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Homework #5 Problem 1

$$\sum h_{ii} = \text{trace}(H)$$

$$= \text{tr}(X(X'X)^{-1}X') \longrightarrow \text{tr}(AB) = \text{tr}(BA)$$

$$= \text{tr}(X'X \cdot (X'X)^{-1}) \longrightarrow \text{if } X \text{ is dimension } (n \times p) \text{ then}$$

$X'X$ is dimension $(p \times p)$ and therefore

$(X'X) \cdot (X'X)^{-1}$ is I_p (identity matrix)

$$= \text{tr}(I_p)$$

$$\underline{\underline{\sum h_{ii} = p}}$$

$$\therefore \underline{\underline{\frac{1}{n} \cdot \sum h_{ii} = \frac{p}{n}}}$$