



Machine Learning with C/C++

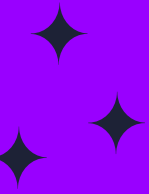
A guide to embedded learning systems

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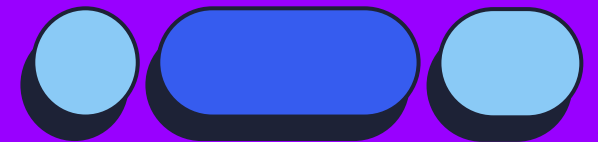


Course Content ✨

- 0. Course Content(You're here)
- 1. Introduction to Machine Learning
- 2. Why C? Wait C for machine learning, how?
- 3. Supervised, Unsupervised & Classification, Regression
- 4. Linear Regression
- 5. Hypothesis Function
- 6. Cost/Error Function
- 7. Gradient Descent
- 8. Linear Regression in C



Introduction to Machine Learning



Definitions

Definitions in literature

1. A computer algorithm is said to learn from experience E with respect to some class of tasks T & performance measure P , if its performance at tasks in T as measured by P improves with experience E .
Example: Playing Tic-Tac-Toe
 E = experience of playing many games of tic-tac-toe.
 T = the task of playing tic-tac-toe
 P = the probability the algorithm will win the next game.
2. Machine learning is a subset of artificial intelligence which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

Definition not in literature

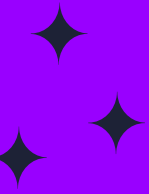
Machine learning is a way to map a set of numbers to another set of numbers. It is just a very fancy way of making a function.



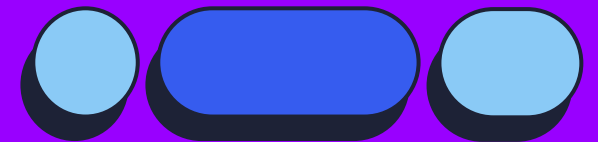
Why C for machine learning?

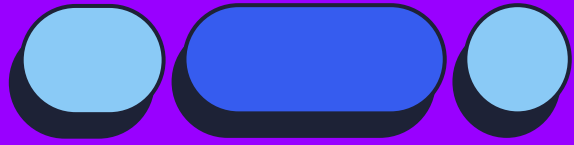
But why pure C/C++ though?





Because I hate python





Reasons to use **C/C++** over python

1. Embedded systems; Actual products use C++.
2. Complete fine grained control.
3. Dependency issues with python is pain incarnate.
4. Low-level algorithm development.
5. AI systems in games use C++ based models.



Types of Machine Learning

Supervised Learning

Regression

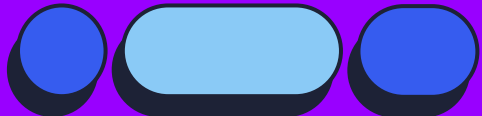
Classification

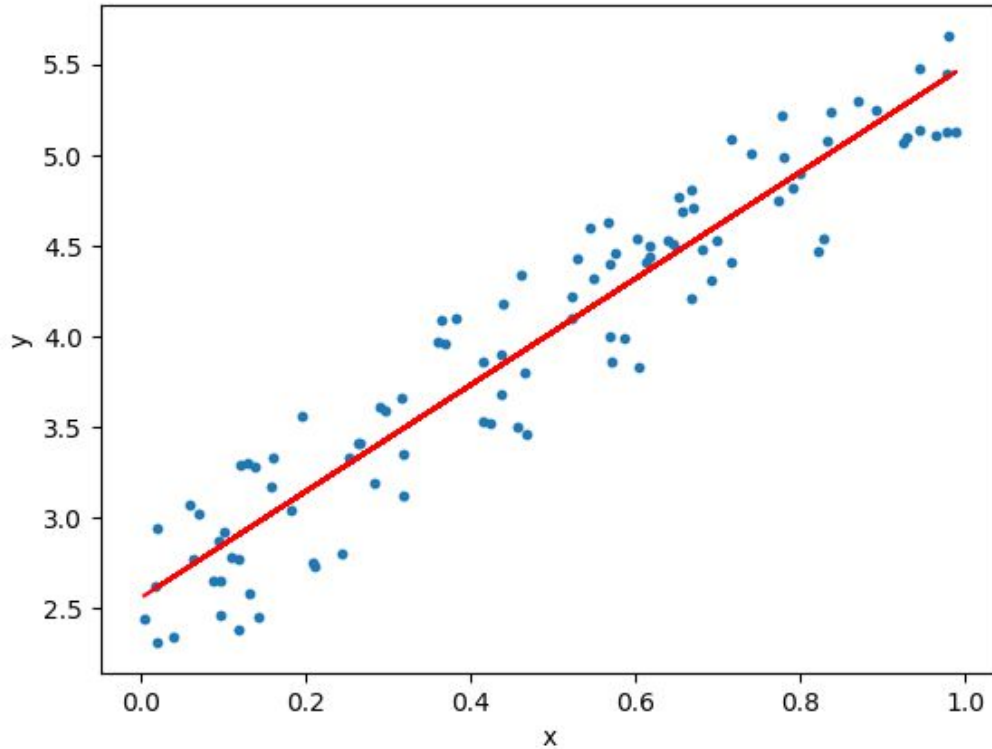
Unsupervised Learning

Clustering

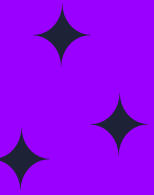
Dimensionality Reduction

Anomaly Detection



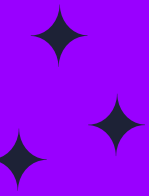


Linear Regression



Linear Regression is the fitting of a line;
 $y = mx + c$,
to a single
parameter-dependent data.
That's it.

But how is it done?





01

Hypothesis Function

The equation that we require to best fit to the data is called the hypothesis function. For linear regression, it is generally written as,

$$h(x) = \theta_0 + \theta_1 x$$



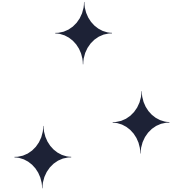


Mean Square Error Function(MSE)

02.

$$J(\theta) = \frac{1}{2m} \sum (h_{\theta}(x^{(i)}) - y^{(i)})^2$$

And Finally,



3.

GRADIENT DESCENT

Gradient Descent is an iterative algorithmic technique to find the minimum of an general n-th dimensional function.

Repeat until convergence

{

$$\theta_j := \theta_j - \alpha \frac{1}{m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)}) x_j^{(i)}$$

}



“

Talk is cheap, show me the
code”

– Linus Torvalds





Thank you!

Do you have any questions?

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