AUDIT GAMES

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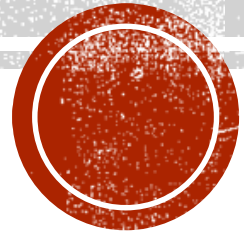

THE PROBLEM

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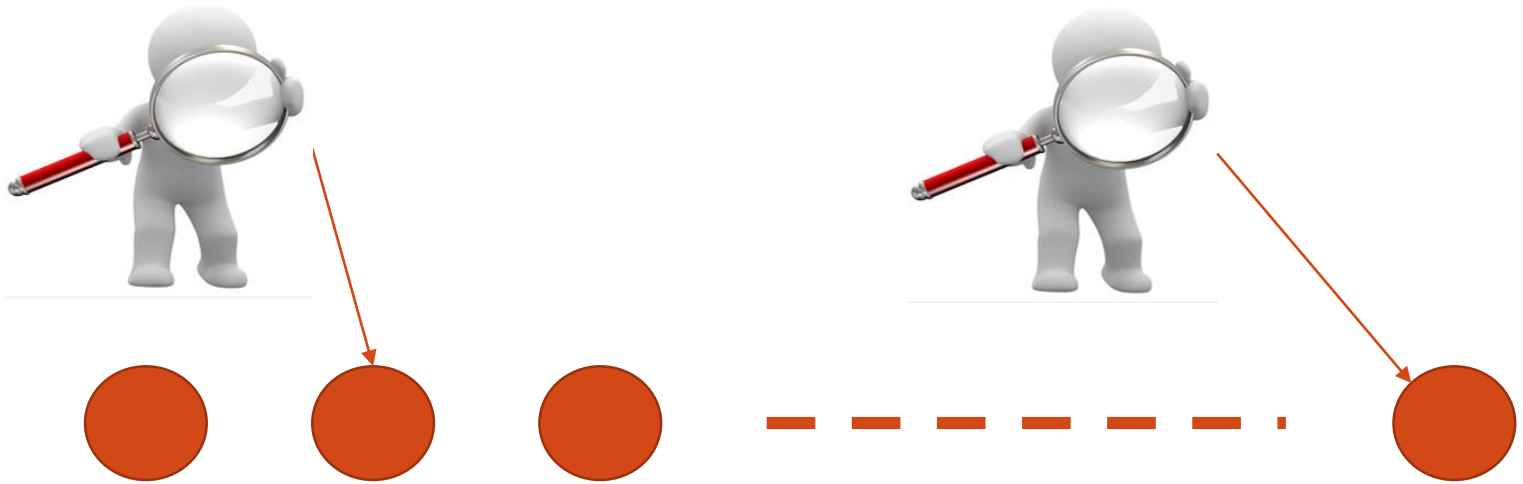
- Resource constrained defender can inspect/protect only $k < n$



EXAMPLES

- Inspect: Auditing for enforcing policies (network policy, financial policy, etc.)
  - n cases to be audited by human auditors, only k inspections possible

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- Protect: Security games [Tambe et al.]
  - n targets that can be attacked, k security resources available for defense

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- How much to punish?
  - Infinite!

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- How much to punish?
- A game theorist's view: Punishment should maximize defender's utility
  - Punishment may not necessarily deter!

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- A leader-follower (Stackelberg) game

REAL LIFE CONSTRAINTS

Cases to be inspected

	1	0	0	0
	0	0	1	0
	0	0	0	1

COMPUTATIONAL PROBLEM

- A non-convex optimization
- Non-convex only due to punishment level x

RESULTS

- Fixed parameter tractable algorithm
  - Discretize x, and solve each resultant LP
  - Fixed parameter is the bit-precision

J. Blocki, N. Christin, A. Datta, A. Procaccia, A. Sinha, Audit Games with Multiple Defender Resources, AAAI 2015 (to appear)
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- Transformation of the combinatorial constraints to a compact form
  - Speeds up computation for audit games and special cases of security games

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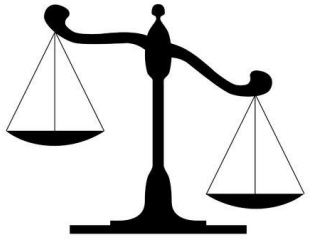
VARIATIONS

- Case specific punishment $x_1, \ldots, x_n$, instead of a single punishment level x

- Result: A fixed parameter tractable algorithm
  - Uses a discretization approach as before
  - The resultant sub-problems are instances of second order cone programs

CONCLUSION



Punishment costs lead to tradeoff between deterrence and loss due to misdeed

Optimal inspection allocation and punishment policy can be computed efficiently