# Extracting Money from Causal Decision Theorists

Caspar Oesterheld, Vincent Conitzer
Department of Computer Science, Duke University





• A "being" offers two boxes.

• A "being" offers two boxes.

Box A: \$1,000

A "being" offers two boxes.

Box A: \$1,000 Box B: \$1,000,000 or nothing

 Twist: Yesterday, the being filled box B if and only if it predicted the agent to take only box B.

A "being" offers two boxes.

Box A: \$1,000

- Twist: Yesterday, the being filled box B if and only if it predicted the agent to take only box B.
- Causal Decision Theory: The agent cannot causally influence the box contents.

A "being" offers two boxes.

Box A: \$1,000

- Twist: Yesterday, the being filled box B if and only if it predicted the agent to take only box B.
- Causal Decision Theory: The agent cannot causally influence the box contents.
  - CEU(one-box) =  $P(box B full) \cdot $1,000,000$

• A "being" offers two boxes.

Box A: \$1,000

- Twist: Yesterday, the being filled box B if and only if it predicted the agent to take only box B.
- Causal Decision Theory: The agent cannot causally influence the box contents.
  - CEU(one-box) = P(box B full)  $\cdot$  \$1,000,000
  - $CEU(two-box) = P(box B full) \cdot $1,000,000 + $1,000$

• A "being" offers two boxes.

Box A: \$1,000

- Twist: Yesterday, the being filled box B if and only if it predicted the agent to take only box B.
- Causal Decision Theory: The agent cannot causally influence the box contents.
  - CEU(one-box) =  $P(box B full) \cdot $1,000,000$
  - $CEU(two-box) = P(box B full) \cdot $1,000,000 + $1,000$
- Evidential Decision Theory:
  - $EEU(one-box) = P(box B full | one-box) \cdot $1,000,000$

• A "being" offers two boxes.

- Twist: Yesterday, the being filled box B if and only if it predicted the agent to take only box B.
- Causal Decision Theory: The agent cannot causally influence the box contents.
  - CEU(one-box) =  $P(box B full) \cdot $1,000,000$
  - $CEU(two-box) = P(box B full) \cdot $1,000,000 + $1,000$
- Evidential Decision Theory:
  - $EEU(one-box) = P(box B full | one-box) \cdot $1,000,000$
  - $EEU(two-box) = P(box B full | two-box) \cdot $1,000,000 + $1,000$

• A being offers two boxes. Each costs \$1 and contains \$3 or nothing. The agent can buy at most one box.

• A being offers two boxes. Each costs \$1 and contains \$3 or nothing. The agent can buy at most one box.

Box 1: \$3 or nothing Box 2: \$3 or nothing

A being offers two boxes. Each costs \$1 and contains \$3 or nothing.
 The agent can buy at most one box.

Box 1: Box 2: \$3 or nothing

Twist: Yesterday, the being filled each box it predicted you not to acquire.

A being offers two boxes. Each costs \$1 and contains \$3 or nothing.
 The agent can buy at most one box.

Box 1: Box 2: \$3 or nothing

- Twist: Yesterday, the being filled each box it predicted you not to acquire.
- Causal Decision Theory:

```
CEU(box 1) + CEU(box 2)
= P(box 1 filled) \cdot $3 - $1 + P(box 2 filled) \cdot $3 - $1
\geq $3 -$2 = $1
```

Hence, CDT recommends buying a box.

## Thank you for your attention!