Social Causality and Responsibility – Modeling and Evaluation

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USC

The Blame Game

- Assigning blame is a central human past time
- Prerequisite for important social functions
  - Distributing rewards in collaborative settings
  - Learning from collaborative success and failure
  - Social planning: predicting and manipulating social agents
  - Explaining social motivations
- Prerequisite for generating and interpreting social dialogues
  - “It’s not my fault!” “Is too!”
- Core determinant of social emotions
  - Distinguishes Guilt from Anger

Many IVA Applications

- Informing models of emotions
  - Gratch, Mao & Marsella 2005
- Guiding mitigating dialogues
  - Martinovski et al. 2005
- Assessing performance in group training
  - Mao and Gratch, 2003

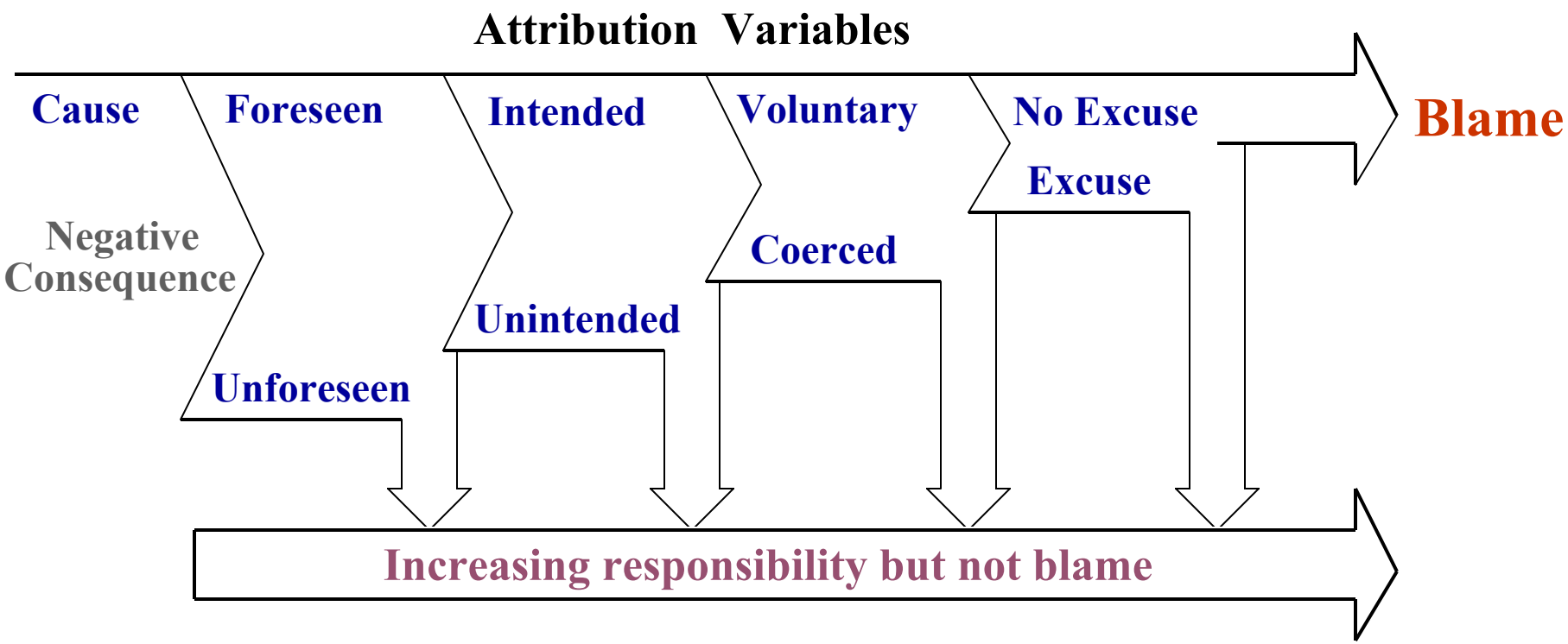
Outline

- Review theory of social causality
- Review computational model of social judgment
  - Presented at last IVA, AAMAS2004
- Evaluate ability to predict human judgments
  - Contrast with alternative models
- Summary and Conclusion

Social Attribution Theory

- Dominant psychological theory of how people form judgments of social cause
- Differs marked from physical causality
  - Incorporates epistemic variables (intent, coercion..)
- Appraisal-theoretic approach (for those that know emotion)
  - Emphasizes cognitive judgments
  - Emphasizes subjective perspective

Social Attribution Theory



Adapted from Shaver [1985]

Example

- An officer orders two marksmen to shoot a man. They strenuously object but the officer insists. The marksmen take careful aim, shoot the man and $\underbrace{\text{he dies}}_{\text{Negative Consequence}}$.

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Direct Observation +
Knowledge of Action

Marksmen: Cause

Example

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Causal Inference

Marksmen: Cause → Intent

Example

- An officer orders two marksmen to shoot a man. They strenuously object but the officer insists. The marksmen take careful aim, shoot the man and he dies.

Dialogue Inference

Marksmen: Cause → Intent → Voluntary X

Example

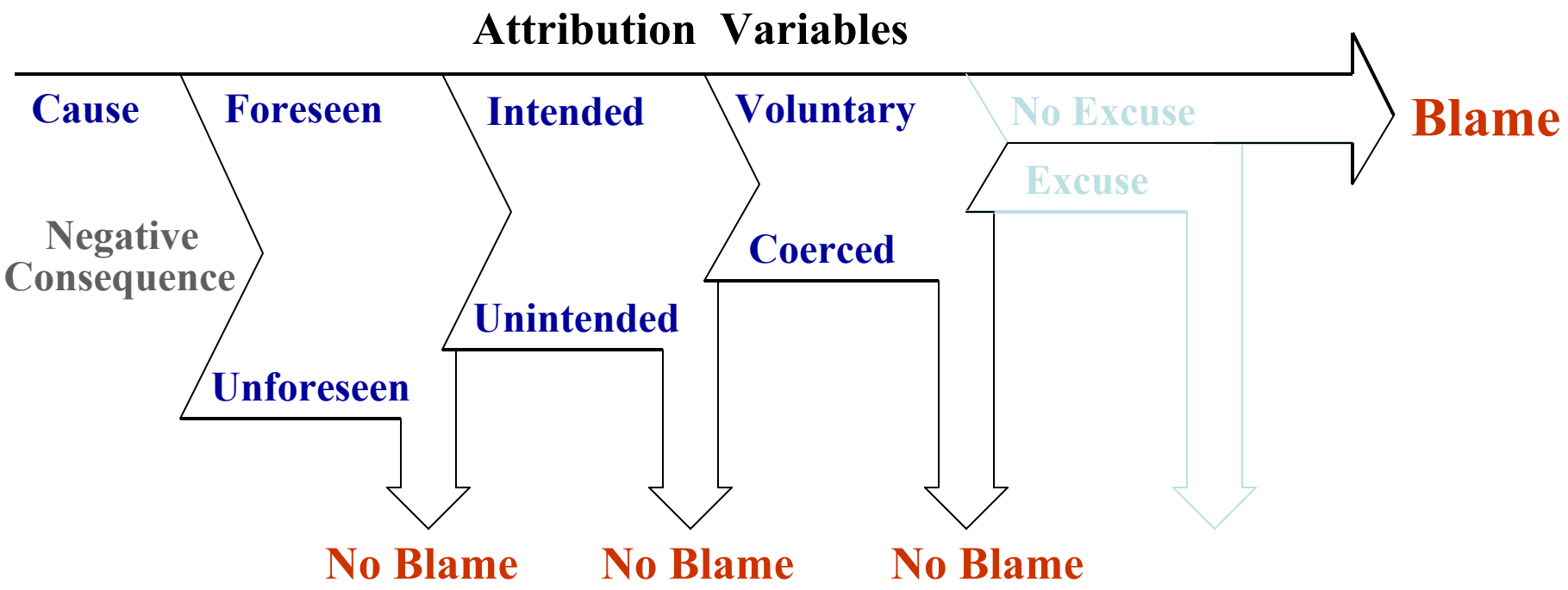
- An officer orders two marksmen to shoot a man. They strenuously object but the officer insists. The marksmen take careful aim, shoot the man and he dies.

Marksmen: Cause → Intent → Voluntary X

Officer: Cause → Intent → Voluntary? → Excuse?

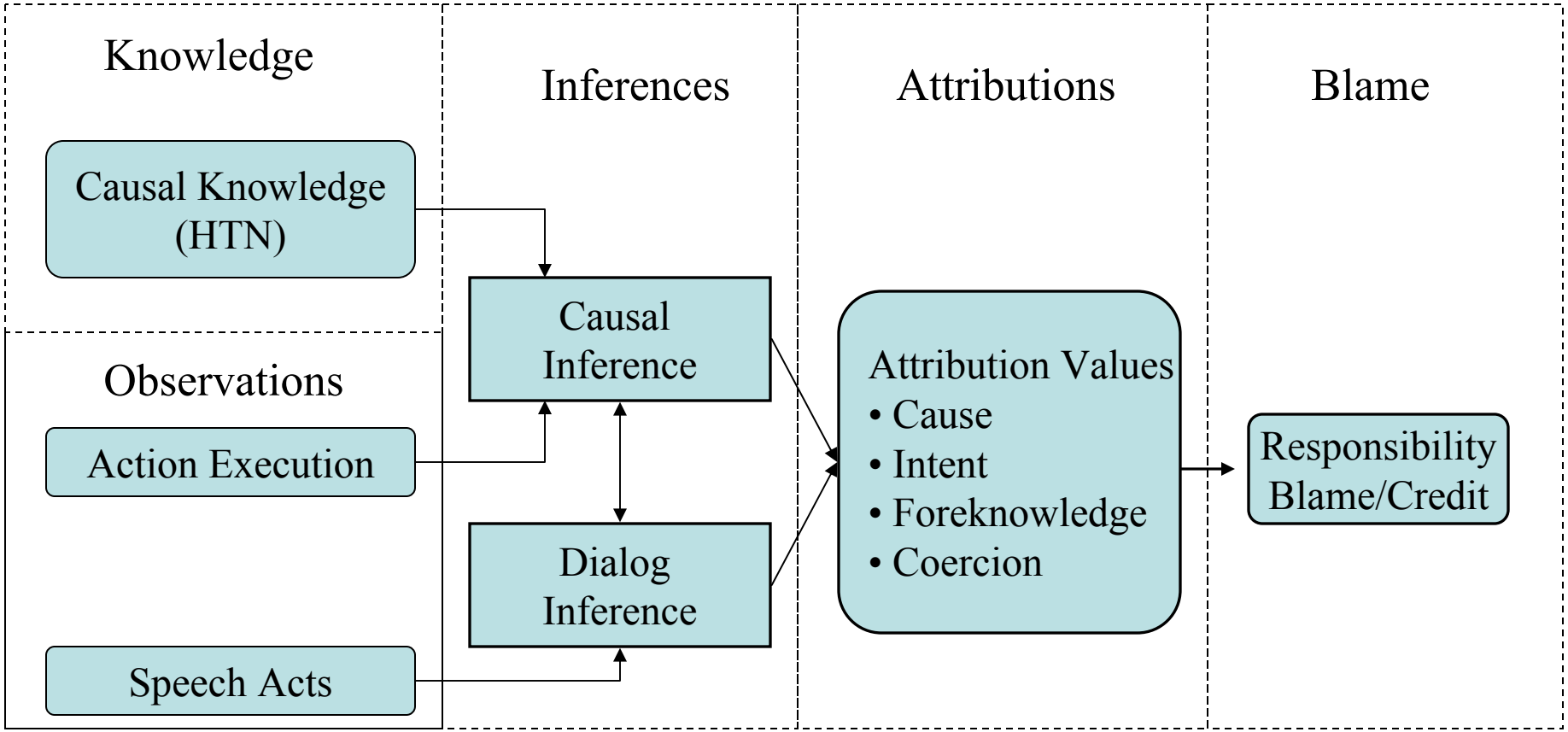
Blame depends on further judgments: was his decision was coerced, was the killing justified

Mao & Gratch 2003 (M&G)



Mao & Gratch 2003 (M&G)

Computational model of attribution theory



Causal & Dialogue Inference

- Foreknowledge

  e.g. if *e* is direct effect of intended act *A* → foreknowledge

- Intention

  Employing general Intention recognition algorithm

  [Mao & Gratch, 2004]

- Coercion

  Dialogue and Counterfactual inference

Example: Coercion

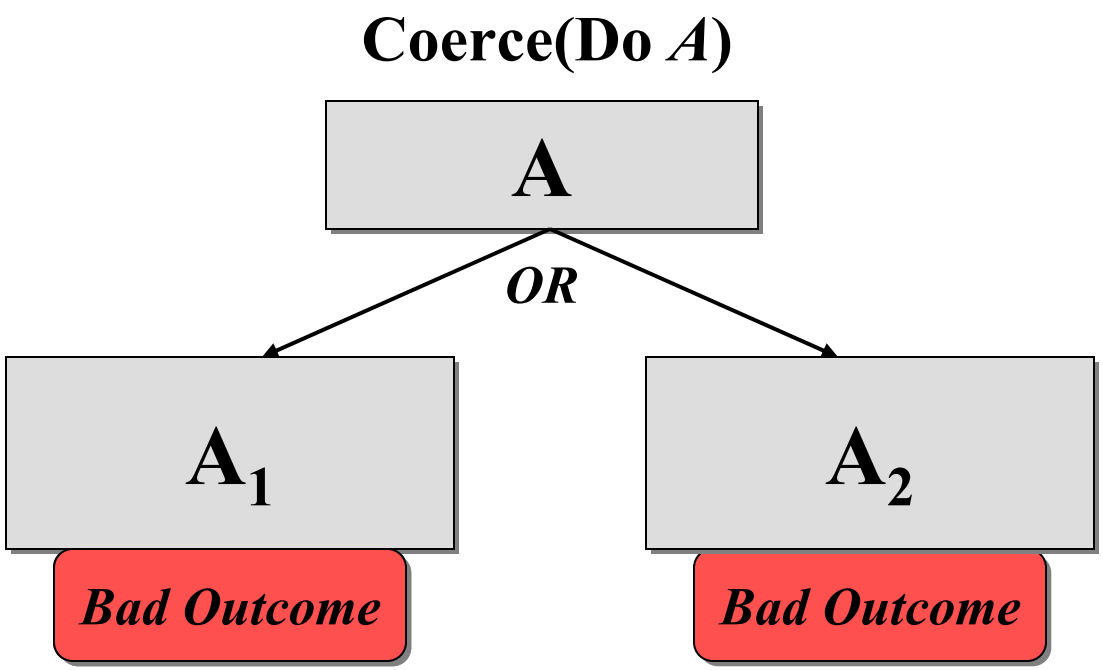
- Some inferences can be quite involved

Officer orders, marksmen reject, officer insists, marksmen accept

$$\textit{Rule}:\ \neg\mathbf{intend}(h, p, t1)) \wedge \mathbf{obligation}(h, p, t2) \wedge \mathbf{accept}(h, p, t3) \wedge t1<t3 \wedge t2<t3<t4 \Rightarrow \mathbf{coerce}(s, h, p, t4)$$

- But act coercion doesn't imply effect coercion
- Also need causal inference

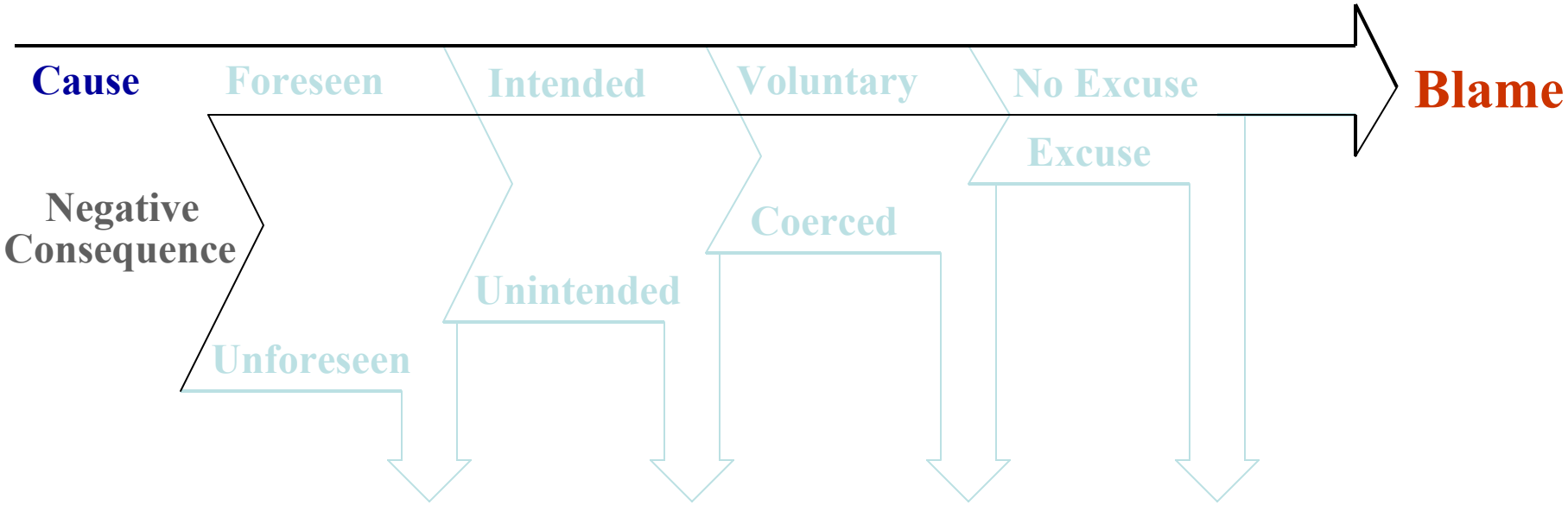
Coercion: counterfactual inference



Subordinate has meaningful choice

No Coercion

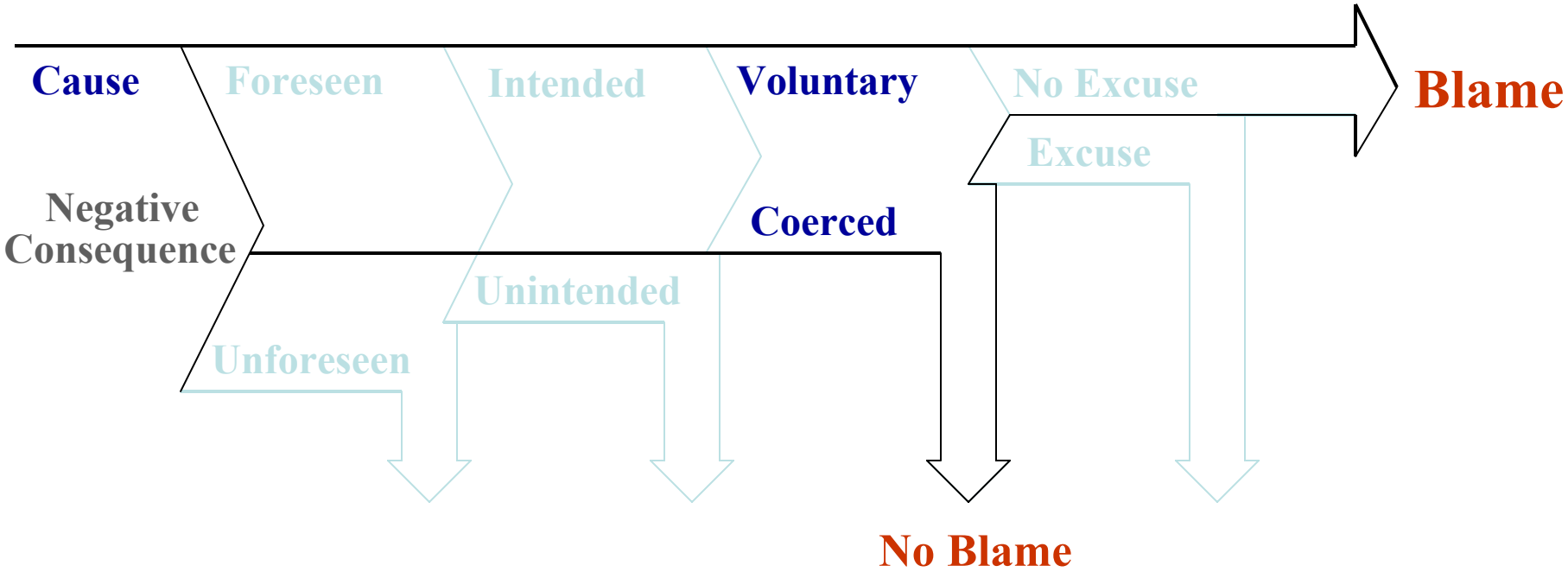
Alternative Models



Blame Physical Cause

- Blame agent that immediately caused consequence

Alternative Models



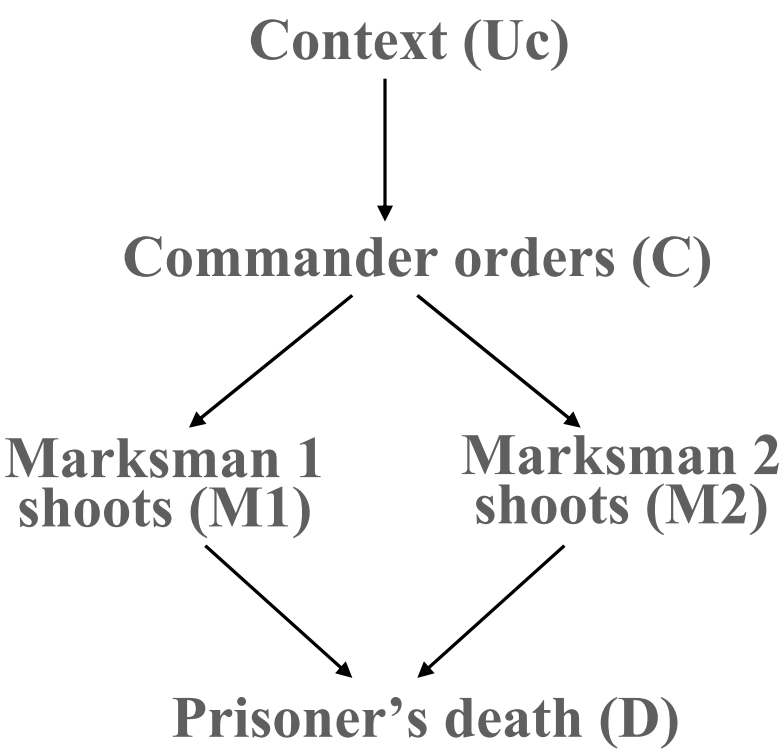
Blame Authority

- Blame highest authority associated with act

C&H (Chockler&Halpern04)

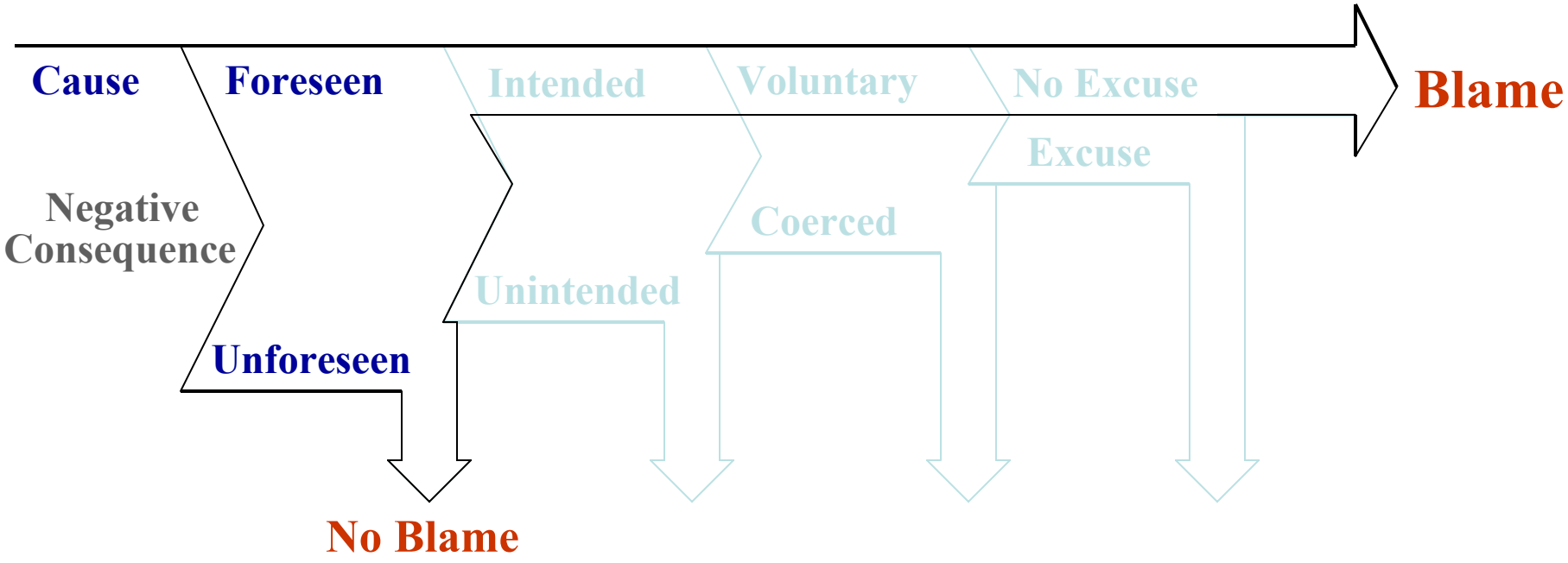
Extension of Pearl's structural-model approach

- Identifies indirect causal factors including social causes



- Causal equations
  $C = M1,\ C = M2$
- Speech treated as a physical action
- *M1=1*, *M2=1* and *C=1* are causes of the death
- Blame shared
  M1=1/2, M2=1/2, C=1

C&H (Chockler&Halpern04)



Claim

- M&G model will better predict human judgments than
  - **Simple causal model**

    Based on physical cause
  - **Simple authority model**

    Always choose highest authority
  - **C&H model**

    Structural model approach to shared responsibility and blame [Chockler & Halpern, 2004]

Method

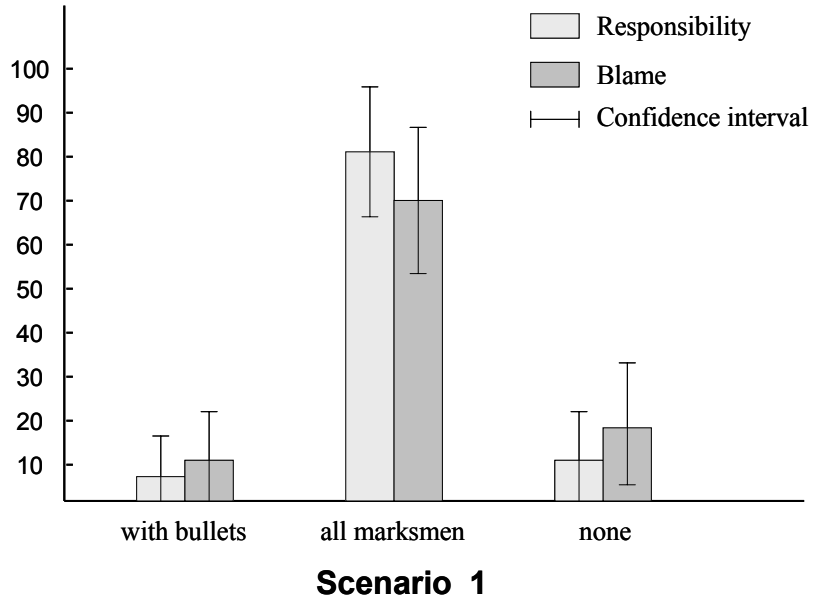
- Constructed 4 variations of C&H04 *firing squad*
  - Vary factors that should influence attributions
  - Emphasized factors influencing coercion
- Encoded variants in each model
  - Checked w/ C&H (personal communication)
- Generated predictions of blame
- Compare predictions with human data
  - Queried 27 Subjects on blame and epistemic variables
  - Judge model predictions against majority response

Scenario 1: No officer

- A firing-squad consists of ten excellent marksmen. Only one marksman has live bullets in his rifle; the rest have blanks. The marksmen do not know who has the live bullets. They shoot at the prisoner and he dies.
- Human majority agreement: *all marksmen*

Blame	Simple Cause Model	Simple Authority Model	C&H Model	Social Inference Model
Predict	marksman with bullets	N/A	all marksmen	all marksmen
Human				

Scenario 1: No officer



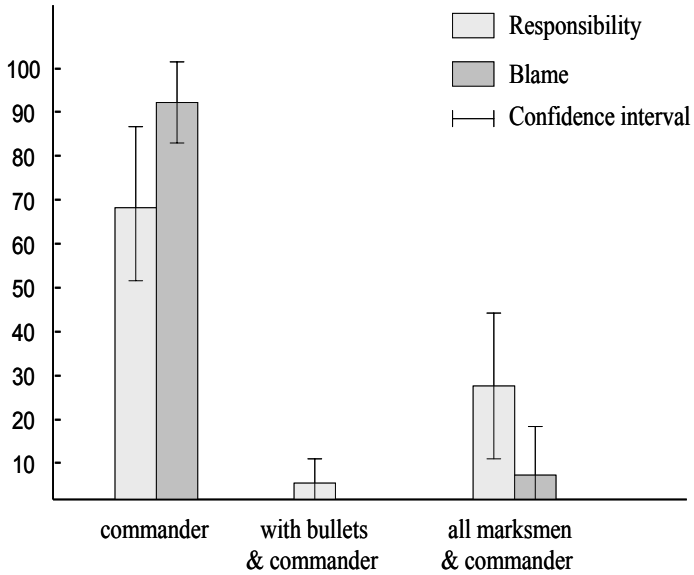
Blame	Simple Cause Model	Simple Authority Model	C&H Model	Social Inference Model
Predict	marksman with bullets	N/A	all marksmen	all marksmen
Human	No	no	yes ☺	yes ☺

Scenario 3: Insubordinate

- The same firing-squad. The commander *orders* the marksmen to shoot the prisoner. The marksmen *refuse* the order. The commander *insists* that the marksmen shoot. They shoot at the prisoner and he dies.
- Human majority agreement: *commander*

Blame	Simple Cause Model	Simple Authority Model	C&H Model	Social Inference Model
Predict	marksman with bullets	commander	all marksmen & commander	commander
Human				

Scenario 3: Insubordinate



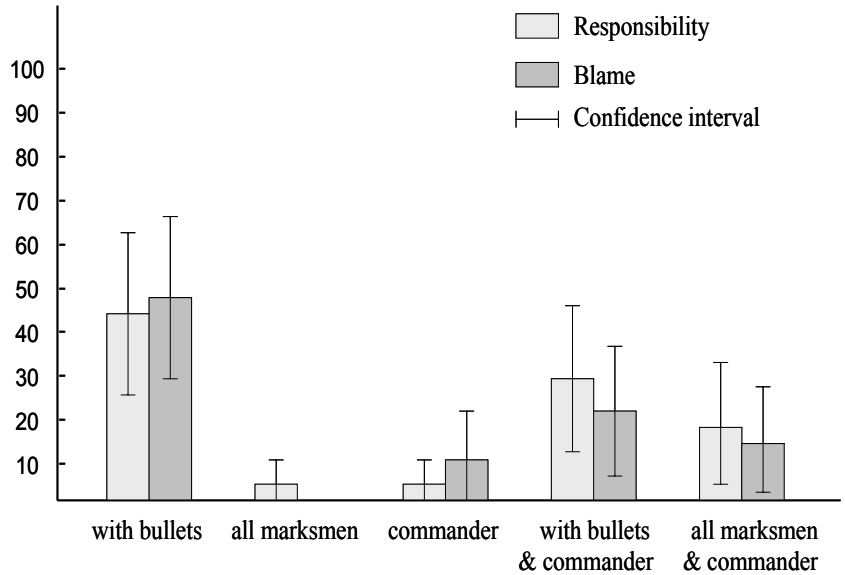
Blame	Simple Cause Model	Simple Authority Model	C&H Model	Social Inference Model
Predict	marksman with bullets	commander	all marksmen & commander	commander
Human	no	yes ☺	no	yes ☺

Scenario 4: marksmen choose

- The same firing-squad. The commander *orders* the marksmen to shoot the prisoner, and each marksman can *choose* to use either *blanks* or *live bullets*. The marksmen shoot at the prisoner and he dies.
- Human majority agreement: *marksman with bullets; commander & marksman with bullets*

Blame	Simple Cause Model	Simple Authority Model	C&H Model	Social Inference Model
Predict	marksman with bullets	commander	N/A	marksman with bullets
Human				

Scenario 4: marksmen choose



Blame	Simple Cause Model	Simple Authority Model	C&H Model	Social Inference Model
Predict	marksman with bullets	commander	N/A	marksman with bullets
Human	Yes* ☺	no	N/A	Yes* ☺

Results: Summary

BLAME	Simple Cause Model		Simple Authority Model		C&H Model		Social Inference Model		Human Majority Agreement
	Results	Match	Results	Match	Results	Match	Results	Match	
S 1	with bullets	no	N/A	N/A	all marksmen	yes	all marksmen	yes	**all marksmen**
S 2	with bullets	no	commander	yes	all marksmen& commander	no	commander	yes	**commander**
S 3	with bullets	no	commander	yes	all marksmen& commander	no	commander	yes	**commander**
S 4	with bullets	yes (partial)	commander	no	N/A	N/A	with bullets	yes (partial)	**with bullets/ w. bullets & commander**

Future Work

- Further refine the computational model
- Experiment on more social scenarios to validate the work
- Implement inference engine and other components of social inference module

Acknowledgements

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