# Discretisation of Stochastic Differential Equations

The Euler-Maruyama method is a numerical technique used to approximate solutions to stochastic differential equations (SDEs). It is an extension of the Euler method for ordinary differential equations (ODEs) to include stochastic (random) components.

## Continuous-Time Model

Consider a general SDE of the form:

where: - $ X\_t $ is the state variable. - $ f(X\_t, t) $ is the drift term. - $ g(X\_t, t) $ is the diffusion term. - $ W\_t $ is a Wiener process (standard Brownian motion).

## Euler-Maruyama Discretisation

To discretize the SDE using the Euler-Maruyama method, we approximate the continuous-time process with discrete-time steps. Let $ t $ be the time step size, and let $ t\_n = n t $ for $ n = 0, 1, 2, $. The discretized version of the SDE is given by:

where $ Z\_n $ are independent standard normal random variables (i.e., $ Z\_n (0, 1) $) representing the increments of the Wiener process.