Numerical Methods and Processes with applications to computational finance and machine learning

Location: University of Aveiro, Department of Mathematics, 23 (Room Sousa Pinto) and 24 (Room 11.1.3) February 2022.

Speaker: Dr. Daniel J. Duffy, dduffy@datasim.nl

No fees. Registration required (email to lakshtanov@ua.pt)

Summary: In this set of lectures we give a global overview of some mathematical and numerical methods for problems in finance and the relationship to machine learning. The coverage consists of five sessions, each session lasting 1 ½ to 2 hours over the two days in order to allow for interaction and discussion. It is also possible to propose and solve student exercises to keep the sessions lively and relevant to the audience!

Session 1: Background and Foundations

Session 2: Theory of Partial Differential Equations (PDEs)

Session 3: Numerical Solution of PDEs

Session 4: Applications to Computational Finance

Session 5: Other Applications (if time permits)

We consider some advanced research topics that should be of interest to a broad public. Some of the topics are: Sensitivity analysis for PDEs; financial 'greeks', Computing greeks: AAD, CSE, CSM and divided differences, The role of Machine Learning, Constrained and unconstrained optimization by ODE gradient systems.

Looking forward to meeting you.

About the Speaker

Daniel Duffy has BA (Mod), MSc and PhD degrees in pure, applied and numerical mathematics (University of Dublin, Trinity College) and he has been active in promoting partial differential equations (PDE) and the Finite Difference Method (FDM) for applications in computational finance. He was responsible for the introduction of the Fractional Step (Soviet Splitting) method and the Alternating Direction Explicit (ADE) method in computational finance. He is also the originator of the exponential fitting method for time-dependent partial differential equations.

Daniel Duffy has extensive experience in coaching, training and project supervision in both industry and academia. He has successfully supervised more than forty MSc/MFE projects in computational finance using C++ to implement PDE/FDM and Monte Carlo models.