

## **Glucose-Insulin Dynamics: a grey-box analogy**

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Regulating plasma glucose levels for both type I and type II diabetic patients is a challenging task. Understanding the effects of meals taken, the physical exercises and stress levels will contribute significantly to the overall management of the plasma glucose levels. This paper provides an extension of the Bergman Minimal model to represent twelve-compartmental models associated with meals taken, physical exercises and stress levels interactions within a semi-closed loop system using Stochastic Differential Equations (SDE). The mathematical modelling is constructed following the Grey-box model analogy as applied on an identifiable patient. Obtained results from the study demonstrates the predictive capability of the model to be good and its sensitivity is enhanced with increased dataset.

**Keywords:** Glucose-Insulin dynamics; Plasma glucose levels; Stochastic differential equation; Bergman minimal model; Grey-box model.