The Stacking Scheme

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Say we obtain the following results, using three different estimators:

Estimator	Performance	Prediction
Method 1	ρ_1	$\vec{y}_1$
Method 2	ρ_2	$\vec{y}_2$
Method 3	ρ_3	$\vec{y}_3$

We define the performance metric[1] in such a way that the smaller the metric ρ_i, the better the performance. Candidates for ρ_i may include

$$\text{RMSE}, \quad 1 - R^2, \quad \frac{\text{RMSE}}{R^2}, \quad \ldots$$

Since a better performance is indicated by a lower estimated RMSE ρ_i, we propose the following stacking scheme, which gives more weights to better performing estimators:

$$\vec{y}_{\text{Stacked}} = \frac{1}{2}\left[\left(1 - \frac{\rho_1}{s}\right)\vec{y}_1 + \left(1 - \frac{\rho_2}{s}\right)\vec{y}_2 + \left(1 - \frac{\rho_3}{s}\right)\vec{y}_3\right] \tag{1}$$

where

$$s = \rho_1 + \rho_2 + \rho_3.$$

Check: suppose under the rarest situation[2] that

$$\vec{y}_1 = \vec{y}_2 = \vec{y}_3 = \vec{y}_{\text{Test}}$$

then by (1)

$$\begin{aligned} \vec{y}_{\text{Stacked}} &= \frac{1}{2}\left(3 - \frac{\rho_1 + \rho_2 + \rho_3}{s}\right)\vec{y}_{\text{Test}} \\ &= \vec{y}_{\text{Test}} \end{aligned}$$

which is the desired result.

[1] The metric is computed from simulated validation tests.
[2] It is possible although improbable.