On the Hardness of Probabilistic Inference Relaxations

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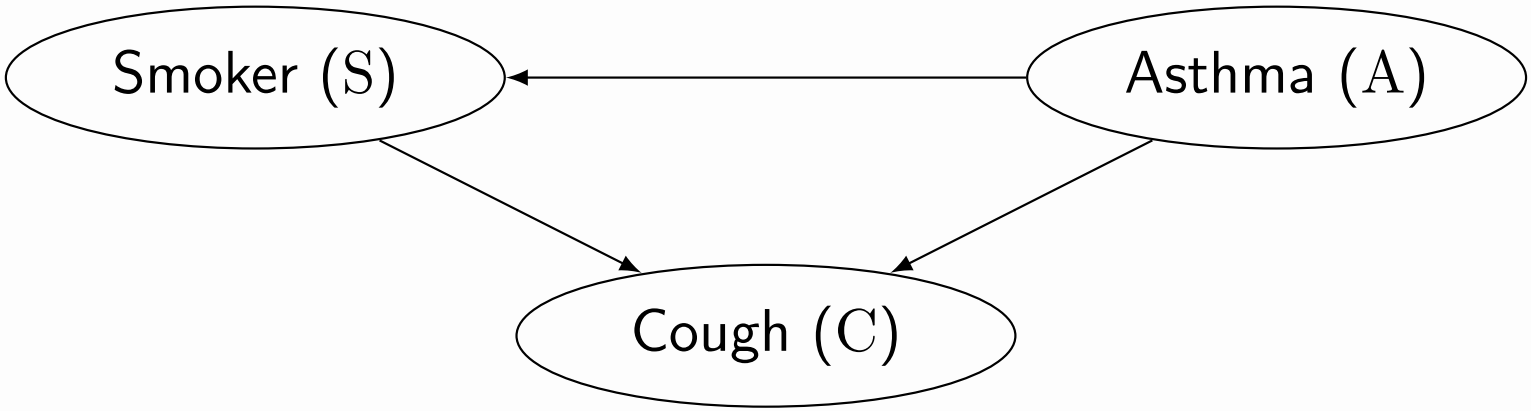
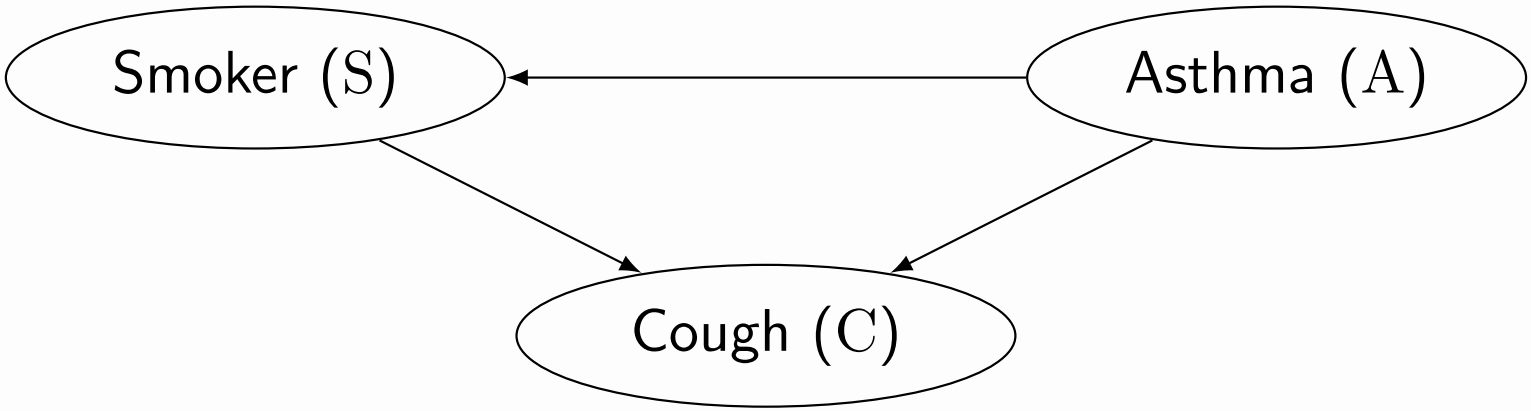
Probabilistic Models



Let $q = \Pr[\text{Asthma}(\mathrm{A}) \mid \text{Cough}(\mathrm{C})]$

Pr[Event | Evidence]

Probabilistic Models



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#P-Hard to compute, so need for relaxations

The Story of Relaxations with a Moral Conclusion

Let $q = \Pr[\text{Event} \mid \text{Evidence}]$

- Additive Relaxations
  Given: δ, ε
  Estimate r such that $\Pr[q - \varepsilon < r < q + \varepsilon] \geq 1 - \delta$
  (Sarkhel et al. 2016); (Fink,Huang, and Olteanu 2013)
- Threshold Relaxations
  Given: thresh, δ
  if $r \geq$ thresh, then textbfOutput YES, else textbfOutput NO
  (Moyé 2006; King, Rosopa, and Minium 2010; Zongming 2009; Gordon et al. 2014; Bornholt, Mytkowicz, and McKinley 2014)

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Not all is lost. New Relaxation that is efficient to compute and can replace threshold relaxation for statistical testing applications
Money Back Guarantee: Come to the poster tonight, and you will leave demanding a rigorous analysis everytime someone proposes new relaxation.