

# LightGBM Interpolation and IDW - 大阪府 - 2025/5/12 19H

LightGBM + IDW Interpolation

$$\hat{Z}(x) = \hat{Z}_{LGBM}(x) + \frac{\sum_{i=1}^N \hat{Z}_{LGBM}(x_i)}{\sum_{i=1}^N \frac{1}{d(x, x_i)^p}}$$

$\hat{Z}(x)$  : Final estimated  $O_x$  at location  $x$

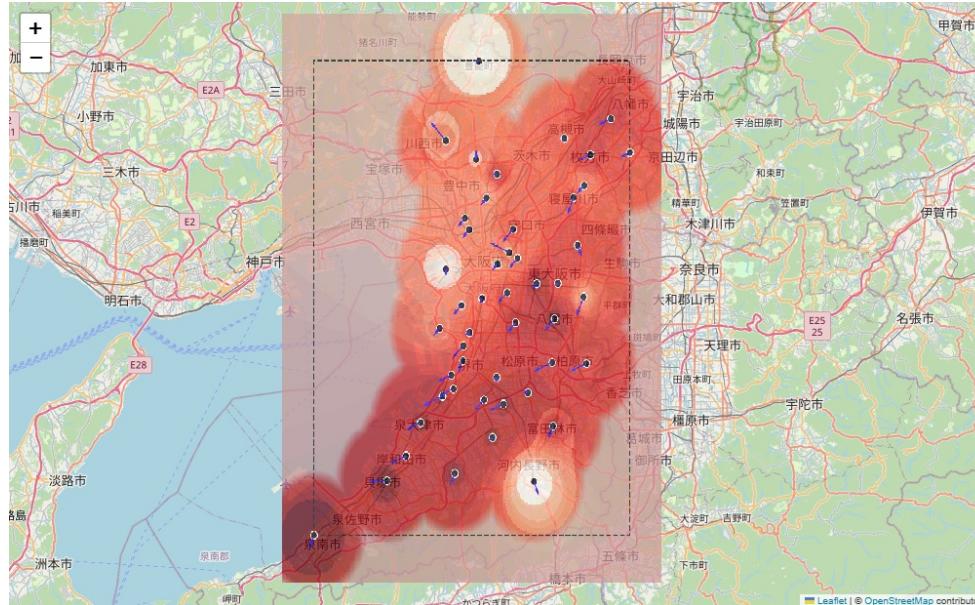
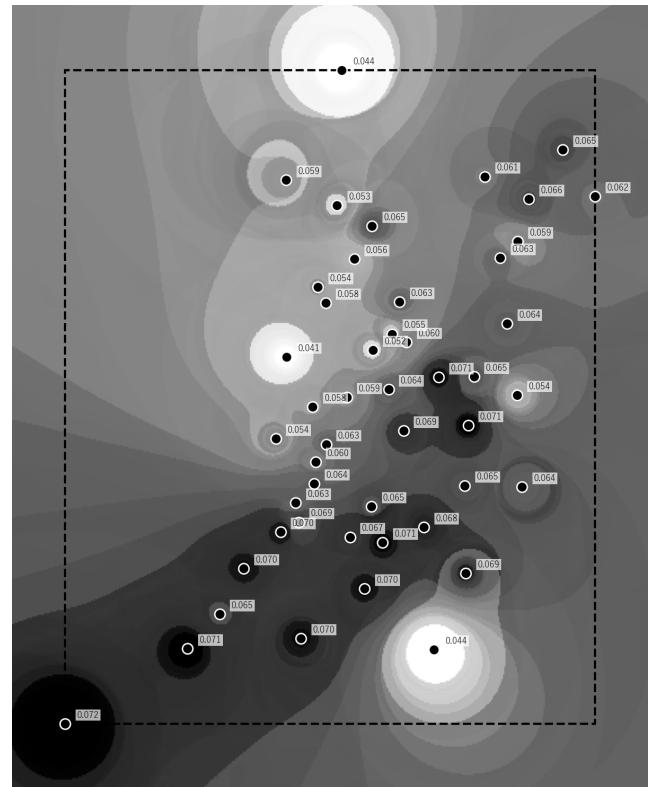
$\hat{Z}_{LGBM}(x)$  : LightGBM prediction at location  $x$

$x_i$  : Monitoring station locations

$d(x, x_i)$  : Distance between point  $x$  and station  $i$  (km)

$p$  : IDW power parameter (commonly 1 ~ 3, here  $p = 2$ )

The second term is the spatial interpolation (IDW) applied to the LightGBM predictions to add spatial smoothness.



| RMSE    | MAE     | R <sup>2</sup> |
|---------|---------|----------------|
| 0.00309 | 0.00210 | 0.822          |

