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Moving patterns and underlying structures in noisy systems: a collection of topics on dynamics in stochastic infinite-dimensional equations

Bosch, M. van den

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Stellingen

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Moving Patterns and Underlying Structures in Noisy Systems

geschreven door

Mark van den Bosch

1. Physical systems are non-anticipative, i.e., they do not involve future states, whereas mathematical frameworks used to study them may contain forward-looking features. In these settings, the Itô framework is no longer adequate, necessitating alternative notions of stochastic integration. [Chapter 2]
2. Intriguingly, in the absence of a spectral gap—where the corresponding linear flow exhibits only algebraic decay—noise can nevertheless induce metastable behaviour that persists over exponentially long timescales. [Chapter 3]
3. The strength of existence results obtained via the Krylov–Bogoliubov method lies, for stochastic infinite-dimensional systems, in their numerical implementability and implications. Indeed, when numerical simulations reveal physically relevant finite-dimensional invariant measures, theory indicates that these are projections of an underlying infinite-dimensional structure. [Chapter 4]
4. While Pyragas control is renowned for stabilising unstable patterns and is often regarded as non-invasive time-delayed feedback, it can equally well destabilise stable patterns and give rise to entirely new (stable) structures. [Chapter 5]
5. Let β_1 and β_2 be two independent Brownian motions. While $\int_0^t \beta_1(s) d\beta_1(s)$ and $\int_0^t \beta_1(s) d\beta_2(s)$ do not share the same distribution, the p -th moments of their suprema up to time T do scale identically, both growing with the rate T^p .
6. Identities such as $\frac{1}{4} = \frac{3}{8} - \frac{1}{8}$, though elementary in appearance, may encode a delicate balance that is essential for closing mathematical arguments.
7. The number of times one might want to rehearse a talk or a lecture initially increases linearly with its duration, reaches a maximum around 10–15 minutes, and then decays exponentially to zero.

8. In contemporary society, mathematical researchers are increasingly expected to justify their work through direct applications; however, mathematics as a discipline must also preserve space for more philosophical pursuits.
9. Nowadays, a PhD candidate's role in the Netherlands is often reduced to the mere production of a dissertation, while it should centre on learning to defend ideas, communicate knowledge effectively, and foster personal development.
10. Education forms the foundation and serves as the building blocks for future generations; therefore, teaching ought to be more actively encouraged.
11. Good ideas are rare and often pop up at the most unexpected times and places.
12. Focusing on the negative things comes easily, whereas appreciating the good things often proves far more challenging.