"Analysis and Applied Mathematics"
Weekly Online Seminar

Seminar leaders:
Prof. Allaberen Ashyralyev (BAU, Istanbul),
Prof. Michael Ruzhansky (UGent, Ghent),
Prof. Makhmud Sadybekov (IMMM, Almaty)

Date: **Tuesday, February 15, 2022**
Time: 13.00-14.00 (Istanbul) = 11.00-12.00 (Ghent) = 16.00-17.00 (Almaty)

Zoom link: https://us02web.zoom.us/j/6678270445?pwd=SFNmQUIvT0tRaH-lDaVYrN3l5bzJVQT09, **Conference ID:** 667 827 0445, **Access code:** 1

Speaker:
Prof. Dr. Gerhard-Wilhelm Weber
Poznan University of Technology, Poznan, Poland

Title: **Alzheimer's disease: new approach for early indication by Voxel-(C)MARS – Mathematics and OR in big-data of us humans**

Abstract: In the first part of this lecture, we will tell in a "nutshell" where Inverse Problems come from, what they are and how they are approached. We will do this by a few questions from different beautiful areas of life. The main and second part of this lecture will demonstrate a powerful application of the Theory of Inverse Problems along with advanced Statistics, Data Science, Machine Learning, Operational Research, Artificial Intelligence, Biomedical Engineering, Neuroscience and its Big-Data, namely for an improved "early indication" of the dementia disease which we call as "Alzheimer's". We shall present some quite diverse views on this dangerous illness. The methods of MARS and our own version of CMARS, notably by addressing the units of "Voxels" in the brain, have led to very good results. In the third part of this lecture we will shortly move from human brain to heart and discuss our selected problem of medical imaging there as well. For both brain and heart we will look at the inverse and the corresponding forward problem of "generation". We shall pursue and overcome this dichotomy in our lastly mentioned challenge, namely how mathematics, algorithms and computational machines can support us in the creation of art. We shall mainly refer to the "Marbling Arts", notably "Ebru". With our lecture we strive to create "appetite" in order to study more, to study and find out more, to create and invent more, and to collaborate and enjoy together more. During the lecture we shall discuss some newest models in physics and biology, cosmology and generalized space-time research, with beauty and wonders of the smallest and the biggest and including the "spirit". For our whole agenda we will need you - our friends and the young generation.

Biography:

Gerhard-Wilhelm Weber is a Professor at Poznan University of Technology, Poznan, Poland, at Faculty of Engineering Management. His research is on mathematics, statistics, operational research, data science, machine learning, finance, economics, optimization, optimal control, management, neuro-, bio- and earth-sciences, medicine, logistics, development, cosmology and generalized space-time research. He is involved in the organization of scientific life internationally. He received Diploma and Doctorate in Mathematics, and Economics / Business Administration, at RWTH Aachen, and Habilitation at TU Darmstadt (Germany). He replaced Professorships at University of Cologne, and TU Chemnitz, Germany. At Institute of Applied Mathematics, Middle East Technical University, Ankara, Turkey, he was a Professor in Financial Mathematics and Scientific Computing, Assistant to the Director, and has been a member of five further graduate schools, institutes and departments of METU. G.-W. Weber has affiliations at Universities of Siegen (Germany), Federation University (Ballarat, Australia), University of Aveiro (Portugal), University of North Sumatra (Medan, Indonesia), Malaysia University of Technology, Chinese University of Hong Kong, KTO Karatay University (Konya, Turkey), Vidyasagar University (Midnapore, India), Mazandaran University of Science and Technology (Babol, Iran), Istinye University (Istanbul, Turkey), Georgian International Academy of Sciences, at EURO (Association of European OR Societies) where he is "Advisor to EURO Conferences" and honorary chair of some EURO working groups, and IFORS (International Federation of OR Societies) where he is member in many national OR societies, subeditor of IFORS Newsletter and member of IFORS Developing Countries Committee, he is member of Pacific Optimization Research Activity Group, etc. G.-W. Weber has supervised many MSc. and PhD. students, authored and edited numerous books and articles, and given many presentations from a diversity of areas, in theory, methods and practice. He has been a member of many international editorial, special issue and award boards; he participated at numerous research projects; he received various recognitions by students, universities, conferences and scientific organizations. G.-W. Weber is an IFORS Fellow.