

**Algorithms for Big Data**

Fall Semester 2019

**Exercise Set 11****Exercise 1:**

Show  $\Omega(n)$  lowerbound for number of edges algorithm has to "touch" to solve  $(1 \pm \varepsilon)$  multiplicative approximation for estimating number of connected components.

**Exercise 2:**

Let  $G_1, G_2, \dots, G_w$  be unweighted graphs such that:  $e \in G_i$  iff  $w(e) \leq i$ . Denote by  $K_i$  the number of connected components of  $G_i$ . Show that weight of MST satisfies

$$w(\text{MST}) = (n - 1) + \sum_{i=1}^{w-1} (K_i - 1)$$

**Exercise 3:**

Why does rounding weights of the input graph to nearest full power of  $(1 \pm \varepsilon)$  does not provide any significant speed-up for cell-probe MST algorithm?