Towards Lifelong Feature-Based Mapping in Semi-Static Environments

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- **Goal:** *Identify* the features, and *estimate* states

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- Sensor noise
- Temporal evolution of the environment

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Our approach: Model *feature persistence beliefs*

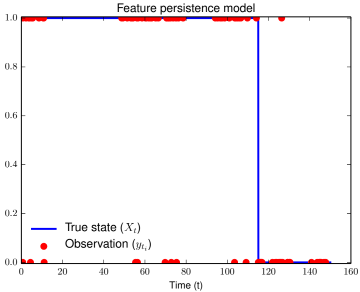
Main idea: the feature persistence model

We propose the following *feature persistence model* to reason about temporal change in semi-static environments:

$$T \sim p_T(\cdot),$$

$$X_t | T = \begin{cases} 1, & t \leq T, \\ 0, & t > T, \end{cases}$$

$$Y_t | X_t \sim p_{Y_t}(\cdot | X_t; P_M, P_F).$$



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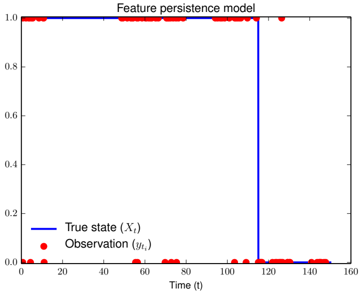

Key properties:

- Feature abstraction: works with *any* map representation
- Fully Bayesian: *explicitly models* uncertainty
- Accepts *any* $p_T(\cdot)$: supports a rich modeling framework
- Speed: admits *constant-time* online inference

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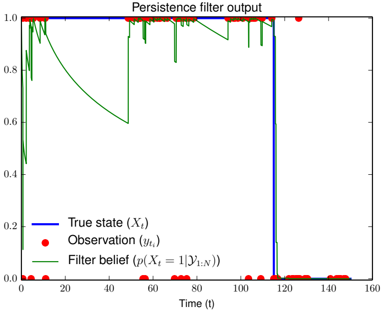

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2. The *persistence filter*, an *exact*, *constant-time online* inference method for computing persistence beliefs; and
3. *Methods for designing custom priors* to encode *a priori* knowledge of environmental dynamics.