AI and Ethics

A quick overview

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LIRIS - SMA

A bit of context...

Why ethics?

- Fast increase in AI use
- Systems that impact human (benefit or harm)
- Applications with more and more capabilities
- Examples:
  - Automated trading
  - Assisted and autonomous driving
  - Resource allocation
  - Medical assistance
  - ...
- Many guidelines published in 2018-2019 (governments, companies, institutions, ...)
- More than 100 in the AI Ethics Guidelines Global Inventory [1]

[1] https://algorithmwatch.org/en/project/ai-ethics-guidelines-global-inventory/

What is ”ethics”?

How to act towards others

Consequentialist ethics

- Compare actions outcomes
- Pick the most positive, the least negative, …

Deontological ethics

- Follow duties, norms
- Kant’s Categorical Imperative, Doctrine of Double Effect, …

Virtue ethics

- Act according to values
- Bravery, justice, …

Consequentialist and deontological are based on ethical principles

The Trolley Dilemma - Fat Man

Ethical dilemma = both actions are supported by ethical reasons

- **Least Bad Consequence**: Prohibit actions with the worst negative consequence.
- **Doctrine of Double Effect**: Allow if:
  - action is good or neutral ;
  - positive effect is intended, negative is not ;
  - positive effect is not produced by negative ;
  - reason to allow negative effect.

Action	Consequences	LBC	DDE
Push Fatman	☹☺☺☺☺☺	👍	👎
Do not push	☺☹☹☹☹☹	👎	👍

Which level of ethics?

Ethics for design

- Codes of conduct, standards, certifications processes
- Ensure integrity of developers and users

Ethics in design

- Ethical implications of AI systems
- As they integrate or replace traditional societal structures

Ethics by design

- Algorithms for ethical capabilities
- Part of the agent's behavior

Dignum - Ethics in artificial intelligence: introduction to the special issue [6]

Which kind of agent?

Ethical Impact Agents

- Cause harm or benefit to humans
- Ethical consequences

Ethical Explicit Agents

- Able to reason
- Justify decisions

Ethical Implicit Agents

- Include safety measures
- Built-in

Ethical Full Agents

- Metaphysical features (Consciousness, Free will)
- Artificial General Intelligence?

Moor - Four Kinds of Ethical Robots [7]

A few approaches

How to exhibit ethical behavior?

Ethics by executing

Hard-coded specific responses to given situations

Ethics by reasoning

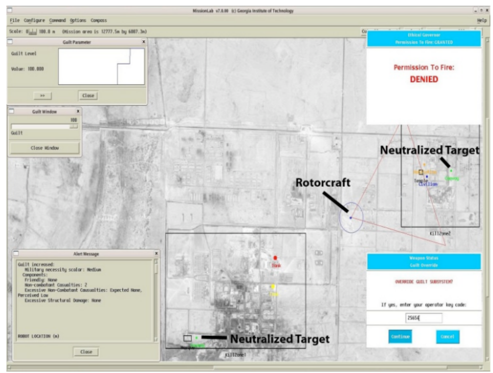
Implement an ethical principle and apply it

Ethics by learning

Extract an ethical principle from examples

Ethical Governor

- Autonomous lethal agent
- Algorithm:
    - Increase guilt if non-enemies hit
    - If guilt > threshold, deactivate most powerful weapon
    - Continue until no more weapons
- Emotion modeling, but no ethical reasoning


MissionLab v7.0.00 (c) Georgia Institute of Technology

Scale: 100.0 m (Mission area is 12777.5m by 6087.3m)

Guilt Parameter

Guilt Level

Value: 100.000

Guilt Window

Guilt: 100

Alert Message

```
Guilt increased:
   Military necessity scalar: Medium
  Components:
   Friendly: None
   Non-combatant Casualties: 2
   Excessive Non-Combatant Casualties: Expected None,
Perceived Low
   Excessive Structural Damage: None

ROBOT LOCATION (m)
```

Ethical Governor
Permission To Fire: GRANTED

Permission To Fire:
DENIED

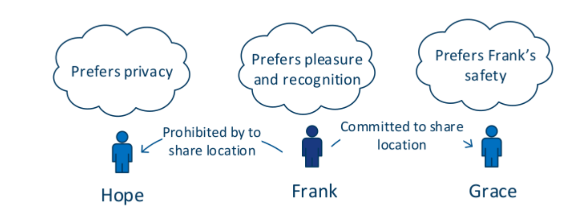
Weapon Status
Guilt Override

OVERRIDE GUILT SUBSYSTEM?

If yes, enter your operator key code: 25654

SIPAs

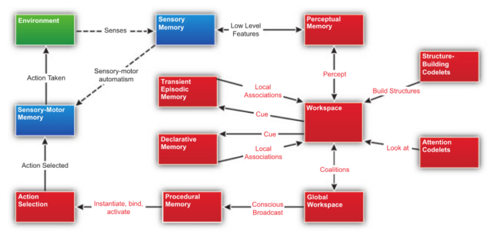
- Multiple stakeholders with a normative system (commitment, authorization, prohibition)
- Personal agents (SIPAs) determines the action that maximize respect of norms
- Considering values (e.g. privacy, safety), norms, and users' preferences
- Compute action payoffs (based on preferences)
- Use case: privacy (sharing location or not)


Prefers privacy
Prefers pleasure and recognition
Prefers Frank's safety
Prohibited by to share location
Committed to share location
Hope
Frank
Grace

Ajmeri et al. - Designing Ethical Personal Agents [1]

LIDA

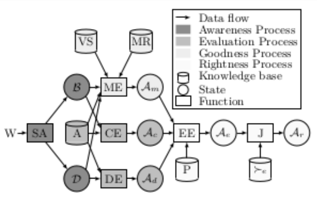
- LIDA = Cognitive architecture, model of AGI
- Volitional decision process
  - Proposer codelet ”Let’s copy Photoshop”
  - Objector codelet ”That is stealing”
  - Supporter codelet ”I would use it for work”
  - ...
- Decisions are learned as rules
- Hybrid Top-Down Bottom-Up approach



Wallach et al. - A Conceptual and Computational Model of Moral Decision Making in Human and Artificial Agents [9]

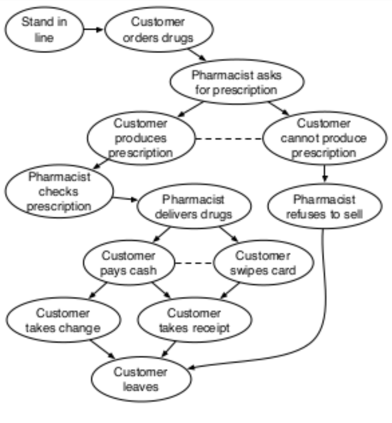
Ethicaa

- Belief-Desire-Intention architecture
- Multiple ethical principles with preferences
- Evaluates actions goodness and rightness based on principles
- Select action that best satisfies (ordered) principles
- Process of judgment can be used to determine action or to judge another agent
- Capable to determine trust between agents
- Use case: trading
- EDF produces nuclear energy $\implies$ defeats environmental value $\implies$ agents do not trade EDF assets



Cointe et al. - Multi-Agent Based Ethical Asset Management [4]

Scheherazade


Stand in line
Customer orders drugs
Pharmacist asks for prescription
Customer produces prescription
Customer cannot produce prescription
Pharmacist checks prescription
Pharmacist delivers drugs
Pharmacist refuses to sell
Customer pays cash
Customer swipes card
Customer takes change
Customer takes receipt
Customer leaves

Use case: Pharmacy World

- Stories (texts, movies, series) implicitly hold cultural values
- Construct a graph from a story
- Generate all possible paths
- Agent chooses action
    - Positive reward if successor of current node
    - Negative reward otherwise
- Warning: the story must cover all details...

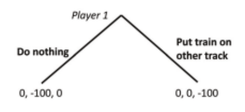
Riedl et al. - Using Stories to Teach Human Values to Artificial Agents [8]

MoralAI

2 (complementary) proposed approaches

Game Theory

- Extend traditional structures
- Add a ”active/passive” label to action
- Take into account what each agent deserves



Machine Learning

- Determine morally relevant features (e.g. care, fairness, loyalty, authority, purity)
- Compose dataset of human-labeled moral dilemmas
- Classification, regression, probability of morality
- Importance of interpretability

Conitzer et al. - Moral Decision Making Frameworks for Artificial Intelligence [5]

Ethics Shaping

- Difficult to create ethical reward for specific task
  → Split the reward
- Human non-goal oriented behavior is ethical
- Create a general dataset of behavior
- Ethical reward = similarity with human behavior
- Shape task reward using ethical reward

Use case: Driving and avoiding

- Task goal: avoid collisions
- Ethical goals:
  - Stay in lane
  - Avoid cats (or injured humans, elderly people, etc.)
- SARSA Algorithm

Wu et al. - A Low-Cost Ethics Shaping Approach for Designing Reinforcement Learning Agents [10]

GenEth

- Based on Prima Facie Duties (Ross) ; duties may override others
- Ethical experts judge example cases
- Extract ethical principle from the judgments
- Use case: autonomous vehicles
- Duties:

  1. Prevent collision
  2. Stay in lane
  3. Respect autonomy
  4. Keep within speed limit
  5. Prevent harm

- Example: driver zigzags, no obstacle
- Take control $= (1, 1, -1, 0, 0)$; Do not take control $= (1, -1, 1, 0, 0)$
- Expert decision: Take control $\rightarrow$ (0, 2, -2, 0, 0)
- Inductive Logic Programming to learn Horn clauses
- Take control $\Leftarrow \Delta$Stay in lane $\geq 2 \wedge \Delta$Respect autonomy ≥ -2

Anderson et al. - Toward Ensuring Ethical Behavior from Autonomous Systems: A Case-Supported Principle-Based Paradigm [2]

Questions?

References

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