

New Velocity at time $t + 1$

$$V_i^{t+1} = V_i^t + \underbrace{\varphi_1 \cdot r_1 (P_i - X_i^t)}_{\text{Cognitive Component}} + \underbrace{\varphi_2 \cdot r_2 (P_g - X_i^t)}_{\text{Social Component}}$$

V_i^t : i's velocity
 P_i : i's personal best
 X_i^t : i's current position
 P_g : Global Best
 X_i^t : i's current position

Distance between i's current position and PERSONAL best (blue dashed line)
 Distance between i's current position and GLOBAL best (red dashed line)

Inertia
 Cognitive Component
 Social Component

where $r_1, r_2 \sim U(0,1)$ ← Random weights that mix individual and social to make new velocity (towards a solution)

and acceleration constants φ_1, φ_2 ← Help limit movement of the particle. In general $\varphi_1 + \varphi_2 \leq 4$

• Position Update:

$$X_i^{t+1} = X_i^t + V_i^{t+1}$$