

# Robust Norm Emergence by Revealing and Reasoning about Context

## Socially Intelligent Agents for Enhancing Privacy

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# Privacy as Social Expectation

Example: Phone Ringer

## US Senator's phone rings during important meeting - can you guess his embarrassing ringtone?

11:56, 17 APR 2015 | BY KARA O'NEILL

It's bad enough when your phone goes off in a silent meeting room, but it's even worse when your ringtone is as embarrassing as this one



A US Senator was left red-faced after his phone went off during a finance meeting - but it was his choice of ringtone that really raised some eyebrows.

[https://www.youtube.com/watch?v=r0tZU2\\_X1-Y](https://www.youtube.com/watch?v=r0tZU2_X1-Y)

- Intrusion
- Disapprobation
- Disclosure

[Westin, 1967]

# Socially Intelligent Personal Agent (SIPA)

A SIPA adapts to social context and supports meeting social expectations

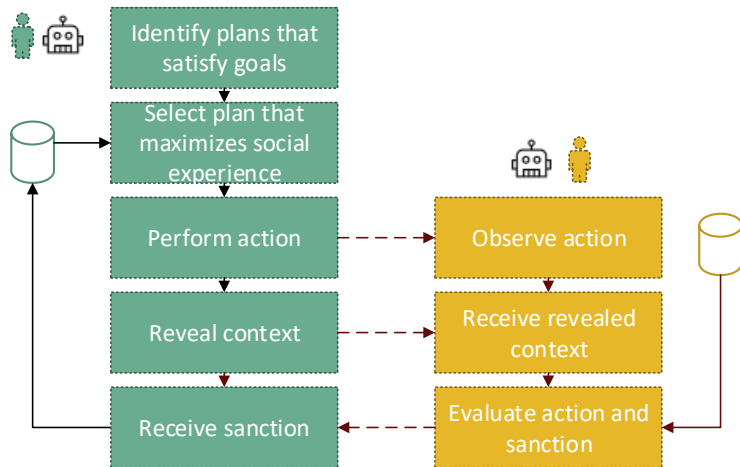
- Ethical: Seeks to balance needs of
  - Primary stakeholder (user) directly interacts with the agent
  - Secondary stakeholders are affected by the agent's actions

## Poros

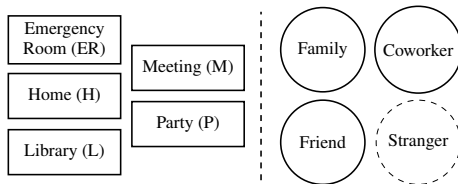
Approach for engineering SIPAs that carry out enriched interactions where

- deviating SIPAs explain their deviations by sharing elements of their contexts

# Interaction and Learning in Poros



# Evaluation: The Ringer Environment



## Agent Societies

- Pragmatic
- Considerate
- Selfish

## Agent Types

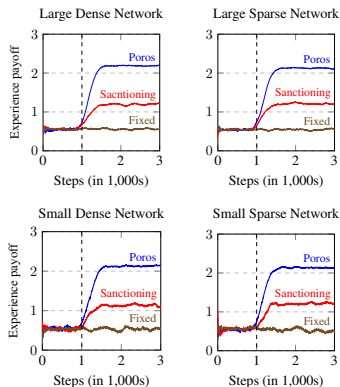
- Fixed
- Sanctioning
- Poros

# Metrics

**Social cohesion** measures the proportion of agents that perceive actions as norm compliant. Higher the social cohesion, lower is the number of negative sanctions

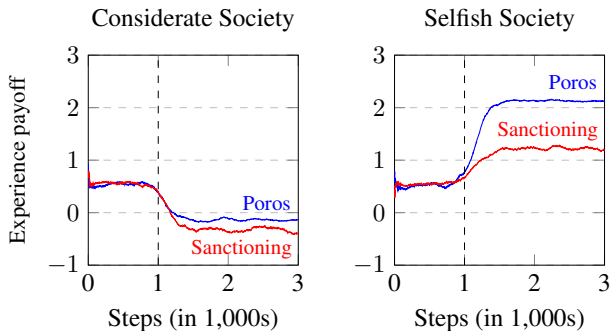
**Social experience** measures the goal satisfaction delivered by an agent (computed by aggregating payoffs for all stakeholders)

# Experiments with Pragmatic Agent Society (Varying Network Types)



Social cohesion and social experience offered by Poros agents are significantly better than those offered by Fixed and Sanctioning agents

# Experiments on Considerate and Selfish Agent Society



- The average social experience drops for considerate Sanctioning and Poros agents after they have gained enough confidence.
- Plots for selfish agents are similar to those in the experiment with pragmatic agents, but with slightly lower stabilized values



# Conclusions

- Poros
  - infers contextually relevant social norms
  - yields higher social cohesion and social experience
- Advance science of security and privacy by tackling nuanced notions of privacy in personal agents

# Subsequent Work and Future Directions

## Subsequent work

- Crucial that SIPAs respect users' values and act ethically
- How can we engineer ethical SIPAs that
  - understand applicable norms, and
  - act or recommend actions that promotes preferred user values?

## Future directions

- How can we incorporate affect in relations to norms?
- How can we support white lies to promote privacy and social cohesion?

# Thank You

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<http://research.csc.ncsu.edu/mas/>

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