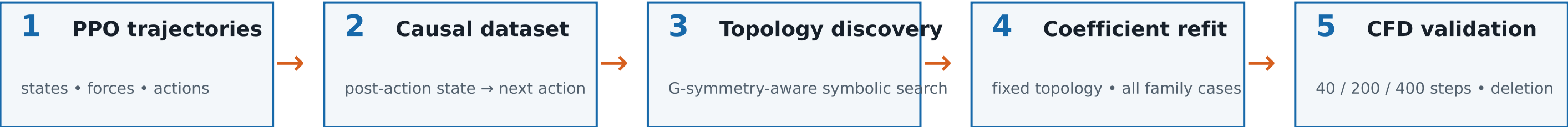


From PPO trajectories to an executable symbolic controller

Causal alignment, symmetry, all-case refitting, then closed-loop CFD—not offline fit alone



Kármán shared family

$$\alpha_F(x) = \frac{1}{2}[f(x) - f(Gx)]$$

$$f(x) = -0.3814 C_{D,r}^a$$

$$\alpha_U(x) = 1.3078 C_{L,r}^s - 3.4312$$

$$\alpha_L(x) = -\alpha_U(Gx)$$

Persistent rear counter-rotation constant dominates;
rear lift correction is secondary.

Illusion shared numerical family

$$\alpha_F(x) = \frac{1}{2}[f(x) - f(Gx)]$$

$$f(x) = -1.8266 C_{D,r}^a + 2.0645 C_{L,F}$$

$$\alpha_U(x) = 1.2544 C_{D,r}^a - 1.5281 C_{L,F}$$

$$\alpha_L(x) = -\alpha_U(Gx)$$

Deployable shared family; deletion evidence does not
establish term uniqueness.

G mirrors upper/lower quantities and applies the signed symmetry map. α is dimensionless cylinder surface speed.