Optimal Persuasion via Bi-Pooling

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The Partially Informed Sender Setting

- States: $\Theta = \{0, 1\}$.
- Sender is partially informed about the state. Namely Sender's belief about the state is distributed according to $F \in \Delta([0, 1])$.
- Sender's policy: A mapping from beliefs to signals.
- Receiver receives the signal, updates his belief, and takes an action that affects Sender's utility.
- **Bayesian persuasion:** Sender commits to a policy before she observes her signal.

Mean Preserving Contractions

Special Property:

Receiver's action is a function of posteriors' mean.

Signalling policy $\rightsquigarrow$ Distribution over posterior means.

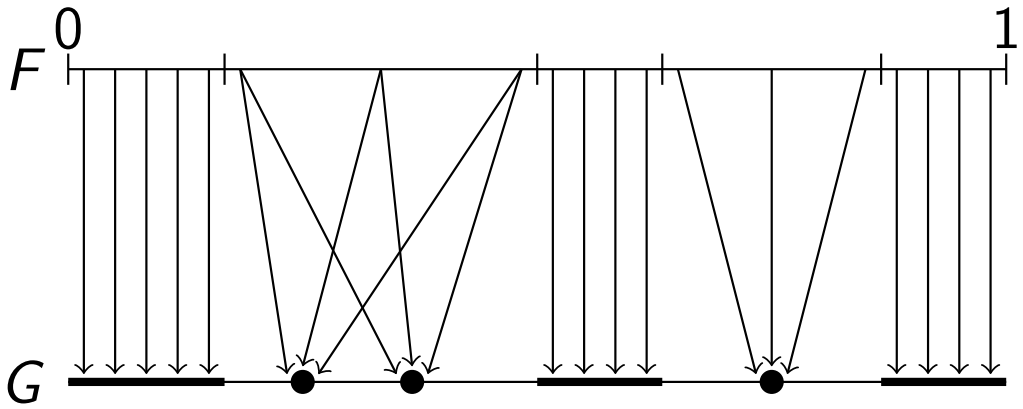
Which distributions over posterior means are implementable?

[Gentzkow, Kamenica '16], [Kolotilin '18]

A distribution over posterior means $G \in \Delta([0,1])$ is implementable by some signalling policy $\Leftrightarrow$

G is a mean preserving contraction of the prior $F \in \Delta([0,1])$.

Bi-Pooling Contractions



Main Theorem 1

Every persuasion problem admits an optimal solution that is a bi-pooling contraction.

Main Theorem 2

For every bi-pooling contraction there exists a persuasion problem (a utility) for which this contraction is the **unique** optimal solution.