Negotiation Between Agents

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Background

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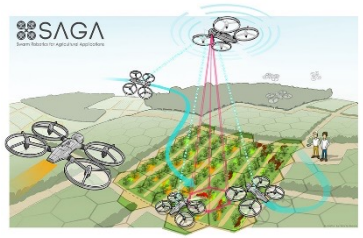
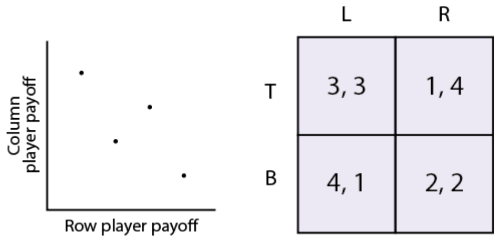
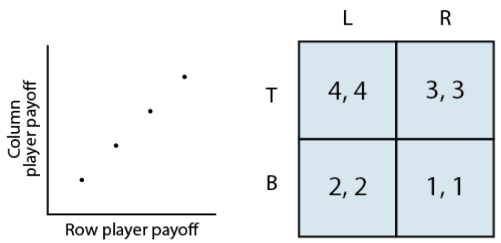
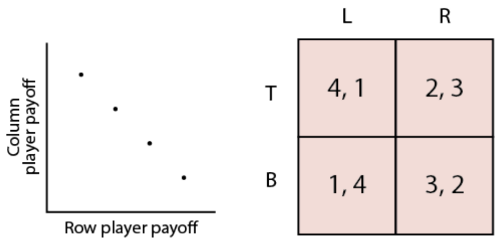




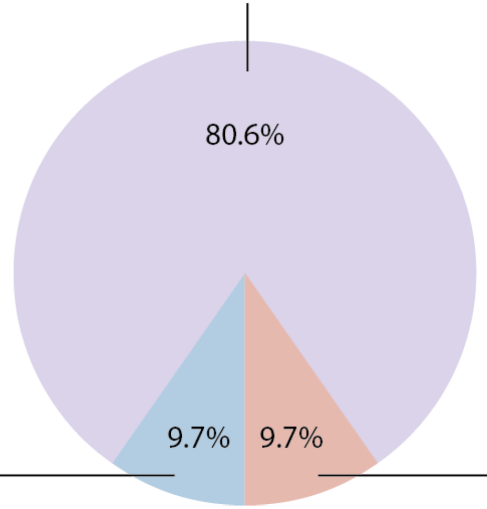
Example mixed-motive game



Example common-interest game

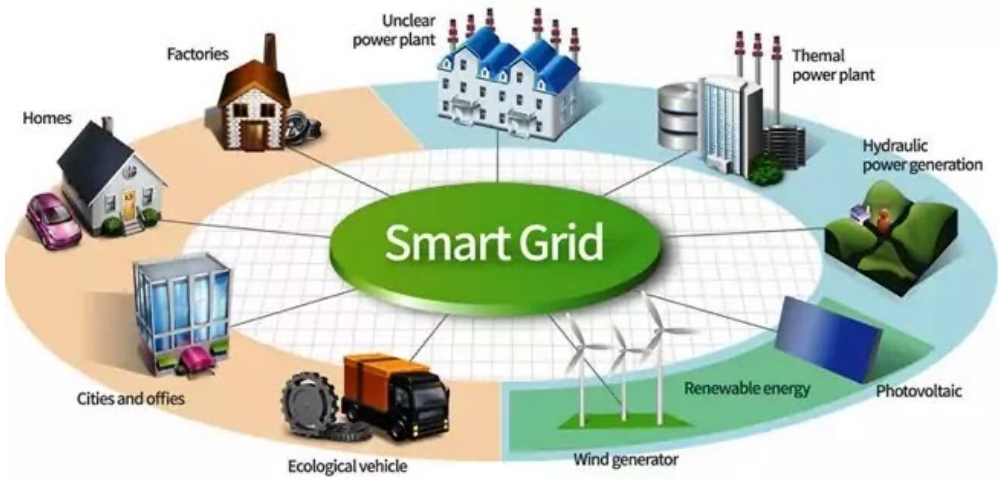


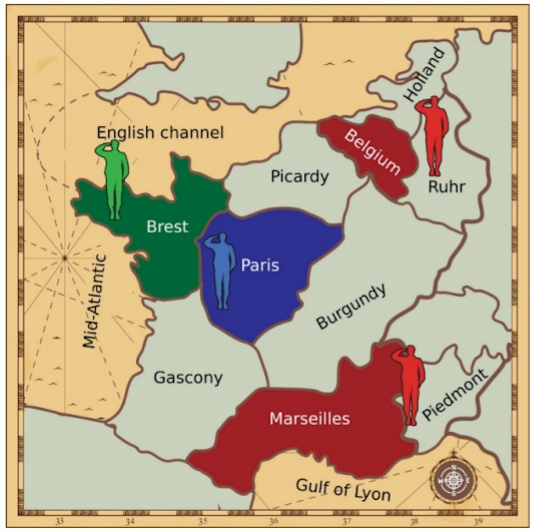
Example conflicting-interest game



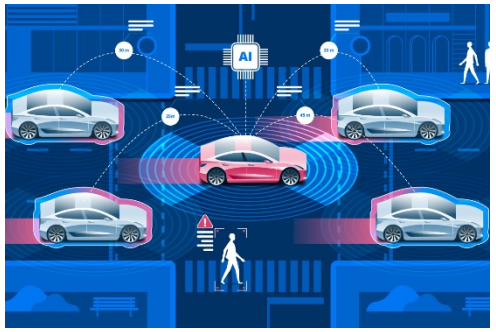
Oxford/Deepmind 2020

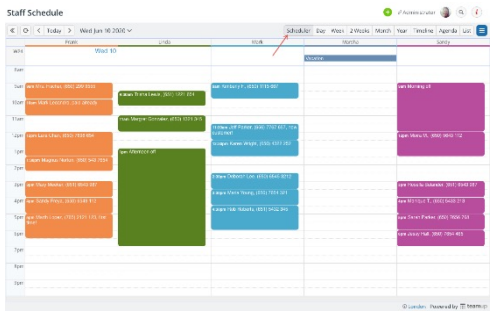
Background





Meta AI & Deepmind 2022

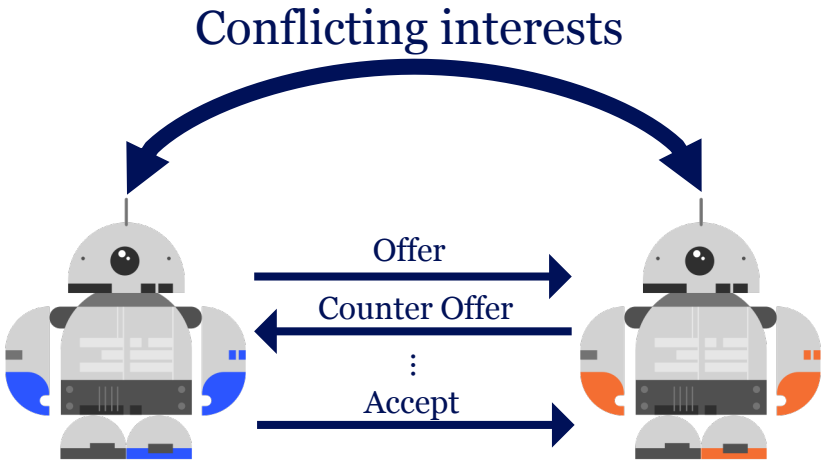




If there are no Institutions/Norms to solve the Mixed-Motive problem then
Negotiation becomes an important method to find common ground

Negotiation Between Agents

- Cooperating agents with partly conflicting interests
  - Decide on a solution $\omega \in \Omega$ through negotiation
  - Agent interests are expressed as utility over solution space $u : \Omega \mapsto \mathbb{R}$
  - Terminology: Negotiation problem



- Example: Agents alternate in making offers until a deadline
  - Utility is awarded based on the reached agreement -> $u(\omega_{agree})$
  - Failing to reach an agreement before the deadline -> $u = 0$

- Goal: e.g. Maximise utility for your agent

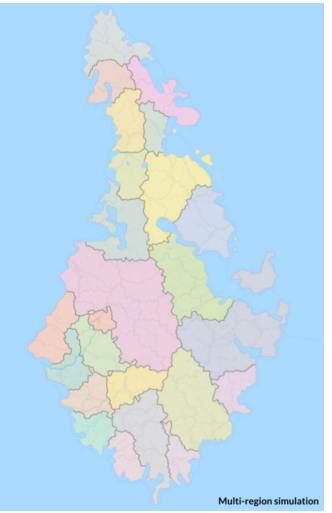
Negotiation Between Agents

- Example: Agents negotiate using natural language
  - Human compatible
  - Achieved recently by Meta AI in the game of Diplomacy

Meta AI (CICERO) - 2022

What do I do?

AI 4 Climate Cooperation

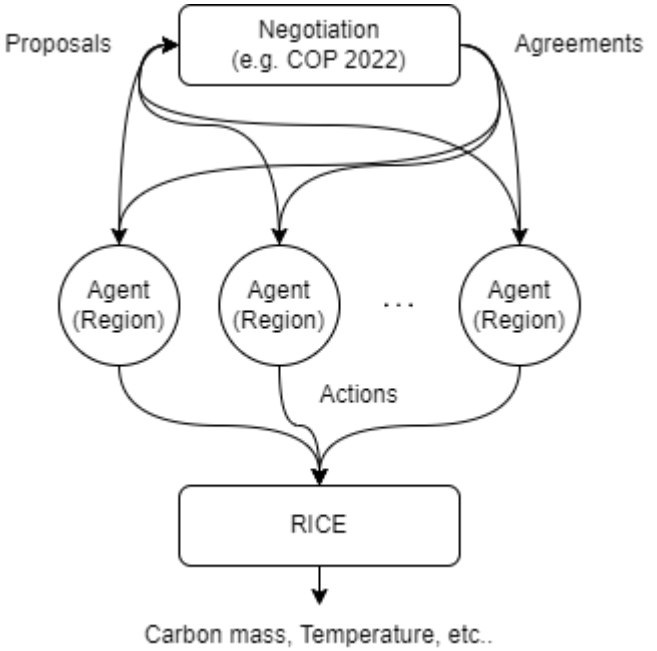


- Climate Cooperation simulation
  - Simulate a world with multiple independent regions
  - Regional Integrated model of Climate and Economy (RICE) – Lessmann et al. (2009)

- Simulate a world for 100 years & avoid climate disaster
  - Can we learn something from such a simulation?

- Climate change mitigation has costs attached
  - Can we prevent free riders by mechanisms?
  - Stop import/export? Increase/Decrease tariffs?

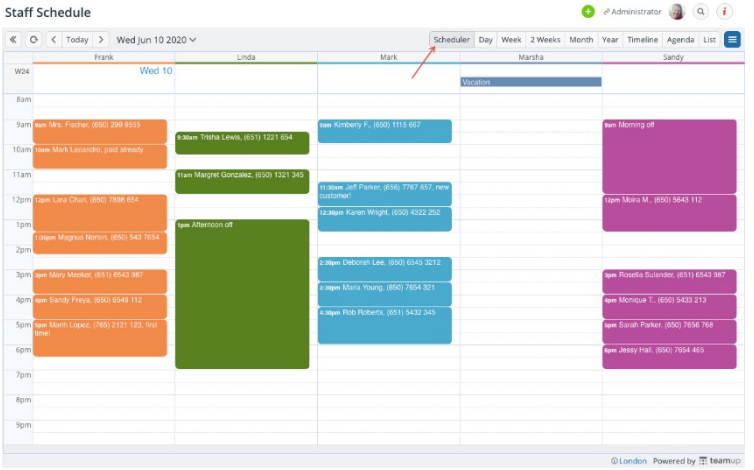
- AI for Global Climate Cooperation
  - https://www.ai4climatecoop.org/



Calendar Scheduling

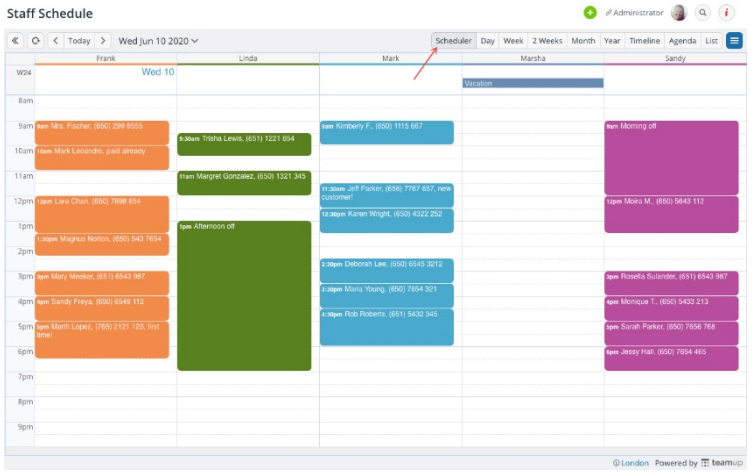
- Attempted before in another AI age (~1995-1998)
  - Katia Sycara, Sarit Kraus

- Motivation
  - Real world problem & annoyance
  - Good fit for negotiating agents (multi-agent, mixed-motive)



- Challenges
  - Understanding human preferences
  - Finding common slots in groups of busy people (rescheduling other meetings?)
  - Communicating with humans

Calendar Scheduling



AI 4 Climate Cooperation