UCLouvain

ÉCOLE POLYTECHNIQUE DE LOUVAIN

LGBIO2060: Modelling of biological systems

Session 2 : Bayesian inference of a binary hidden state

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Reminder :

Bayes inference : $P(s|m) \propto P(m|s)P(s)$

Normalization

Bayes inference : $P(s|m) = \frac{P(m|s)P(s)}{P(m)}$

State

Measurements

$P(s|m)$ = posterior

$P(m|s)$ = likelihood

$P(s)$ = prior

$P(m)$ = normalization term

Let’s take an example

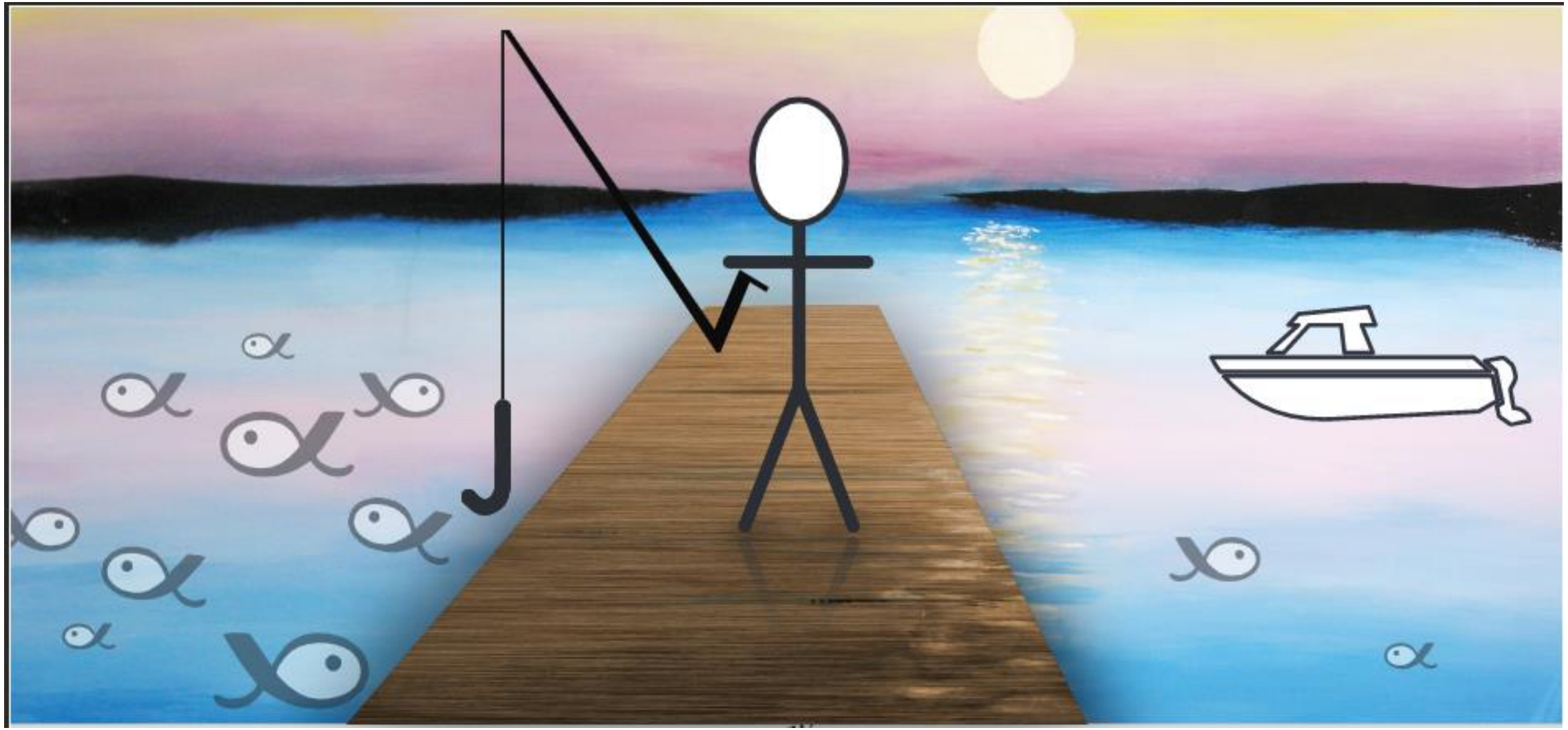

Image taken from Neuromatch Academy

- **Hidden State s** : Right or Left

- **Action** : Fishing on the left or on the right

- **Measurement m** : Catching a fish or not catching a fish

$P(m|s)$ of catching a fish given the fish are on a specific side
$P(s)$ is the prior knowledge of the fish being on one side
$P(s|m)$ is the posterior probability of a state given the measurements

Goal → Infer where the fish are (hidden state) from measurements
Decide on which side we want to fish