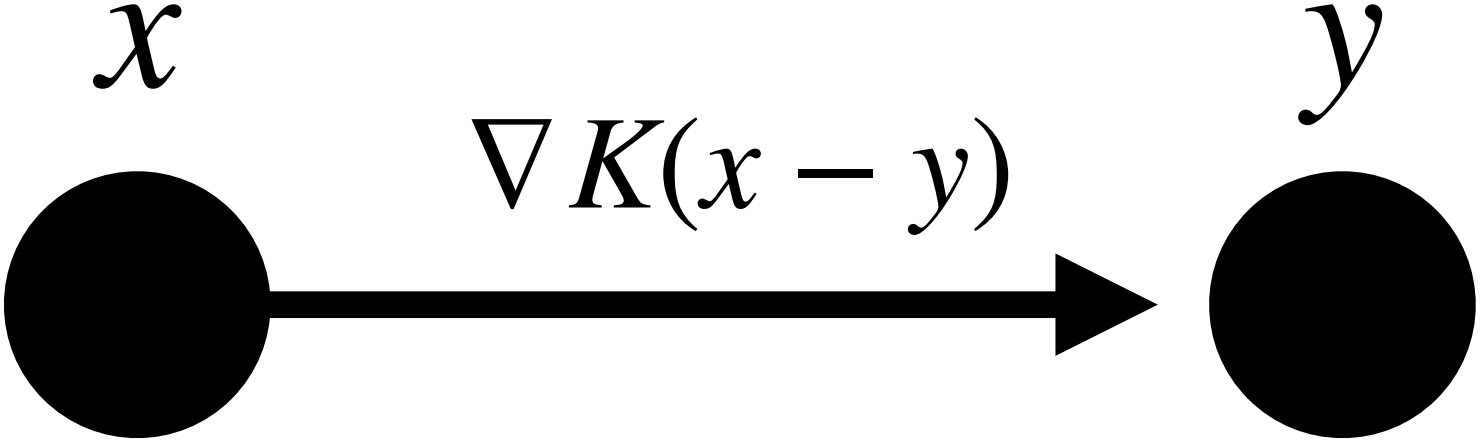
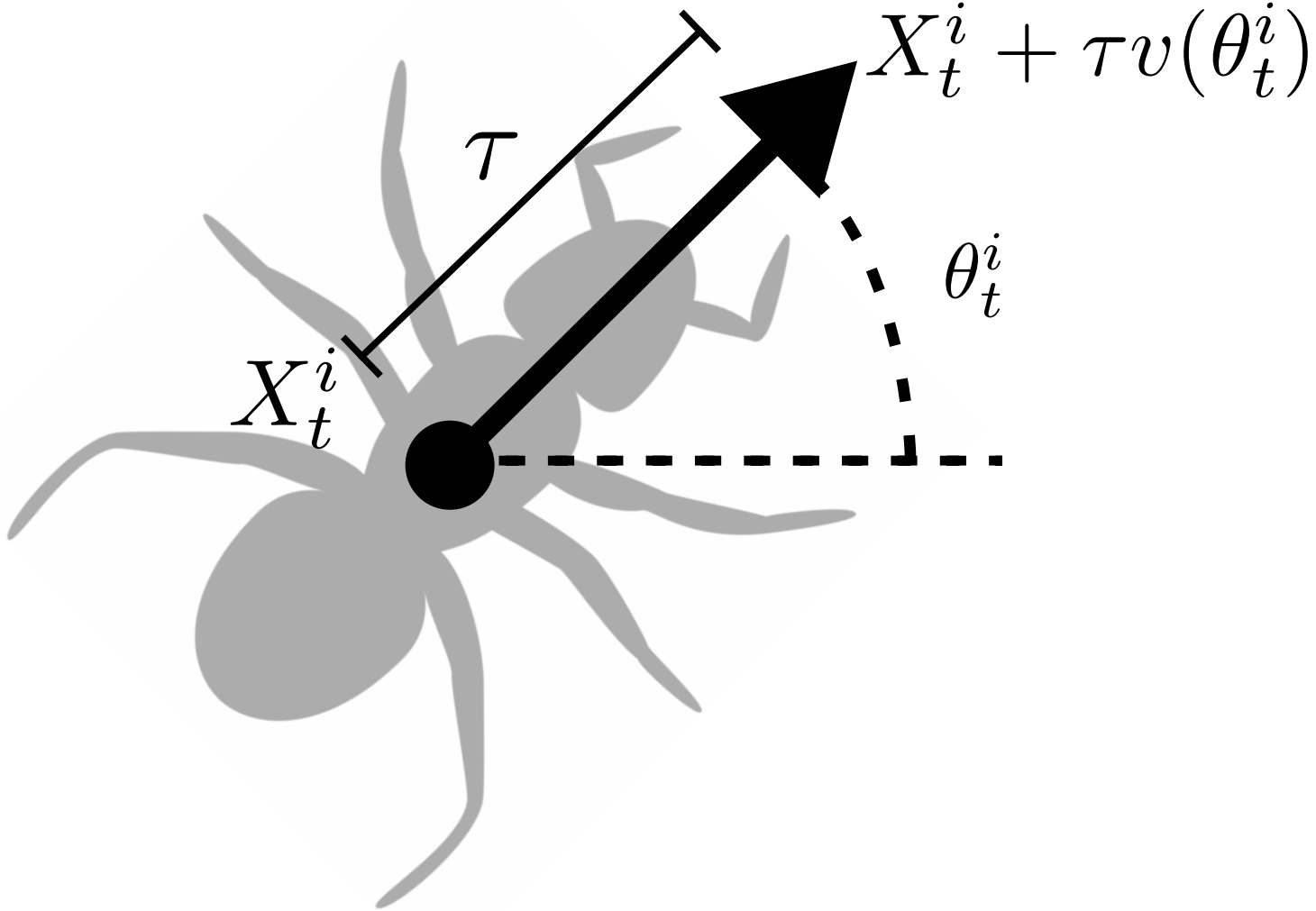
$$
\begin{cases}
\mathrm{d}X_t^i &= \mathrm{Pe} v(\theta_t^i)\mathrm{d}t + \sqrt{2\sigma_x}\mathrm{d}W_t^i \\
\mathrm{d}\theta_t^i &= \chi F\left(\left(X_t^i, \theta_t^i\right), \mu_t^N\right)\mathrm{d}t + \sqrt{2}\mathrm{d}B_t^i
\end{cases}
$$

- Ant model (dW, Bruna & Burger, SIAM J. Appl. Dyn. Syst., 2025):

$$F = n(\theta_t^i) \cdot \frac{1}{N} \sum_{j \neq i} \nabla K(X_t^i + \tau v(\theta_t^i) - X_t^j)$$

- ∇K attractive interaction kernel

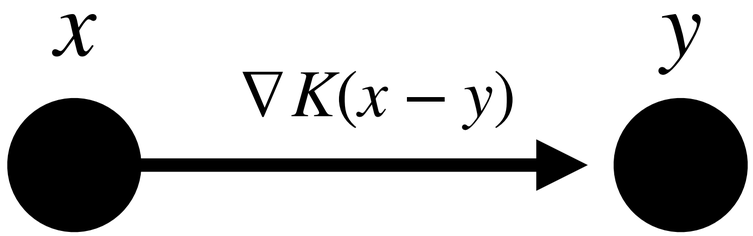

x
y
$\nabla K(x-y)$


$X_t^i + \tau v(\theta_t^i)$
τ
θ_t^i
X_t^i

Interacting ants

Interacting ants

$$\begin{cases} \mathrm{d}X_t^i &= \mathrm{Pe}v(\theta_t^i)\mathrm{d}t + \sqrt{2\sigma_x}\mathrm{d}W_t^i \\ \mathrm{d}\theta_t^i &= \chi F\left(\left(X_t^i, \theta_t^i\right), \mu_t^N\right)\mathrm{d}t + \sqrt{2}\mathrm{d}B_t^i \end{cases}$$



- Ant model (dW, Bruna & Burger, SIAM J. Appl. Dyn. Syst., 2025):
  $F = n(\theta_t^i) \cdot \frac{1}{N} \sum_{j \neq i} \nabla K(X_t^i + \tau v(\theta_t^i) - X_t^j)$

- ∇K attractive interaction kernel