Fourmlas Sheet.

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Probability.

Multiplicative Chernoff bound. Suppose $X_1, ..., X_n$ are independence random variables taking values in $\{0, 1\}$ Let X denote their sum and let $\mu = \mathbf{E}\left[\sum X_i\right]$ denote the sum's expected value. Then for any $\delta > 0$:

$$\mathbf{Pr}\left[X \geq (1+\delta)\,\mu\right] \leq e^{-2\frac{\delta^2\mu^2}{n}} \mathbf{Pr}\left[|X-\mu| \geq \delta\mu\right] \leq 2e^{-\delta^2\mu/3}, \qquad 0 \leq \delta \leq 1$$