Hawker Opportunity Score

We compute an opportunity score H_i for each location i (e.g. a sub-zone or grid cell). The score balances three factors: population demand, hawker supply, and accessibility.

(1) Smoothed Demand

$$\text{Dem}_i = \sum_u P_u \, K_{\lambda_D}(d_{ui})$$

- i: the analysis location (where we evaluate the opportunity).
- u: a demand point (population centroid).
- P_u: resident population at location u.
- d_{ui}: distance between the population centroid u and the location of the analysis i.
- $K_{\lambda_D}(\cdot)$: kernel function with bandwidth λ_D (e.g. Gaussian or exponential).

Interpretation: Locations close to large populations will have higher demand.

(2) Competing-Adjusted Supply

$$\text{Sup}_i = \sum_j \left(\frac{C_j}{\sum_u P_u \, K_{\lambda_C}(d_{uj})} \right) K_{\lambda_S}(d_{ji})$$

- j: a hawker center.
- C_j: capacity of the hawker center j (e.g. number of stalls; or set to 1 if unknown).
- d_{uj}: distance between the demand centroid u and the hawker center j.
- $\sum_u P_u K_{\lambda_C}(d_{uj})$: effective demand served by the hawker center j.
- d_{ji}: distance between the hawker center j and the location of the analysis i.
- $K_{\lambda_S}(\cdot)$: kernel with bandwidth λ_S.

Interpretation: Hawker supply is weighted down if it already faces high surrounding demand. This avoids overstating supply in saturated areas.

(3) Accessibility

$$\mathrm{Acc}_i = \beta_{\mathrm{MRT}} \sum_m w_m K_{\lambda_M}(d_{mi}) + \beta_{\mathrm{BUS}} \sum_b w_b K_{\lambda_B}(d_{bi})$$

- m: MRT stations, b: bus stops/interchanges.
- w_m, w_b: weights (e.g. number of lines or service frequency; default = 1).
- d_{mi}, d_{bi}: distances from MRT/bus to location i.
- $K_{\lambda_M}, K_{\lambda_B}$: kernels for MRT and bus proximity.
- $\beta_{\mathrm{MRT}}, \beta_{\mathrm{BUS}}$: importance weights for MRT vs bus access.

Interpretation: Locations near public transport receive a higher accessibility score.

(4) Combined Opportunity Score

We standardize each component using a robust z-score $Z(\cdot)$ so that scales are comparable. The final Hawker Opportunity Score is:

$$\begin{cases} H_i = w_D\, Z(\mathrm{Dem}_i) - w_S\, Z(\mathrm{Sup}_i) + w_A\, Z(\mathrm{Acc}_i), \\ w_D + w_S + w_A = 1 \end{cases}$$

- w_D, w_S, w_A: weights controlling the importance of demand, supply, and accessibility.
- Suggested defaults: $w_D = 0.5,\ w_S = 0.3,\ w_A = 0.2$.

Interpretation: A high H_i indicates strong population demand, limited hawker supply, and good accessibility, making it a promising candidate region for a new hawker center.