Department of Numerical Analysis and Scientific Computing

Simula Research Laboratory

Oslo, Norway

Optimization in Oslo
A Seminar Series on Continuous Optimization

Date:
Wednesday November 8, 2023 at 14:00 (CET)

Speaker:
Prof. Juan Carlos De los Reyes
Escuela Politécnica Nacional de Ecuador

Title:
Bilevel learning for inverse problems

Abstract:
In recent years, novel ideas have been applied to several inverse problems in combination with machine learning approaches, to improve the inversion by optimally choosing different parameters of interest. A fruitful approach in this sense is bilevel optimization, where the inverse problems are considered as lower-level constraints, while on the upper-level a loss function based on a training set is used. When confronted with inverse problems with sparsity-based regularizers or nonlinear dynamics, however, the bilevel optimization problem structure becomes quite involved, and classical nonlinear or bilevel programming results cannot be directly utilized.
In this talk, I will present the general setting of bilevel inverse problems and discuss the main theoretical challenges, as well as the applicability to relevant practical instances. Particular attention will be paid to imaging problems with sparsity-based regularizers and nonlinear inverse problems arising in variational data assimilation. The main difficulties related to the reformulation as single level problems, the derivation of optimality conditions and the numerical solution will be addressed.

Brief Bio:

Dr. De los Reyes is Founding Director of the Ecuadorian Research Center for Mathematical Modeling (MODEMAT) and Professor of Mathematical Optimization at Escuela Politécnica Nacional de Ecuador. He obtained his

PhD in 2003 at the University of Graz, Austria, and worked as postdoctoral researcher at the Technical University of Berlin (2005-2006). In 2009 he was awarded an Alexander von Humboldt Fellowship for Experienced Researchers to carry out research in Germany, and in 2010 he was awarded a J.T. Oden Faculty Fellowship at The University of Texas at Austin. He has held Visiting Professor positions at the Humboldt University of Berlin (2010), the University of Hamburg (2013) and the Weierstrass Institute of Berlin (2021). From 2019 to 2021 he was appointed Director of Research of Escuela Politécnica Nacional de Ecuador. He is former President of the Ecuadorian Mathematical Society (2012-2014), member of the Ecuadorian Academy of Sciences (since 2015), and Fellow of TWAS (since 2016). Dr. De los Reyes has served as member of organizing committees of various academic events, and has promoted the creation and strengthening of scientific networks in Latin-America.