
CompartmentalSystems Documentation

Release 1

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CompartmentalSystems is a Python package to deal with compartmental models of the form

$$\frac{d}{dt} x(t) = B(x(t), t) x(t) + u(t).$$

Since most computations are based on the state transition operator Φ that solves

$$\frac{d}{dt} \Phi(t, s) = B(t) \Phi(t, s), \quad \Phi(s, s) = \mathbf{I},$$

nonlinear models need to be linearized in the first step. Then the package provides numerical computation of

- age
 - compartmental age densities
 - system age densities
 - compartmental age mean and higher order moments
 - system age mean and higher order moments
 - compartmental age quantiles
 - system age quantiles
- transit time
 - forward and backward transit time densities
 - backward transit time mean and higher order moments
 - forward and backward transit time quantiles

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1.1 CompartmentalSystems.smooth_reservoir_model

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1.2 CompartmentalSystems.smooth_model_run

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1.3 CompartmentalSystems.start_distributions

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CHAPTER 2

Jupyter notebook examples

- [Analysis of a nonlinear global carbon cycle model \(html\)](#) .
- `Analysis of a nonlinear global carbon cycle model (ipynb)`

CHAPTER 3

Important Note

$B(t) = (b_{ij}(t))$ is supposed to be a *compartmental matrix* for all times t :

- $b_{ii}(t) \leq 0$ for all i
 - $b_{ij}(t) \geq 0$ for $i \neq j$
 - $\sum_{i=1}^d b_{ij}(t) \leq 0$ for all j
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CHAPTER 4

Indices and tables

- `genindex`
- `modindex`
- `search`