Wiggins: Detecting Valuable Information in Dynamic Networks Using **Limited Resources**



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MOTIVATION

Many applications require the detection of events in a network as soon as they happen or shortly after, as the value of the information obtained by detecting the events decays rapidly as time passes.

Applications

News and Feeds, Algorithmic Trading, Anomaly detection, Machine Malfunction, etc





Nodes $V = \{1, 2, ..., n\}$

A set $S \subseteq V$ is the **final destination** of an item with **probability** $\pi(S)$

Novelty of each item *decays*: After t ime steps the novelty is θ^t for $\theta \in (0, 1)$

> Limited budget/resources per time-step Number of *allowed* simultaneous *probes* = *c* (memoryless) probing *c*-schedule: A distribution

$p = (p_1, \ldots, p_n)$

picks c nodes to probe, independently sampled from p

Load of the system at time



1000

500

1500

time

2000

2500

PROBLEM DEFINITION

Definition: Cost of a schedule $p = (p_1, \ldots, p_n)$: $cost_{\theta}(p) := \lim_{t \to \infty} \frac{1}{t} \sum \mathbb{E}(L_{\theta}(t'))$

CHALLENGE **Lemma:** Given π , for a *c*-schedule *p* we have: **Enron-Email**









