$ minimizes R , and $\gamma > 0$ maximizes R)
- $r_i(n) \sim N(0, \sigma^2)$

Discussion [\[edit\]](#)

Essentially, ALOPEX changes each system variable $W_{ij}(n)$ based on a product of: the previous change in the variable $\Delta W_{ij}(n-1)$, the resulting change in the cost function $\Delta R(n)$, and the learning rate parameter γ . Further, to find the absolute minimum (or maximum), the stochastic process $r_{ij}(n)$ (Gaussian or other) is added to stochastically "push" the algorithm out of any local minima.

References [\[edit\]](#)

- Harth, E., & Tzanakou, E. (1974) Alopex: A stochastic method for determining visual receptive fields. *Vision Research*, **14**:1475-1482. [Abstract from ScienceDirect](#)^[?]



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