



# Game Theory

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*All models are wrong, but some are useful.*

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# Chapter 1 Signalling Game

Based on

- "Kreps, D. M., & Sobel, J. (1994). Signalling. *Handbook of game theory with economic applications*, 2, 849-867."
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## 1.1 Canonical Game

### Definition 1.1 (Canonical Game)

1. There are two players: **S** (sender) and **R** (receiver).
2. **S** holds more information than **R**: the value of some random variable  $t$  with support  $\mathcal{T}$ . (We say that  $t$  is the **type** of **S**)
3. Prior belief of **R** concerning  $t$  are given by a probability distribution  $\rho$  over  $\mathcal{T}$  (common knowledge)
4. **S** sends a **signal**  $s \in \mathcal{S}$  to **R** drawn from a signal set  $\mathcal{S}$ .
5. **R** receives this signal, and then takes an **action**  $a \in \mathcal{A}$  drawn from a set  $\mathcal{A}$  (which could depend on the signal  $s$  that is sent).
6. **S**'s payoff is given by a function  $u : \mathcal{T} \times \mathcal{S} \times \mathcal{A} \rightarrow \mathbb{R}$  and **R**'s payoff is given by a function  $v : \mathcal{T} \times \mathcal{S} \times \mathcal{A} \rightarrow \mathbb{R}$ .



## 1.2 Nash Equilibrium

### Definition 1.2 (Strategy)

A **behavior strategy** for **S** is given by a function  $\sigma : \mathcal{T} \times \mathcal{S} \rightarrow [0, 1]$  such that  $\sum_s \sigma(t, s)$  for each  $t$ .

A **behavior strategy** for **R** is given by a function  $\alpha : \mathcal{S} \times \mathcal{A} \rightarrow [0, 1]$  such that  $\sum_a \alpha(s, a)$  for each  $s$ .

