

## Topic / title of Dissertation:

- *Nonsmooth Optimization and Machine Learning*

## Instructor(s), supervisor, sources of funding

- Supervisors: Napsu Karmitsa and Tapio Pahikkala
- Funding: Tensor Learning for Biomedicine project, MATTI

## Key research questions, expected contribution

- Utilize NSO methods in the framework of ML problems, and vice versa
  - I am currently working on improving the prediction accuracy of the drug-target interaction prediction problem via NSO method called *Variable Metric Bundle Method with Limited Memory (LMBM)*
- Benefit from ML ideologies (tex. early stopping) and techniques (tex. vec trick) for improving practical performance of NSO methods
- Early stopping with penalty functions could open doors also for more general research in constraint handling of NSO methods
- Combine NSO methods with deep learning models

## Published papers and manuscripts:

- Napsu Karmita, Sona Taheri, Adil M. Bagirov, Pauliina Mäkinen:  
*Missing Value Imputation via Nonsmooth Clusterwise Linear Regression.*  
Revision submitted to Transactions on Knowledge and Data  
Engineering 28.02.2019

Working on it...

## Plans towards completion:

- Finish the article about the effects of using LMBM as the optimization method in the drug-target interaction prediction problem
- Explore the possibilities of using LMBM in the framework of deep learning (ANNs suffer from difficulties in defining the descent direction and choosing an optimal step size)
- Explore the possibilities of solving constrained optimization problem (tex. related to drug-target interactions) with LMBM via case specific penalty functions