

Time Warping Model - A overview

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March 22, 2025

Consider the model:

$$y_x = f(x) + \varepsilon = A \sin(g(x) + b) + B \cos(2(g(x) + b) + \pi) + \varepsilon_x \quad (1)$$

with $\varepsilon \sim \mathcal{N}(0, \sigma^2)$. In particular, we assume that the signals have no trend and have constant amplitudes. Define the growth-time process $g(x) = \int_0^x \xi_t dt$ where ξ_x is a square-root diffusion process (CIR-process) fulfilling

$$d\xi_x = -\beta(\xi_x - a)dx + \omega\sqrt{\xi_x}dW_x \quad (2)$$

Since $\xi_x > 0$ we have that $g(x)$ is always increasing. When $g(x)$ is speeding up, i.e. $g''(x) > 0$, somatic growth of the teeth/tusk is slowing down.

EM algorithm - and why it won't work

The model depends on an unobserved stochastic process ξ_x .

SAEM algorithm