Learning Algorithms with Self-Play: A New Approach to the Distributed Directory Problem

ICTAI ‘21

Oliver Richter, Lukas Rusch, Roger Wattenhofer (ETH Zurich, Switzerland)
Pankaj Khanchandani (Adobe Systems, India)
Distributed Directory
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Arrow

[Demmer & Herlihy 1998]
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Arrow on Rings
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Arvy
Arvy
Arvy
Arvy Performance

\[ \sigma = \text{input request sequence} \]

\[ \text{Cost}(\sigma) = \frac{\text{Cost of Algorithm}(\sigma)}{\text{Cost of Oracle}(\sigma)} \]

\[ \text{Competitive Ratio} = \max_{\sigma} \text{Cost}(\sigma) \]
### Arvy Performance

<table>
<thead>
<tr>
<th>Graph</th>
<th>Arvy Protocol</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree</td>
<td>Arrow</td>
<td>O(1)</td>
</tr>
<tr>
<td>Cycles</td>
<td>Bridge</td>
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</tr>
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## Arvy Performance

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<td>Treewidth = ?</td>
<td>Arvy = ?</td>
<td>?</td>
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Route Agent $\pi_A$  
Request Agent $\pi_\sigma$

... trained to minimize competitive ratio  

... trained to maximize competitive ratio
Treewidth