A remark on tutorial class 3
Date: 16.Feb 2017

In the tutorial class 3, I made a mistake as follows.

$$\begin{aligned}\|Ax\|_{l^1} &= \sum_i |\sum_j a_{ij}x_j| \le \sum_i \sum_j |a_{ij}||x_j| \\ &\le \sum_i (\sup_j |a_{ij}|) \sum_j |x_j| \le \sum_i (\sup_j |a_{ij}|)\|x\|_{l^1} \\ &\le (\sup_j \sum_i |a_{ij}|)\|x\|_{l^1}.\end{aligned}$$

Here the last inequality is wrong because we have a counterexample:
Let

$$A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix},$$

then

$$\sum_i (\sup_j |a_{ij}|) = 2,$$

but

$$\sup_j \sum_i |a_{ij}| = 1.$$

The right argument is that

$$\begin{aligned}\|Ax\|_{l^1} &= \sum_i |\sum_j a_{ij}x_j| \le \sum_i \sum_j |a_{ij}||x_j| \\ &\le \sum_j \sum_i |a_{ij}||x_j| \quad \text{(Change the order of summation)} \\ &\le \sum_j |x_j|(\sum_i |a_{ij}|) \\ &\le \sum_j |x_j|(\sup_j \sum_i |a_{ij}|) \\ &\le (\sup_j \sum_i |a_{ij}|)\|x\|_{l^1}.\end{aligned}$$

I am very sorry for the confusion brought to you.