

### Phase 1: Low-Fidelity POMDP

4D State: ( $L$ ,  $\sigma$ ,  $B$ ,  $C$ )

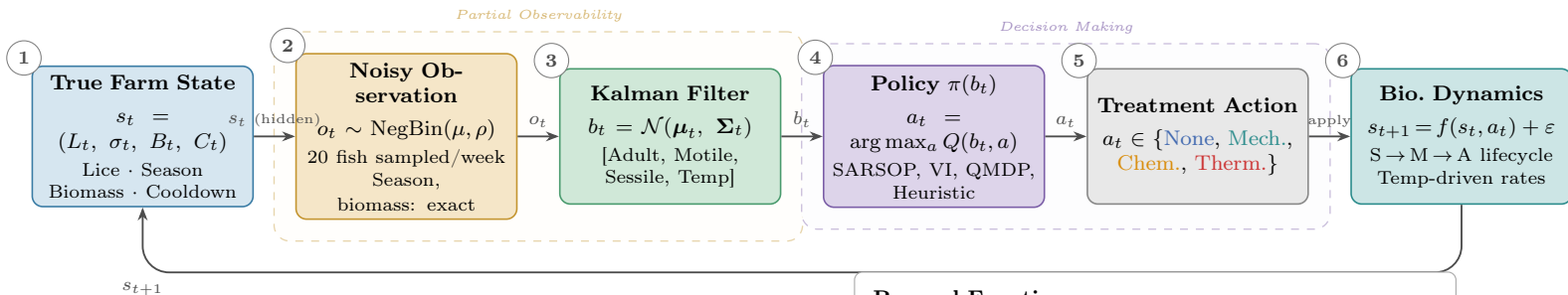
Solvers: SARSOP / VI / QMDP

Policy transfer

### Phase 2: High-Fidelity Simulation

10D State: 3-stage lice dynamics

NegBin observation + Kalman filter



#### Treatment Actions

	None	Mech.	Chem.	Therm.
Cost (MNOK)	0	2.5	1.5	4.0
Efficacy (%)	0	75	60	88
Mortality (%)	0	0.6	0.4	0.8
Fish stress	0	0.35	0.30	0.40

#### Reward Function

$$R(s, a) = - \sum_i \lambda_i \cdot c_i(s, a)$$

$\lambda_{\text{trt}}$	Treatment cost (direct MNOK)
$\lambda_{\text{reg}}$	Regulatory penalty (threshold violation)
$\lambda_{\text{bio}}$	Biomass loss (mortality + growth)
$\lambda_{\text{health}}$	Fish welfare (treatment stress)
$\lambda_{\text{lice}}$	Sea lice burden (chronic damage)