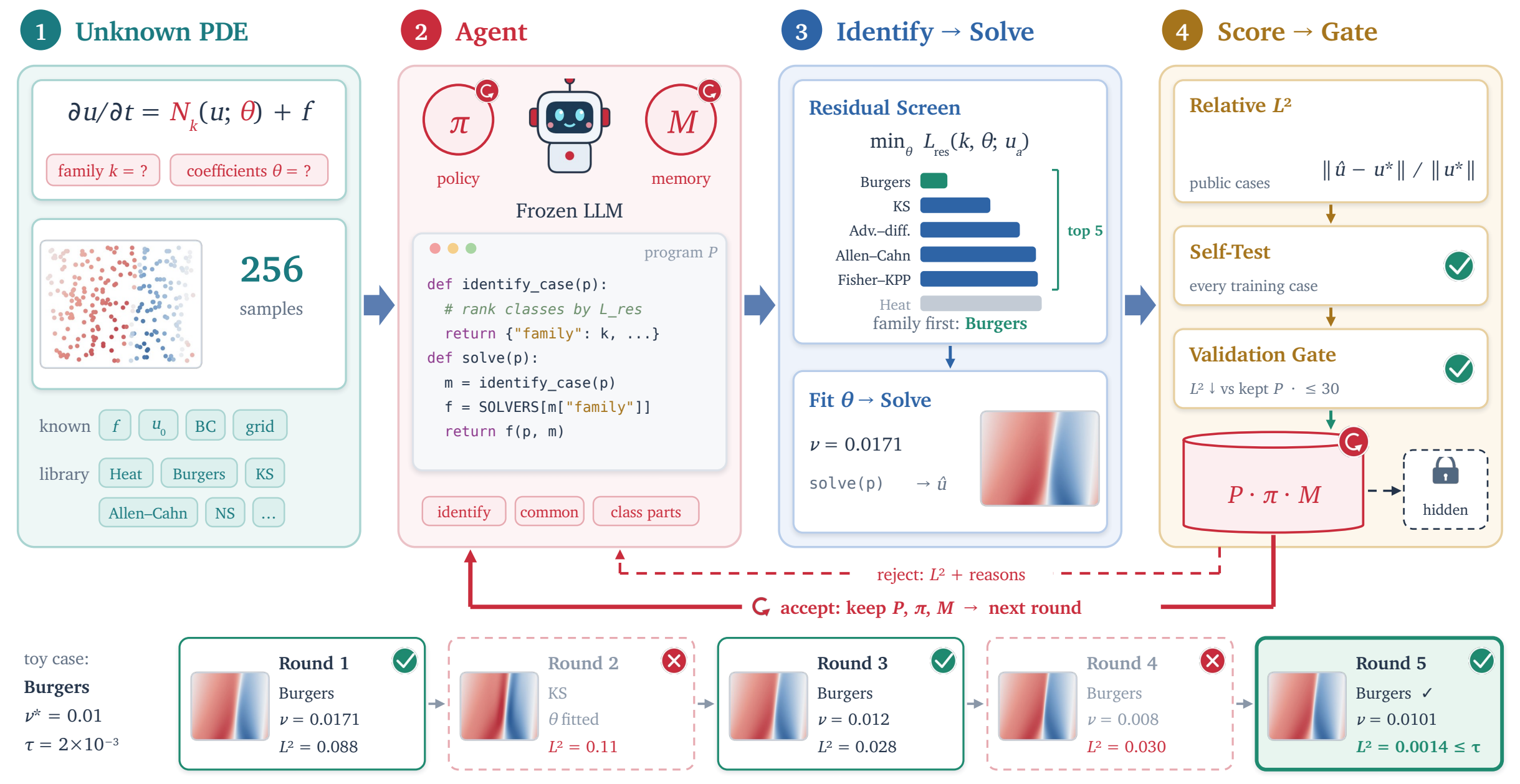

1 Unknown PDE
$\partial u/\partial t = N_k(u; \theta) + f$
family k = ?
coefficients θ = ?
256
samples
known
f
u_0
BC
grid
library
Heat
Burgers
KS
Allen–Cahn
NS
...
2 Agent
policy
memory
Frozen LLM
program P
def identify_case(p):
# rank classes by L_res
return {"family": k, ...}
def solve(p):
m = identify_case(p)
f = SOLVERS[m["family"]]
return f(p, m)
identify
common
class parts
3 Identify → Solve
Residual Screen
$\min_\theta L_{res}(k, \theta; u_a)$
Burgers
KS
Adv.–diff.
Allen–Cahn
Fisher–KPP
Heat
top 5
family first: Burgers
Fit θ → Solve
$\nu = 0.0171$
solve(p) → $\hat{u}$
4 Score → Gate
Relative L^2
public cases
$\| \hat{u} - u^* \| / \| u^* \|$
Self-Test
every training case
Validation Gate
$L^2 \downarrow$ vs kept P · ≤ 30
$P \cdot \pi \cdot M$
hidden
reject: L^2 + reasons
accept: keep P, π, M → next round
toy case:
Burgers
$\nu^* = 0.01$
$\tau = 2\times10^{-3}$
Round 1
Burgers
$\nu = 0.0171$
$L^2 = 0.088$
Round 2
KS
θ fitted
$L^2 = 0.11$
Round 3
Burgers
$\nu = 0.012$
$L^2 = 0.028$
Round 4
Burgers
$\nu = 0.008$
$L^2 = 0.030$
Round 5
Burgers ✓
$\nu = 0.0101$
$L^2 = 0.0014 \le \tau$