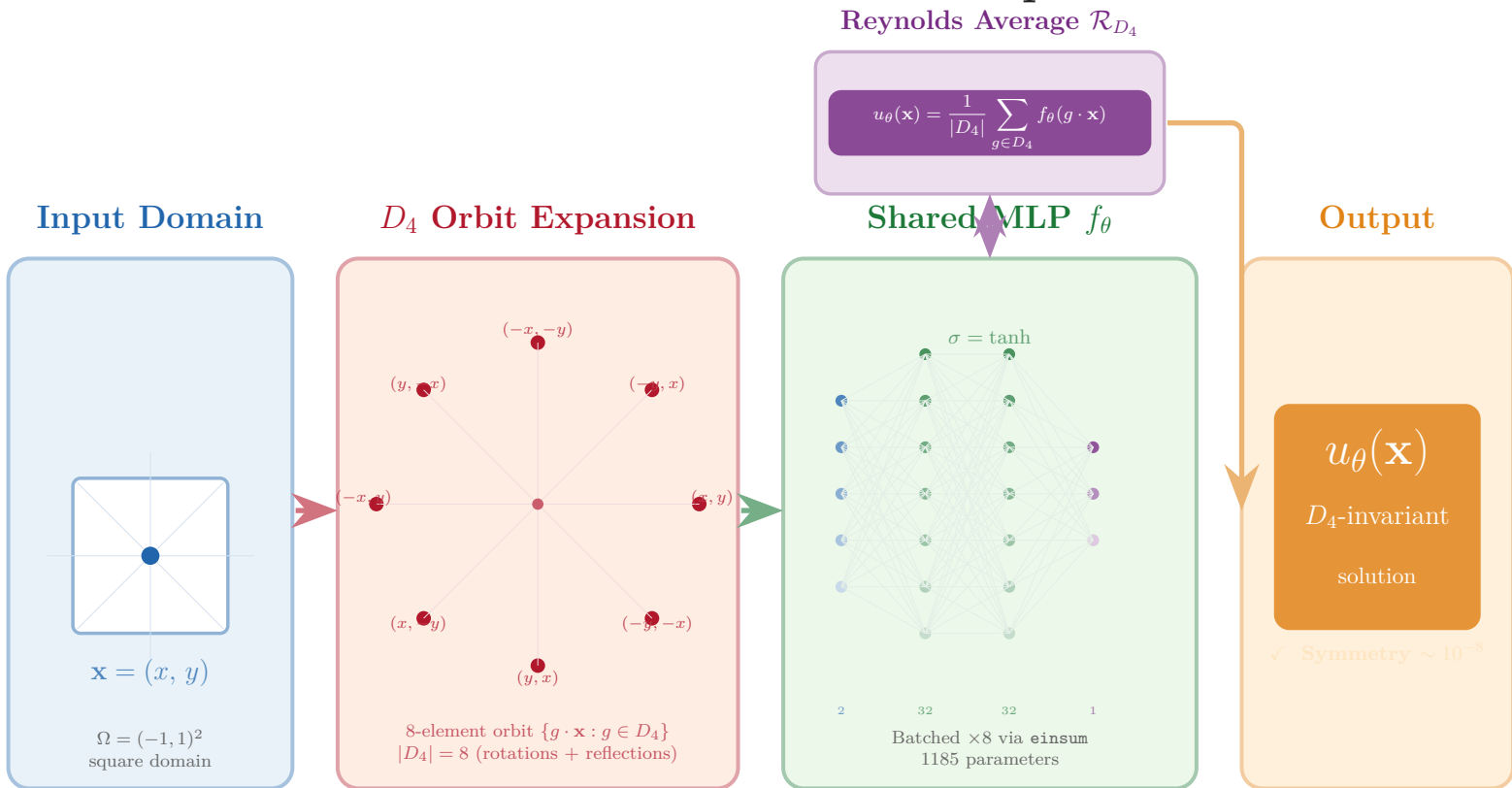


D_4 -PINN — Hard-Constraint Group-Invariant Architecture



Proposition 1 (Architectural Invariance): $\forall \theta \in \Theta, \forall \mathbf{x} \in \mathbb{R}^2, u_\theta(g' \cdot \mathbf{x}) = u_\theta(\mathbf{x})$ for all $g' \in D_4$. • The Reynolds average guarantees exact D_4 -invariance of every forward pass at machine precision.