

# Modeling cerebro-vascular autoregulation after postural change perturbations

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## Abstract:

Mathematical models of the cardiovascular system and of cerebral autoregulation (CAR) have been employed for several years in order to describe the time course of pressures and flows changes subsequent to postural changes. The assessment of the degree of efficiency of cerebral auto regulation has indeed importance in the prognosis of such conditions as cerebro-vascular accidents or Alzheimer. In the quest for a simple but realistic mathematical description of cardiovascular control, which may be fitted onto non-invasive experimental observations after postural changes, the present work proposes a first version of an empirical Stochastic Delay Differential Equations (SDDEs) model. The model consists of a total of four SDDEs and two ancillary algebraic equations, incorporates four distinct delayed controls from the brain onto different components of the circulation, and is able to accurately capture the time course of mean arterial pressure and cerebral blood flow velocity signals, reproducing observed auto-correlated error around the expected drift.