Appendix A: Notation

Table 1 List of recurrent variables.

$\tau \in \mathcal{T}$, Δt	time
$\mathcal{G} = (\mathcal{N}, \mathcal{L})$, $\mathcal{C} \subset \mathcal{N}$	graph, centroids
$\nu \in \mathcal{N}$, $\lambda \in \mathcal{L}$, $\alpha \in \mathcal{A}$	node, link, area
$\rho = (\lambda_1, \lambda_2, \dots)$, $\rho \in \mathcal{R}$	route
$\kappa \in \mathcal{K}$	OD pair
$\zeta \in \mathcal{Z}$, t_ζ^{arr}, t_ζ^{dep}	train, arrival and departure time
$\pi \in \mathcal{P}$	platform
$\boldsymbol{d} = [d_{\kappa,\tau}]$	demand
$\boldsymbol{f} = [f_{\lambda,\tau}]$	flow
$\boldsymbol{a} = [a_{\alpha,\tau}]$	accumulation
$\boldsymbol{e}_{\text{on}} = [e_\zeta^{\text{on}}]$, $\boldsymbol{e}_{\text{off}} = [e_\zeta^{\text{off}}]$	exchange volumes
$\boldsymbol{\Delta}$	reduction matrix
$\boldsymbol{\Sigma}(\boldsymbol{d}; \boldsymbol{y})$	assignment model
$\boldsymbol{y}$	parameter vector
$\boldsymbol{\chi} = [\chi_p]$, $\boldsymbol{\varphi} = [\phi_{\lambda,\tau}]$	schedule-based estimates
η, ε, ω	errors
$r_{\zeta,\lambda}^{\text{sec}}$	platform sector split ratio
w	estimation weight

Appendix B: Assignment model for walking facilities

This section outlines an assignment model for walking facilities in an uncongested train station. In accordance with Assumptions 2 and 3 in Section 3.3.1 of the main article, the prevailing traffic conditions are demand-independent.

Route choice: The outcome of the route choice model is represented by a route choice matrix $\boldsymbol{R}(\boldsymbol{y}) = [r_{(\rho,\tau'),(\kappa,\tau)}]$ of size $|\mathcal{R}||\mathcal{T}| \times |\mathcal{K}||\mathcal{T}|$. An element $r_{(\rho,\tau'),(\kappa,\tau)}(\boldsymbol{y})$ denotes the probability that a pedestrian associated with OD pair κ and departure time interval τ chooses route ρ during time interval τ'. Route choice is instantaneous such that $r_{(\rho,\tau'),(\kappa,\tau)} = 0$ if $\tau \neq \tau'$.

The time to traverse link λ during time interval τ is denoted by $\Delta t_{\lambda,\tau}^{\text{trav}}(\boldsymbol{y})$. The travel time on route ρ during time interval τ is given by

$$U_{\rho,\tau}(\boldsymbol{y}) = V_{\rho,\tau} + \psi, \tag{1}$$

where $\psi \sim \text{EV}(0, \vartheta)$ with ϑ a calibration parameter contained in $\boldsymbol{y}$, and where the sum of link travel times is given by

$$V_{\rho,\tau}(\boldsymbol{y}) = \sum_{\lambda \in \rho} \Delta t_{\lambda,\tau}^{\text{trav}}. \tag{2}$$

For OD pair κ, the likelihood that a user chooses route $\rho \in \mathcal{R}_\kappa$ is given by

$$r_{(\rho,\tau),(\kappa,\tau)}(\boldsymbol{y}) = \frac{\exp(-\vartheta V_{\rho,\tau})}{\sum_{\rho' \in \mathcal{R}_\kappa} \exp(-\vartheta V_{\rho',\tau})}. \tag{3}$$

Table 2 List of considered network loading maps.

$\boldsymbol{B} = [b_{(\lambda,\tau'),(\rho,\tau)}]$	The link flow assignment matrix $\boldsymbol{B}(\boldsymbol{y})$ is of size $\lvert\Lambda\rvert\lvert\mathcal{T}\rvert \times \lvert\mathcal{R}\rvert\lvert\mathcal{T}\rvert$. The entry $b_{(\lambda,\tau'),(\rho,\tau)}(\boldsymbol{y})$ represents the probability that a pedestrian associated with route ρ and departure time interval τ reaches link λ during time interval τ'.
$\boldsymbol{C} = [c_{(\alpha,\tau'),(\rho,\tau)}]$	The area accumulation assignment matrix $\boldsymbol{C}(\boldsymbol{y})$ is of size $\lvert\mathcal{A}\rvert\lvert\mathcal{T}\rvert \times \lvert\mathcal{R}\rvert\lvert\mathcal{T}\rvert$. The entry $c_{(\alpha,\tau'),(\rho,\tau)}(\boldsymbol{y})$ denotes the expected contribution of a pedestrian associated with route ρ and departure time interval τ to the accumulation of area α during time interval τ'.

Network loading: The network loading model defines mappings from route flows to link flows and area accumulations. Table 2 defines the corresponding assignment matrices.

Based on these definitions, we may write

$$\boldsymbol{\Sigma}_f(\boldsymbol{d};\boldsymbol{y}) = \boldsymbol{B}(\boldsymbol{y})\boldsymbol{R}(\boldsymbol{y})\boldsymbol{d}, \tag{4}$$

and

$$\boldsymbol{\Sigma}_a(\boldsymbol{d};\boldsymbol{y}) = \boldsymbol{C}(\boldsymbol{y})\boldsymbol{R}(\boldsymbol{y})\boldsymbol{d}, \tag{5}$$

respectively.

Let the distance along a route ρ up to the beginning of link λ be denoted by ℓ_ρ^λ. Furthermore, let the departure times of pedestrians within a time interval be distributed uniformly, i.e., the distribution of continuous departure time t for any route during a time interval τ is given by

$$h_\tau(t) = \begin{cases} \frac{1}{\Delta t} & \text{if } t \in \tau, \\ 0 & \text{otherwise.} \end{cases} \tag{6}$$

Assuming that each pedestrian is walking at a constant speed, the probability for a person on route ρ that departs during time interval τ to arrive on link λ during time interval τ' is given by

$$\begin{aligned} b_{(\lambda,\tau'),(\rho,\tau)} &= \Pr(t \in \tau, t' \in \tau' \mid \rho, \lambda) \\ &= \Pr\left(t \in \tau, v \in \left[\frac{\ell_\rho^\lambda}{t_{\tau'}^+ - t}, \frac{\ell_\rho^\lambda}{t_{\tau'}^- - t}\right]\right), \end{aligned} \tag{7}$$

where t_τ^- and t_τ^+ represent the bounds of time interval τ, and where t and t' represent the continuous departure and arrival time, respectively. For the most common case that $\ell_\rho^\lambda > 0$ and $\tau' > \tau$, we obtain

$$\begin{aligned} b_{(\lambda,\tau'),(\rho,\tau)} &= \int_{t=t_\tau^-}^{t_\tau^+} \int_{v=\ell_\rho^\lambda/(t_{\tau'}^+ - t)}^{\ell_\rho^\lambda/(t_{\tau'}^- - t)} f_v(v) g_\tau(t)\, \mathrm{d}v\, \mathrm{d}t \\ &= \frac{1}{\Delta t} \int_{t=t_\tau^-}^{t_\tau^+} F_v\left(\frac{\ell_\rho^\lambda}{t_{\tau'}^- - t}\right) - F_v\left(\frac{\ell_\rho^\lambda}{t_{\tau'}^+ - t}\right) \mathrm{d}t, \end{aligned} \tag{8}$$

where $F_v(v)$ denotes the cumulative distribution function corresponding to $f_v(v)$. Similarly, if $\ell_\rho^\lambda > 0$ and $\tau = \tau'$, we obtain

$$\begin{aligned} b_{(\lambda,\tau),(\rho,\tau)} &= 1 - \Pr\left(t \in \tau, t' \notin \tau \mid \rho, \lambda\right) \\ &= 1 - \Pr\left(t \in \tau, v \in \left[0, \frac{\ell_\rho^\lambda}{t_\tau^+ - t}\right]\right) \\ &= 1 - \frac{1}{\Delta t} \int_{t=t_\tau^-}^{t_\tau^+} F_v\left(\frac{\ell_\rho^\lambda}{t_\tau^+ - t}\right) - F_v(0)\, \mathrm{d}t. \end{aligned} \tag{9}$$

Thus, the probability that a user associated with route ρ and departure time interval τ reaches link λ during time interval τ' is given by

$$b_{(\lambda,\tau'),(\rho,\tau)} = \begin{cases} 0 & \text{if } \ell_\rho^\lambda = 0,\ \tau < \tau', \\ 1 & \text{if } \ell_\rho^\lambda = 0,\ \tau = \tau', \\ \text{Eq. (8)} & \text{if } \ell_\rho^\lambda > 0,\ \tau < \tau', \\ \text{Eq. (9)} & \text{if } \ell_\rho^\lambda > 0,\ \tau = \tau'. \end{cases} \tag{10}$$

The assignment fraction for area accumulations can be derived accordingly. Let us consider an area α, and let us assume that each route enters and leaves area α at most once. Let v be the constant, individual speed of a person traveling along route ρ, $\ell_{\text{in}}^{\rho,\alpha}$ the distance along the route ρ to the entrance of area α and $\ell_{\text{out}}^{\rho,\alpha}$ the corresponding distance to its exit. Consequently, $t_{\text{in}} = \ell_{\text{in}}^{\rho,\alpha}/v$ is the time after departure at which a person with speed v enters area α and $t_{\text{out}} = \ell_{\text{out}}^{\rho,\alpha}/v$ the corresponding time at which it is exited. If a route ρ does not cross area α, then $\ell_{\text{in}}^{\rho,\alpha} = \infty$. If we consider a time interval $[t^-, t^+]$ after departure, the expected sojourn time for this person with constant speed v inside the area α within the interval is given by

$$\varsigma(v, \ell_{\text{in}}^{\rho,\alpha}, \ell_{\text{out}}^{\rho,\alpha}, t^-, t^+) = \begin{cases} t^+ - \ell_{\text{in}}^{\rho,\alpha}/v & \text{if } t^- \leq \ell_{\text{in}}^{\rho,\alpha}/v \leq t^+ \leq \ell_{\text{out}}^{\rho,\alpha}/v, \\ \ell_{\text{out}}^{\rho,\alpha}/v - t^- & \text{if } \ell_{\text{in}}^{\rho,\alpha}/v \leq t^- \leq \ell_{\text{out}}^{\rho,\alpha}/v \leq t^+, \\ t^+ - t^- & \text{if } \ell_{\text{in}}^{\rho,\alpha}/v \leq t^- \leq t^+ \leq \ell_{\text{out}}^{\rho,\alpha}/v, \\ (\ell_{\text{out}}^{\rho,\alpha} - \ell_{\text{in}}^{\rho,\alpha})/v & \text{if } t^- \leq \ell_{\text{in}}^{\rho,\alpha}/v \leq \ell_{\text{out}}^{\rho,\alpha}/v \leq t^+, \\ 0 & \text{otherwise.} \end{cases} \tag{11}$$

In Eq. (11), the first line corresponds to the case where a person reaches the area within the time interval, but does not exit it. The second line is the inverse case. The third line represents the case where a person stays within the area during the full time period. Finally, the fourth line represents the case where a pedestrian enters and leaves the area during the period of interest, and the fifth case the situation where a pedestrian is not present in area α during the time interval at all.

Using Eq. (11), the expected contribution of a pedestrian traveling along route ρ with departure time interval τ to the accumulation of area α during time interval τ' is given by

$$\begin{aligned} c_{(\alpha,\tau'),(\rho,\tau)} &= \int_{t=t_\tau^-}^{t_\tau^+} \int_{v=0}^{\infty} \frac{\varsigma(v, \ell_{\text{in}}^{\rho,\alpha}, \ell_{\text{out}}^{\rho,\alpha}, t_{\tau'}^- - t, t_{\tau'}^+ - t)}{\Delta t} f_v(v) h_\tau(t) \, \mathrm{d}v \, \mathrm{d}t \\ &= \frac{1}{\Delta t^2} \int_{v=0}^{\infty} f_v(v) \int_{t=t_\tau^-}^{t_\tau^+} \varsigma(v, \ell_{\text{in}}^{\rho,\alpha}, \ell_{\text{out}}^{\rho,\alpha}, t_{\tau'}^- - t, t_{\tau'}^+ - t) \, \mathrm{d}t \, \mathrm{d}v. \end{aligned} \tag{12}$$

For an efficient implementation, we note that the assignment fractions (10) and (12) are time-invariant, i.e., for $\Delta\tau = \tau' - \tau$ it holds that

$$b_{(\lambda,\tau'),(\rho,\tau)} = b_{(\lambda,\Delta\tau),(\rho,0)} \text{ and } c_{(\alpha,\tau'),(\rho,\tau)} = c_{(\alpha,\Delta\tau),(\rho,0)}. \tag{13}$$

To further reduce the cost involved in computing Eq. (10) and Eq. (12), a maximum travel time $TT_{\max}$ is defined. If $\Delta\tau \geq TT_{\max}$, it is assumed that $b_{(\lambda,\Delta\tau),(\rho,0)} = 0\ \forall\, \lambda, \rho$ and $c_{(\alpha,\Delta\tau),(\rho,0)} = 0\ \forall\, \alpha, \rho$. The threshold $TT_{\max}$ is chosen such that the error incurred by this numerical approximation is negligible.