

# ASAC: Active Sensing using Actor-Critic models

Jinsung Yoon<sup>1</sup>, James Jordon<sup>2</sup>,  
Mihaela van der Schaar<sup>1 3</sup>

<sup>1</sup> University of California, Los Angeles (UCLA)

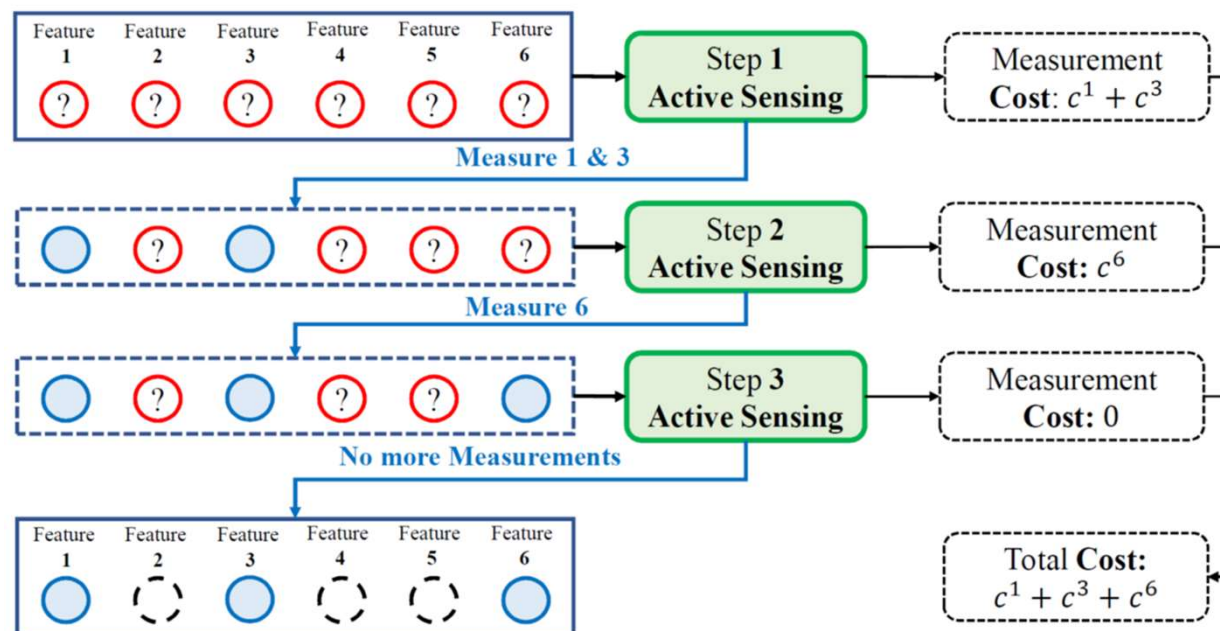
<sup>2</sup> University of Oxford

<sup>3</sup> University of Cambridge

August 9th, 2019

# What is Active Sensing?

- **Objective**
  - Sequentially decide **what** and **when** to observe when making observations is **costly**
- **Medical Applications**
  - **Personalized Screening**
  - **Personalized Monitoring**



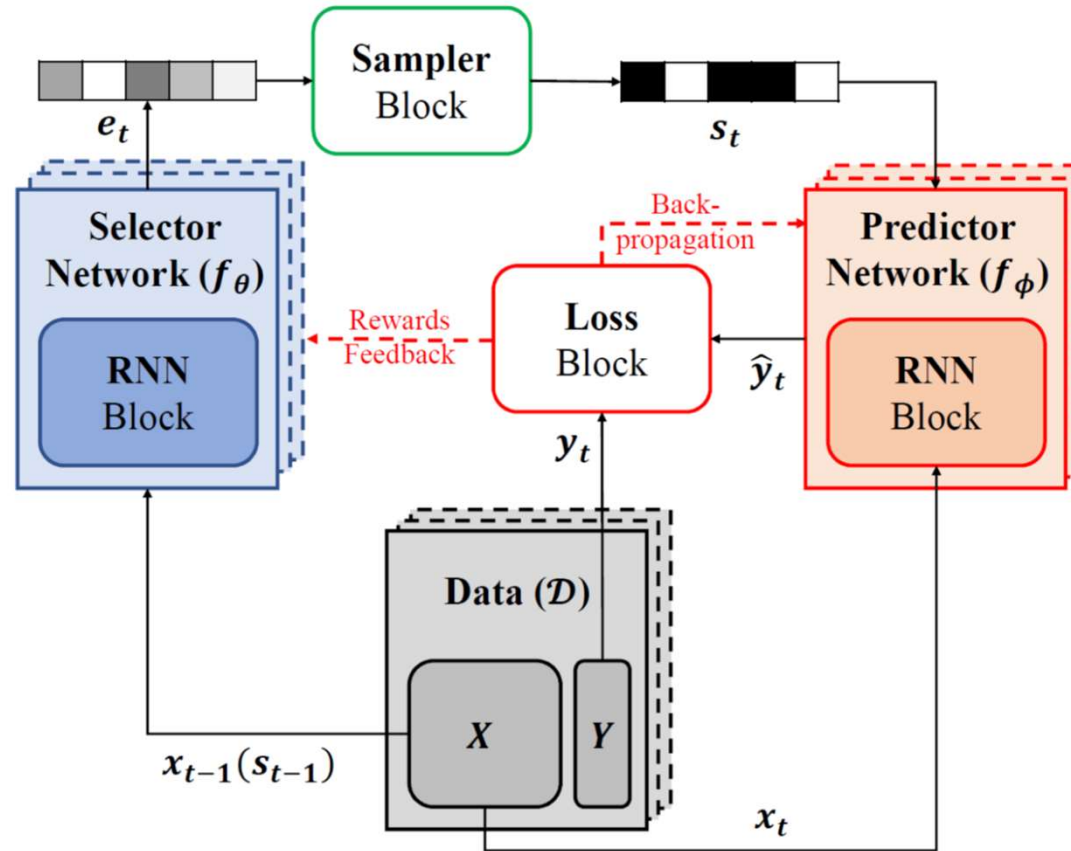
# What is Active Sensing?

---

- **Objective**
  - Sequentially decide **what** and **when** to observe when making observations is **costly**
- **Medical Applications**
  - **Personalized Screening**
  - **Personalized Monitoring**
- **Optimization Problem**

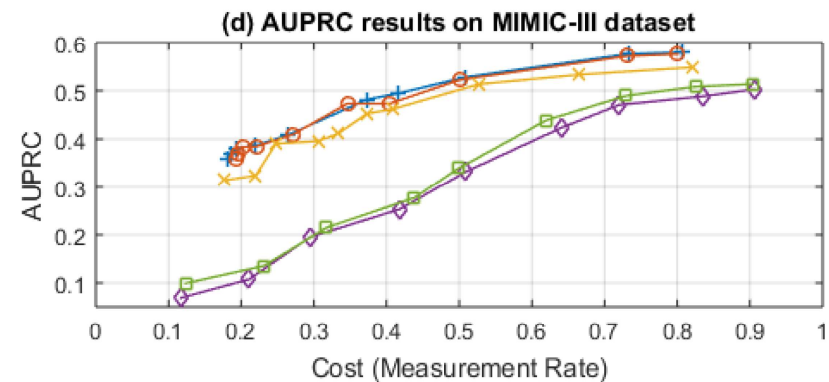
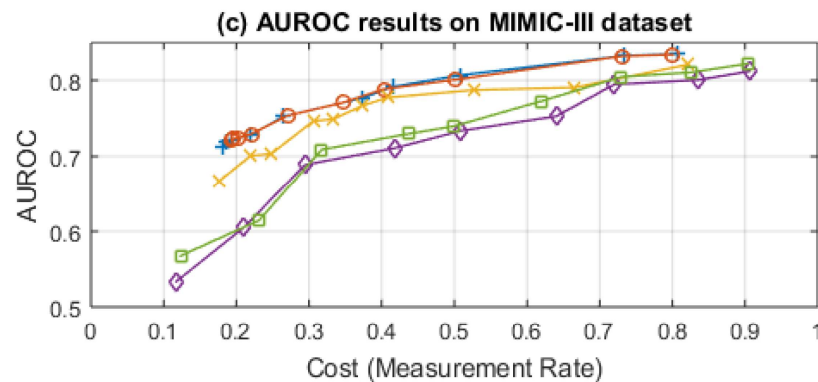
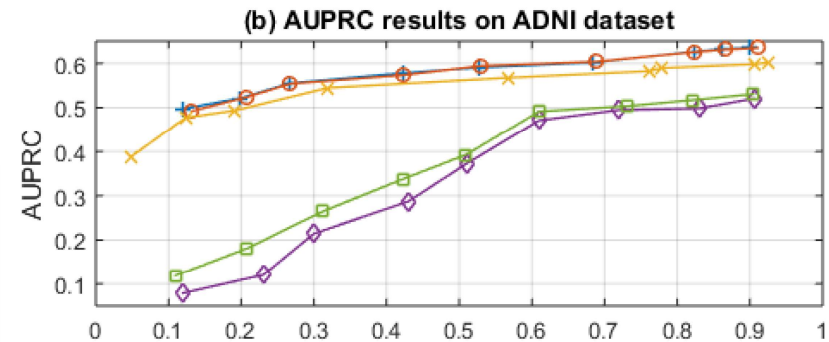
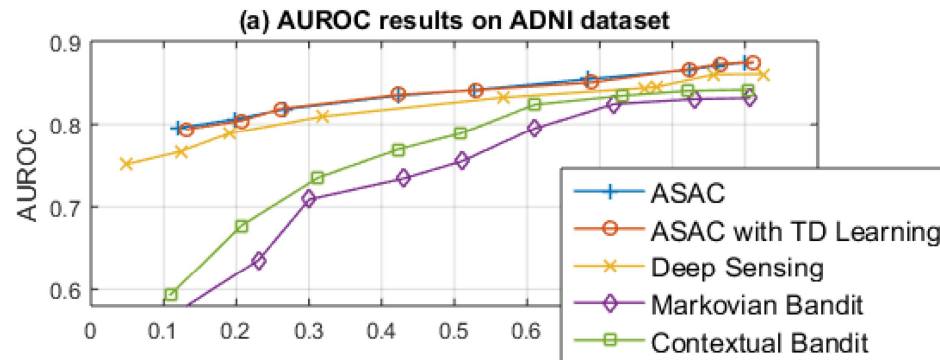
$$\begin{aligned} \min_{\mathbf{s}_1, \dots, \mathbf{s}_T} \quad & \sum_{t=1}^T \mathbb{E}_{\mathbf{x} \sim p_X} [\mathbf{c}^T \mathbf{s}_t] \\ \text{s.t.} \quad & (Y_t | \mathbf{X}_{\leq t} = \mathbf{x}_{\leq t}) \stackrel{d}{=} (Y_t | \mathbf{X}(\mathbf{s}_{\leq t}) = \mathbf{x}(\mathbf{s}_{\leq t})) \text{ for all } t \in \{1, 2, \dots, T\} \end{aligned}$$

# Proposed Model: ASAC



- **Selector Network:** Determine what should be observed in the future
- **Predictor Network:** Evaluate the selection

# Experiments on ADNI and MIMIC-III Datasets



- **X-axis:** Cost (Measurement Rate), **Y-axis:** Predictive Performance
- We achieve **higher predictive power** with **same cost constraints**
- Equivalently, **lower measurement costs** with **same predictive power**

# ASAC: Active Sensing using Actor-Critic models

## Poster # 6

More information on our research group (ML-AIM)  
including various software solutions can be found at:  
**[vanderschaar-lab.com](http://vanderschaar-lab.com)**