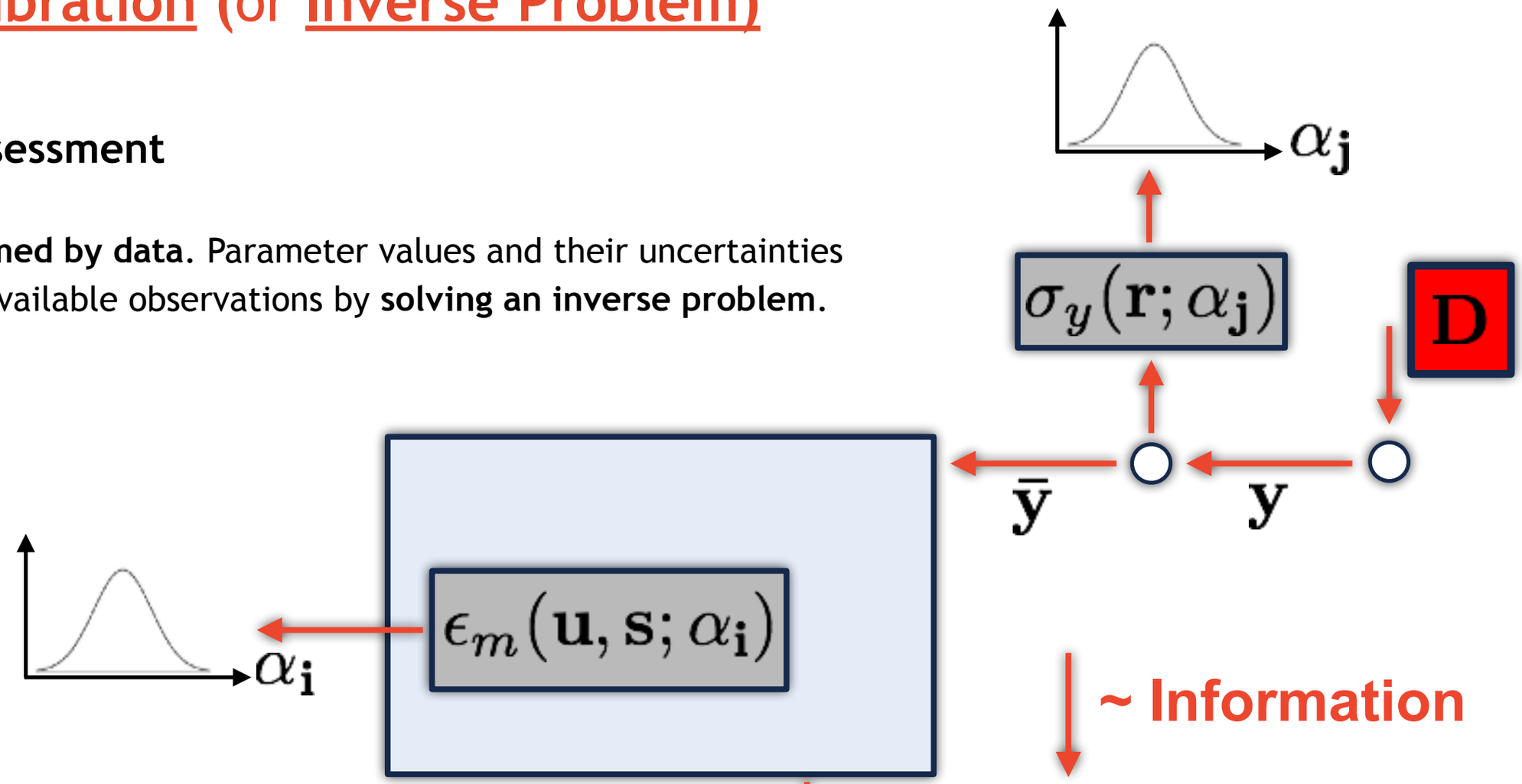
The 3-Steps Reliability Assessment

- **Model Calibration (or Inverse Problem)**
- **Validation**
- **Predictive Assessment**

The model is **informed by data.** Parameter values and their uncertainties are inferred from available observations by **solving an inverse problem.**



The use of probability to represent uncertainty naturally leads to the formulation of the calibration problem as Bayesian (**Bayesian Inference**):

Posterior **Likelihood** **Prior**

$$p(\theta,\alpha|\mathbf{D},\mathcal{M}) = \frac{\mathcal{L}(\theta,\alpha;\mathbf{D},\mathcal{M})\ \mathbf{p}(\theta,\alpha|\mathcal{M})}{\int \mathcal{L}(\theta,\alpha;\mathbf{D},\mathcal{M})\ \mathbf{p}(\theta,\alpha|\mathcal{M})\ \mathbf{d}\theta\mathbf{d}\alpha}$$

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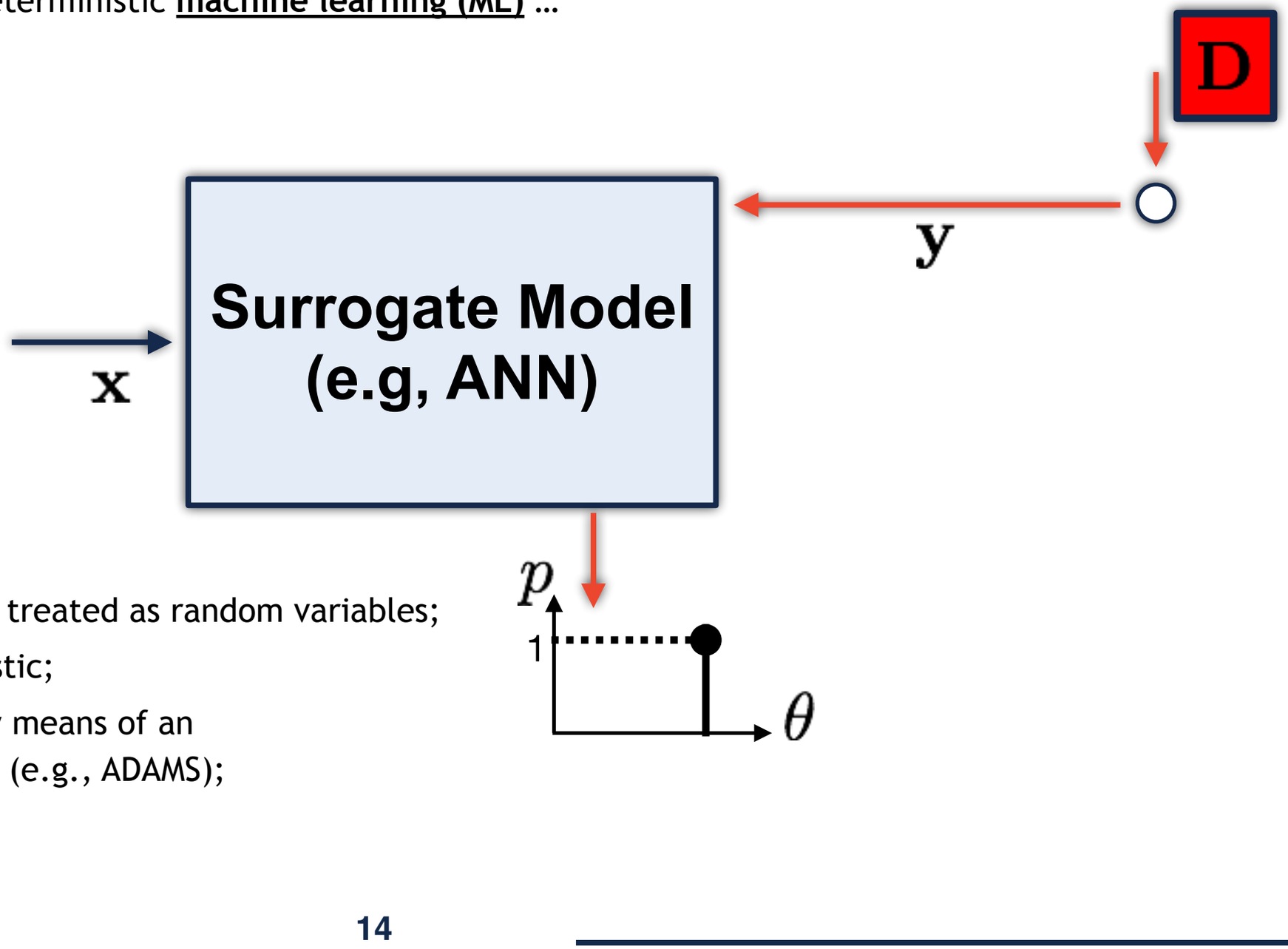
Similar to training process in deterministic **machine learning (ML)** …



…, but in classic ML:

- The parameters are not treated as random variables;
- The model is deterministic;
- The training happens by means of an **optimization algorithm** (e.g., ADAMS);