

A SUPPLEMENTARY MATERIAL

A.1 Proof of Lem. 7

Proof. We follow equivalency of the following inequalities,

$$\begin{aligned}
 m - \frac{1}{\gamma}D &\leq \frac{1}{\gamma}\sqrt{A(B + mC)} \\
 m^2 - \frac{2}{\gamma}mD + \frac{1}{\gamma^2}D^2 &\leq \frac{1}{\gamma^2}A(B + mC) \\
 m^2 - \left(\frac{2}{\gamma}D + \frac{1}{\gamma^2}AC\right)m + \frac{1}{\gamma^2}D^2 - \frac{1}{\gamma^2}AB &\leq 0 \\
 m &\leq \left(\frac{2}{\gamma}D + \frac{1}{\gamma^2}AC\right. \\
 &\quad \left. + \sqrt{\left(\frac{2}{\gamma}D + \frac{1}{\gamma^2}AC\right)^2 - 4\left(\frac{1}{\gamma^2}D^2 - \frac{1}{\gamma^2}AB\right)}\right)/2 \\
 &= \frac{1}{\gamma}D + \frac{1}{2\gamma^2}AC \\
 &\quad + \frac{1}{\gamma}\sqrt{\frac{1}{\gamma}DAC + \frac{1}{4\gamma^2}(AC)^2 + AB}.
 \end{aligned}$$

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