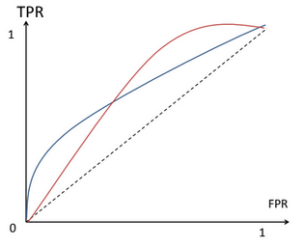
Theoretical task 5.

Recommendations: all solutions should be short, mathematically strict (unless qualitative explanation is needed), precise with respect to the stated question and clearly written. Solutions may be submitted in any readable format, including images.

1. *The bank B in the country X loans money to people. The bank uses machine learning to predict reliability of borrowers (a classifier that predicts reliability based on a form filled in by the borrower). In the country X economic crises occur from time to time. In the period of crisis the bank minimizes the risks granting loans only to the most reliable people based on their classifier. On the contrary, when the economy is growing, the bank can act in a more risky manner and give credits to more people with lower reliability. The figure below depicts ROC-curves of two classifiers with equal AUC. Which one should the bank use in the time of a crisis?*



2. *Imagine the binary classification problem. On a big enough test set classifier a_1 has 90% of errors, and classifier a_2 – 50%. Explain, why classifier a_1 can be more useful than a_2?*

3. *Find the computational complexity of the linear and kernel SVM* ***prediction*** *procedure for a single object (SVM is already trained).*

4. *Consider SVM regression optimization problem. Write down dual formulation of that problem with Lagrangian and Karush-Kuhn-Takker theorem.*