

DSPDE2010: Topics for discussion on Friday, June 4

Strongly related, of course. The classification is somewhat arbitrary.

1. Topics

- Multiplicity of concepts of solution in PDE.
- Stochastic aspects of DS, ODE, PDE: Theory, applications, numerics.
- (Near) Hamiltonian systems: inhomogeneous/anisotropic diffusion, transport phenomena.
- Fast-slow dynamics, very different time scales, effective dimensions.
- The role of invariant manifolds, homoclinic phenomena.
- Appearance of singularities, blow-up.
- Finite time dynamics. Transients: tools, indicators, methods.
- Mathematics in Biology.
- Networks: suitability, algorithms

2. Tools

- Combine/distinguish qualitative \longleftrightarrow quantitative, formal \longleftrightarrow heuristics.
- Modeling: equations, parameters. Efforts to determine parameters by independent methods.
- Limits to predictability posed by lack of information (with or without chaos).
- Numerical methods: algorithms. Scientific computing tools. Complexity. Impact on hardware. How to be confident on numerical computations.
- Use of physically/geometrically-motivated aggregate quantities, like entropy, enthalpy, potentials, moments, averages, Lyapunov exponents,...
- Methods to extract information from high-dimensional data sets.
- Human \longleftrightarrow data interface.

3. Interrelations to stress

- DS \longleftrightarrow PDE.
- Approximation between theory and practice.
- Industrial applications with requirements different from scientific applications.

4. More general aspects: theoretical, didactic, etc

- Constructive theoretical results: sharp estimates of the domain of validity; reasons for the failure beyond that domain. Sharp estimates of errors.
- Prevalence vs genericity. Relevance of theoretical results. Which are the “most common cases” in applications?
- Separate high-quality ideas from long and laborious details.
- What should we teach to the students? Future professional issues? Computational finance? Scientific computing? Good background and ability to solve problems?