



CD Lab

Computational Dynamics Laboratory



Department of Mathematics, Computer Science and Physics
University of Udine

research

The CDLab develops, analyzes, implements and applies numerical methods for dynamical systems:

- typically infinite-dimensional systems arising from functional and abstract equations (delay, renewal, PDEs), modeling problems ranging from population dynamics to control engineering
- both direct and indirect methods for time integration and simulation, as well as for approximation of spectra and continuation in view of stability and bifurcation analyses, from equilibria to chaos.



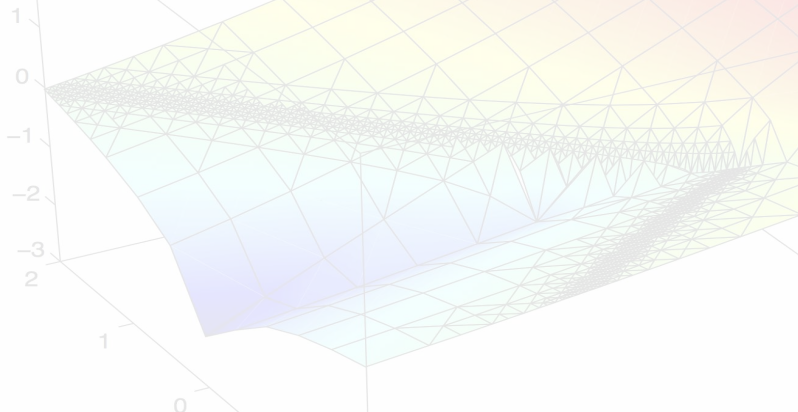
\bar{x}_1

\bar{x}_0

software

The CDLab pursues a continual development towards alternative solutions

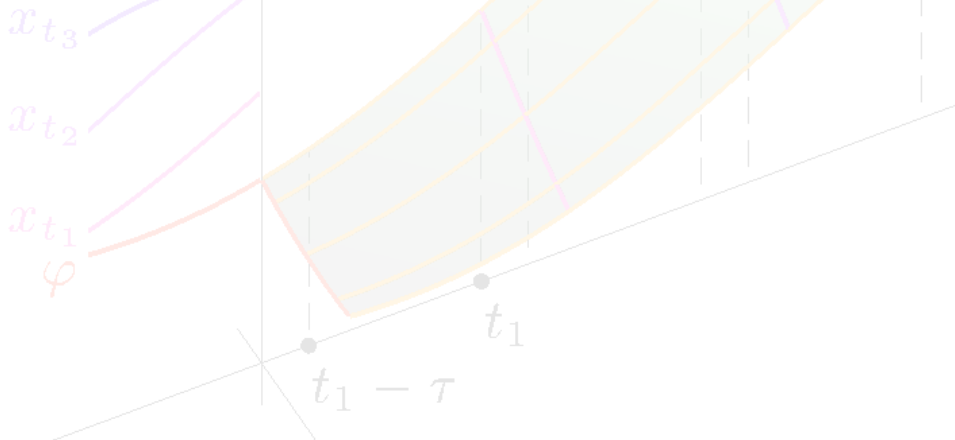
- with an eye on performance and user-friendliness
- devoted to those facing mathematical/dynamical/application challenges with no or little computational background
- using Matlab/Octave, Python, MatCont, DDE-BIFTOOL (Mathematica, GeoGebra, XPPAUT, etc.).



third mission

The CDLab also provides support in learning and training

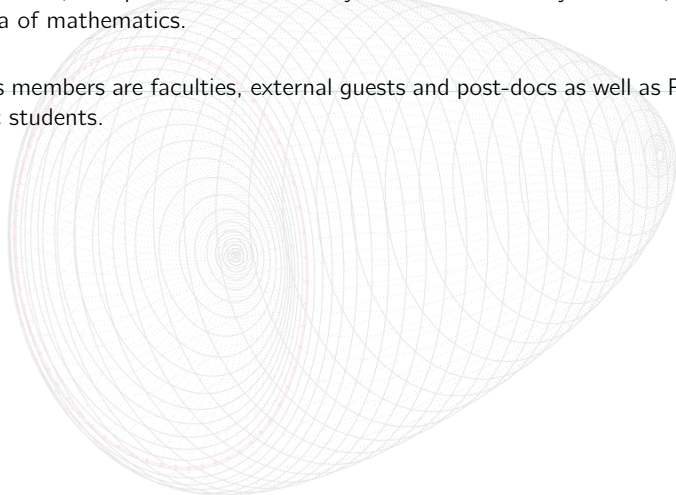
- mathematical software and methods
- to students, colleagues and researchers
- at universities, schools or non-academic, in a consolidated international network
- through theses, internships, Erasmus exchanges



where and who

Founded in 2017, the CDLab is an officially accredited laboratory of the Department of Mathematics, Computer Science and Physics of the University of Udine, the first in the area of mathematics.

Among its members are faculties, external guests and post-docs as well as PhD and MSc/BSc students.



some recent publications

- Ramirez, **Breda**, Sipahi, *A scalable approach to compute delay margin of a class of neutral-type time delay systems*, SIAM J. Control Optim.
- **Scarabel**, Pellis, Bragazzi, Wu, *Canada needs to rapidly escalate public health interventions for its COVID-19 mitigation strategies*, Infect. Dis. Model.
- **Vermiglio**, Zamolo, *Sensitivity analysis for stability of uncertain delay differential equations using polynomial chaos expansions*, Springer Adv. Delays Dyn.
- **Andò**, **Breda**, *Convergence analysis of collocation methods for computing periodic solutions of retarded functional differential equations*, SIAM J. Numer. Anal.
- **Breda**, Kuniya, Ripoll, **Vermiglio**, *Collocation of next-generation operators for computing the basic reproduction number of structured populations*, J. Sci. Comput.
- **Breda**, **Liessi**, *Approximation of eigenvalues of evolution operators for linear renewal equations*, SIAM J. Numer. Anal.
- Diekmann, **Scarabel**, **Vermiglio**, *Pseudospectral discretization of delay differential equations in sun-star formulation: Results and conjectures*, Discrete Contin. Dyn. Syst. Ser. S



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