Online Independent Set Beyond the Worst-Case

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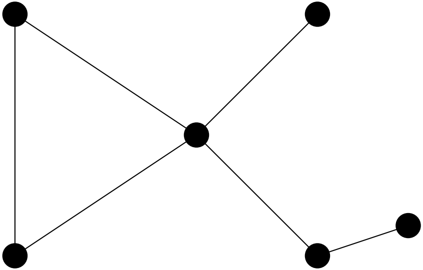
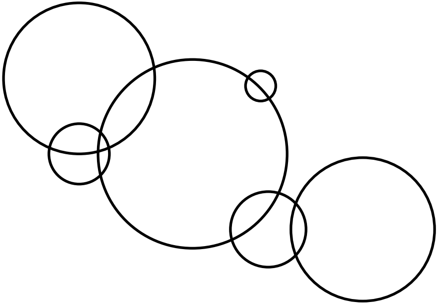


- Graph $G = (V, E)$ appears online
- bounded inductive independence number ρ
- Common Example: Disk Graphs (Further: chordal, interval, line, planar graphs)



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- Worst-case competitive-ratio: $\Omega(n)$
- Our work: stochastic input model

Stochastic Input Sequences

- Variety of models in use
- quite different nature

Our Contribution

- Sampling Model bridges between models
- Approximation of unweighted (weighted) IS in $O(1)$ ($O(\log n)$)

Input: Nodes from G online
$M_1, M_2, M_3, M_4 \leftarrow \emptyset$;
$k \leftarrow B\left(n, \frac{1}{2}\right)$ where $n = |V|$;
$V' \leftarrow \{\text{first } k \text{ nodes from } V\}$;
$V^+ \leftarrow V \setminus V'$;
forall $v \in V'$ *in order according to* $\prec$ **do**
  if $M_1 \cup \{v\}$ *is independent* **then** $M_1 \leftarrow M_1 \cup \{v\}$
end
forall $v \in V^+$ *in order of arrival* **do**
  if $\nexists u \in M_1, u \prec v$ *with* $\{u, v\} \in E$ **then** $M_2 \leftarrow M_2 \cup \{v\}$;
  if $v \in M_2$ **then** w/prob $q := \frac{1}{2\rho}$: $M_3 \leftarrow M_3 \cup \{v\}$;
  if $v \in M_3$ *and* $\nexists u' \in M_4$ *s.t.* $\{v, u'\} \in E$ **then** $M_4 \leftarrow M_4 \cup \{v\}$
end
return M_4;