$$\text{Score} = \sum_f w_f \left(\frac{\sum_i |g_{f,i} - \hat{g}_{f,i}|}{\sum_i \hat{g}_{f,i}} \right)$$

$\text{Score} = \text{Score}_{S_1} + \text{Score}_{S_2}$

$\text{Score}_{S_1} = fc$

$\text{Score}_{S_2} = gc'$

6 eqs.

$f = \dfrac{S_1}{S_1 + S_2}$

$g = \dfrac{S_2}{S_1 + S_2}$

$fc + gc' = 0.159$

$fc + g\varepsilon_2 = 0.304$

$f\varepsilon_1 + gc' = a = 0.854$

$f\varepsilon_1 + g\varepsilon_2 = b = 1.000$

$f + g = 1$

$S_1 + S_2 = 2821$

$1 < S_2 < 510$

f : % of site 1

g : % of site 2

ε_1 = preds are set to 0 for S_1

ε_2 = preds are set to 0 for S_2

S_1 : # of site 1

S_2 : # of site 2

c : unweighted Score for S_1

c' : unweighted Score for S_2

2821 : 48% of test set comprising public LB

Put everything in terms of S_2, since that is what we are trying to solve for

$$S_1 + S_2 = 2821$$

$$S_1 = 2821 - S_2$$

$$f = \frac{S_1}{S_1 + S_2}$$

$$f = \frac{2821 - S_2}{2821 - S_2 + S_2}$$

$$f = \frac{2821 - S_2}{2821}$$

$$f = 1 - \frac{S_2}{2821}$$

$$g = \frac{S_2}{2821 - S_2 + S_2} = \frac{S_2}{2821}$$

Rewrite 4 leaderboard equations

$$fc + gc' = 0.159$$

$$fc + g\varepsilon_2 = 0.304$$

$$f\varepsilon_1 + gc' = 0.854$$

$$f\varepsilon_1 + g\varepsilon_2 = 1$$

$$x = fc$$

$$y = gc'$$

$$w = f\varepsilon_1$$

$$z = g\varepsilon_2$$

$\longrightarrow$

$$x + y = 0.159$$

$$x + z = 0.304$$

$$w + y = 0.854$$

$$w + z = 1$$

matrix solver

$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0.159 \\ 0.304 \\ 0.854 \\ 1 \end{bmatrix}$$

Substitution to solve for f & g.

recall f & g are both in terms of site 2.

$$\boxed{f = 1 - \frac{S_2}{2821}} \qquad \boxed{g = \frac{S_2}{2821}} \qquad f = 1 - g$$

$$x = fc = \left(1 - \frac{S_2}{2821}\right)c \qquad ; \quad y = gc' = \frac{S_2}{2821}c'$$

$$fc + gc' = 0.159 \qquad \text{①}$$
$$fc + g\varepsilon_2 = 0.304 \qquad \text{④}$$
$$f\varepsilon_1 + gc' = a \qquad \text{③}$$
$$f\varepsilon_1 + g\varepsilon_2 = b \qquad \text{②}$$

$$1 < S_2 < 510$$

5 eqs   5 unknowns

f & g

c

c'

ε_1

ε_2