Theoretical Machine Learning - COS 511

Homework Assignment 6

Due Date: 21 Apr 2015, till 22:00

(1) Consulting other students from this course is allowed. In this case - clearly state whom you consulted with for each problem separately.

(2) Searching the internet or literature for solutions, other than the course lecture notes, is NOT allowed.

Ex. 1:
Show that the set $\mathcal{K}_\delta$ is convex.

Ex. 2:
Show that for any point $x \in \mathcal{K}_\delta$, the ball of radius $\delta$ centered at $x$ is contained in $\mathcal{K}$.

Ex. 3:
Describe a boosting algorithm based on the Online Gradient Descent algorithm. Give a bound on its running time.

Choose one of the following two questions. Solving both = extra credit

Ex. 4:
Consider the BCO setting with $H$-strongly convex functions. Show that in this case we can attain a regret rate of $\tilde{O}(T^{2/3})$.

Hint: recall that we can attain a rate of $O(\log T)$ in the full-information OCO with $H$-strongly convex functions.

Ex. 5:
Spell out an algorithm for online routing based on the BCO technology we have seen in class. That is - write down the setting, input and output, and goal.

Write down how to model this as BCO including decision set and cost function description, as well as feedback.
Write a pseudo code for routing in oblivious congestion networks, with bandit feedback (end-to-end length only). Include explanation on all components (i.e. flow-decomposition).