

*Stochastic B-series and order conditions for exponential integrators*

**Alemayehu Adugna Arara** (Hawassa University, Hawassa, Ethiopia), Kristian Debrabant, Anne Kværnø

We will discuss B-series for the solution of a stochastic differential equation of the form

$$dX(t) = \left( AX(t) + g_0(X(t)) \right) dt + \sum_{m=1}^M g_m(X(t)) \star dW_m(t), \quad X(0) = x_0,$$

for which the exact solution can be written as

$$X(t) = e^{tA}x_0 + \int_0^t e^{(t-s)A}g_0(X(s))ds + \sum_{m=1}^M \int_0^t e^{(t-s)A}g_m(X(s)) \star dW_m(s).$$

Based on this, we will derive an order theory for exponential integrators for such problems. The integral w. r. t. the Wiener process has to be interpreted e. g. as an Itô or a Stratonovich integral.

**References**

[1] <https://arxiv.org/pdf/1801.02051.pdf>