Extended Kalman Filter

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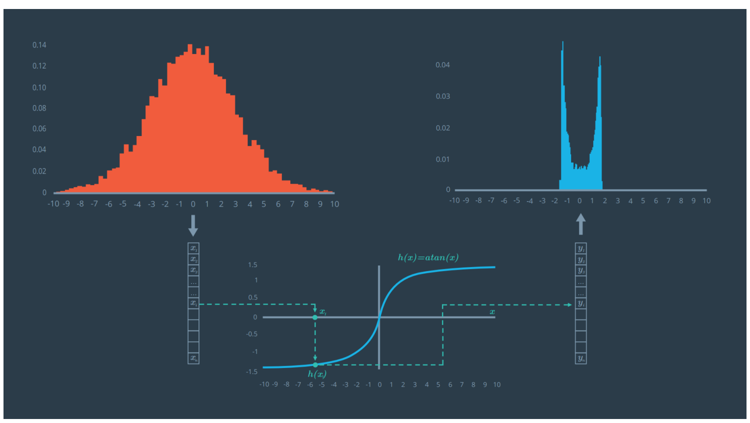
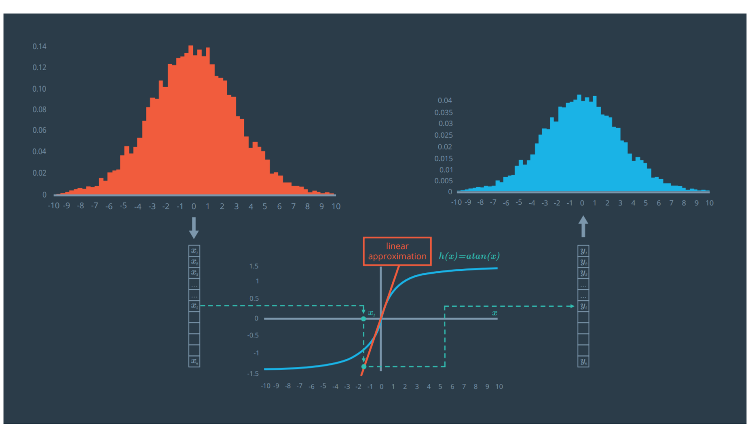


Follow the arrows from top left to bottom to top right: (1) A Gaussian from 10,000 random values in a normal distribution with a mean of 0. (2) Using a nonlinear function, arctan, to transform each value. (3) The resulting distribution.



How to Perform a Taylor Expansion

The general form of a **Taylor series expansion** of an equation, $f(x)$, at point μ is as follows:

$$f(x) \approx f(\mu) + \frac{\partial f(\mu)}{\partial x}(x - \mu)$$

Simply replace $f(x)$ with a given equation, find the partial derivative, and plug in the value μ to find the Taylor expansion at that value of μ.

See if you can find the Taylor expansion of $arctan(x)$.

Let's say we have a predicted state density described by

$\mu = 0$ and $\sigma = 3$.

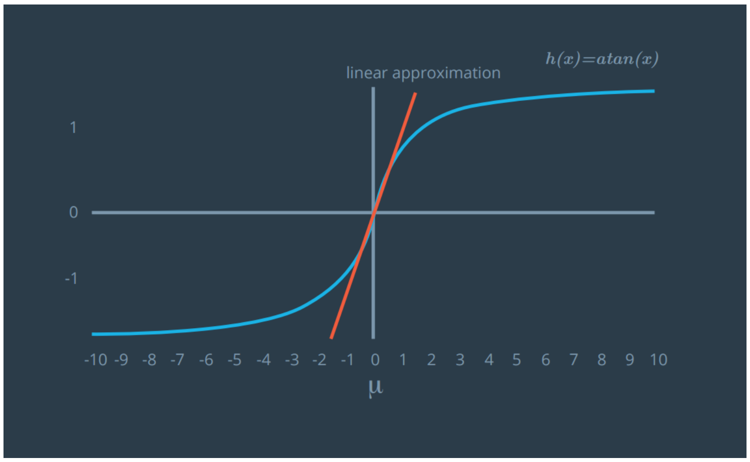
The function that projects the predicted state, x, to the measurement space z is

$h(x) = arctan(x)$.

and its partial derivative is

$\partial h = 1/(1 + x^2)$.

I want you to use the first order Taylor expansion to construct a linear approximation of $h(x)$ to find the equation of the line that linearizes the function $h(x)$ at the mean location μ.



The orange line represents the first order Taylor expansion of arctan(x). What is it?

A) $h(x) \approx x$

B) $h(x) \approx 1/(1 + x^2)$

C) $h(x) \approx x + arctan(x)$

D) $h(x) \approx 3 + x$

QUIZ QUESTION

Which of the above equations (↑) represents the first order Taylor expansion of arctan(x) around mu =