Correction: Definition of Local Sensitivity at Distance k

The L_1 *local sensitivity* of a function f on database X is the maximum L_1 norm of the difference between $f(X)$ and $f(Y)$, where Y is a neighbor of X:

$$LS_f(X) = \max_{Y:d(X,Y)\leq 1} \|f(X) - f(Y)\|_1$$

In contrast to global sensitivity, the max in this case is taken over Y *only*, with X fixed to the *true database* (the actual data over which you're running the query).

The *local sensitivity at distance* k is defined as:

$$A_f^k(X) = \max_{X':d(X,X')\leq k} LS_f(X')$$

Expanding the definition, this is equivalent to:

$$A_f^k(X) = \max_{X':d(X,X')\leq k} \quad \max_{Y:d(X',Y)\leq 1} \|f(X') - f(Y)\|_1$$

Note: the definition given in class was not correct (it was missing the second max**).**

For a complete definition, see Nissim et al. [1], Definition 3.1.

References

[1] K. Nissim, S. Raskhodnikova, and A. Smith. Smooth sensitivity and sampling in private data analysis. 2011. Draft Full Version, v1.0. `http://www.cse.psu.edu/~ads22/pubs/NRS07/NRS07-full-draft-v1.pdf`.