Receiving the Top Coordinate

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$$\Pr[\text{Not receiving } i^*] = \prod_j \left(1 - \frac{\mathbf{e}_{i^*}^{-1} x_{i^*}(j)^p}{\sum_i \mathbf{e}_i^{-1} x_i(j)^p} \right)^{O(s^{p-2} \cdot \log^3 n)}$$

$$\leq \exp\left(-s^{p-2}\log^3 n \sum_j \frac{\mathbf{e}_{i^*}^{-1} x_{i^*}(j)^p}{\sum_i \mathbf{e}_i^{-1} x_i(j)^p}\right)$$

$$\leq \exp\left(-s^{p-2}\log^3 n \cdot \frac{\mathbf{e}_{i^*}^{-1}\left(\sum_j x_{i^*}(j)^{p/2}\right)^2}{\sum_j \sum_i \mathbf{e}_i^{-1} x_i(j)^p}\right)$$

$$(1 - x \leq \exp(-x))$$

$$\left(\sum_i \frac{a_i}{b_i} \geq \frac{(\sum_i \sqrt{a_i})^2}{\sum_i b_i} \right)$$

Receiving the Top Coordinate

$$\Pr[\text{Not receiving } i^*] = \prod_j \left(1 - \frac{\mathbf{e}_{i^*}^{-1} x_{i^*}(j)^p}{\sum_i \mathbf{e}_i^{-1} x_i(j)^p}\right)^{O(s^{p-2} \cdot \log^3 n)}$$

$$\leq \exp\left(-s^{p-2} \log^3 n \sum_j \frac{\mathbf{e}_{i^*}^{-1} x_{i^*}(j)^p}{\sum_i \mathbf{e}_i^{-1} x_i(j)^p}\right) \qquad (1 - x \leq \exp(-x))$$

$$\leq \exp\left(-s^{p-2} \log^3 n \cdot \frac{\mathbf{e}_{i^*}^{-1} \left(\sum_j x_{i^*}(j)^{p/2}\right)^2}{\sum_j \sum_i \mathbf{e}_i^{-1} x_i(j)^p}\right) \qquad \left(\sum_i \frac{a_i}{b_i} \geq \frac{\left(\sum_i \sqrt{a_i}\right)^2}{\sum_i b_i}\right)$$

Receiving the Top Coordinate (Contd.)

$$\leq \exp\left(-s^{p-2}\log^3 n \cdot \frac{\mathbf{e}_{i^*}^{-1}(\sum_j x_{i^*}(j)^{p/2})^2}{\sum_j \sum_i \mathbf{e}_i^{-1} x_i(j)^p}\right)$$