1145-65-151 **Ugur Abdulla**, **Vladislav Bukshtynov** and **Ali Hagverdiyev***
(ahaqverdiyev2011@my.fit.edu), 300 Cornell Ave, Melbourne, FL 32901. *Gradient Method in Hilbert-Besov Spaces for the Optimal Control of Parabolic Free Boundary Problems.*

In this presentation I will talk about computational analysis of the inverse Stefan type free boundary problem, where information on the boundary heat flux is missing and must be found along with the temperature and the free boundary. We pursue optimal control framework introduced in *U.G. Abdulla, Inverse Problems and Imaging, 7, 2(2013), 307-340; 10, 4(2016), 869–898*, where boundary heat flux and free boundary are components of the control vector, and optimality criteria consist of the minimization of the quadratic declinations from the available measurements of the temperature distribution at the final moment, phase transition temperature on the free boundary, and the final position of the free boundary. We develop gradient descent algorithm based on Frechet differentiability in Hilbert-Besov spaces complemented with preconditioning of the Frechet gradient through implementation of the Riesz representation theorem. Five model examples with various levels of complexity are considered. Extensive comparative analysis through implementation of preconditioning and Tikhonov regularization, calibration of preconditioning and regularization parameters, effect of noisy data, comparison of simultaneous identification of control parameters vs. nested optimization is pursued. (Received August 09, 2018)