



Frequentist Persuasion

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Motivation

People interpret communication based on past experience.

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Customer reviews

★★★★★ 4.3 out of 5 ▾

314 customer ratings



RECOMMENDATION FORM FOR PhD PROGRAM ADMISSIONS

Applicant's Name: _____
Recommender's Name: _____
Institution/Program: _____

Please evaluate the applicant in the following categories by checking the appropriate box in each row.

	Below Average	Average	Good	Top 10%	Top 5%	Exceptional (Top 1%)
Intellectual Ability	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Motivation & Initiative	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Analytical Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Writing Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Communication Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall Potential	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments:

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Motivation

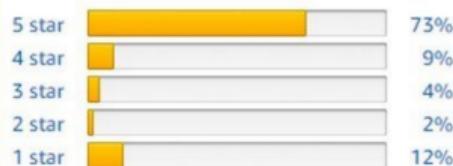
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The distribution of available data depends on nature **and** sender's strategy.

Outline

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- Model** of persuasion where posteriors are estimated from data.
- Examples** of over- and under-communication relative to KG.
- Existence** of finite receiver-optimal sample sizes.
- Characterization** of the sense in which FP → KG.
- Conclusion** and related literature.

Model

The Frequentist Persuasion Game

See [here](#).

Formal Environment

Players	Sender and Receiver
States	Θ (Finite)
Actions	A (Finite)
Messages	M (Finite)
Payoffs	$U^R, U^S : A \times \Theta \rightarrow \mathbb{R}$
Prior	$\mu_0 \in \Delta(\Theta)$

Sample Size	$N \in \mathbb{N}$
Learning Rule	$\ell : (\text{Data}) \times M \rightarrow \Delta(\Theta)$

1. Sender chooses **experiment**
 $\sigma : \Theta \rightarrow \Delta(M)$
2. N IID (state, message) pairs are drawn from $\Theta \times M$. Call this **data**
 $H_N = \{(\theta_i, m_i)\}_{i=1}^N$.
3. Receiver sees H_N , and a **payoff-relevant** message m .
4. Receiver forms beliefs according to ℓ and acts.
5. Payoffs realized.

Receiver's Decision Problem

$$a(m; H_N) = \arg \max_{a \in A} \sum_{\theta \in \Theta} U^R(a, \theta) \cdot \ell(\theta; m, H_N)$$

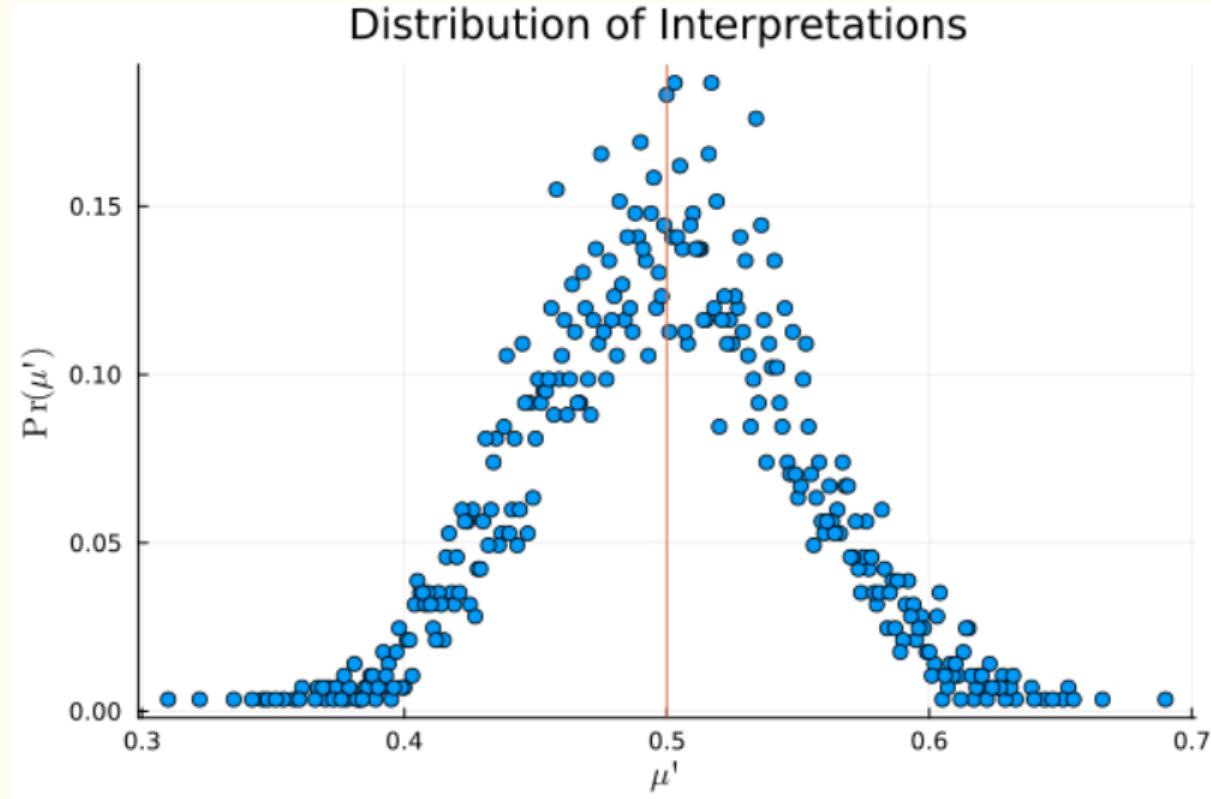
Result 1: Receiver-Optimal Sample Sizes

Consider the prosecutor-judge example. There exists a finite $N^* < \infty$ where:

1. Prosecutor provides more information than at any other N' .
 2. Receiver's (ex-ante) welfare is higher than at any other N' .
-

See [here](#).

Result 1: Visualization



Result 1: Proof Sketch

1. Let $V_N(z) := \underbrace{(\mu_0 + z(1 - \mu_0))}_{\pi(z)} \cdot c_N(z)$, where $c_N(z) = \Pr[\ell(1; [X, Y, Z])] \geq \frac{1}{2}$.

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2. Consistency and asymptotic normality of ℓ , combined with **convergence of experiments** $z_N \rightarrow z^{KG}$, imply that $c_N(z_N) \rightarrow \frac{1}{2}$.
3. Since c_N is decreasing and $\pi(z)$ is increasing:

$$\max_{[z^{KG}, z^{KG} + \varepsilon]} V_N(z) \leq \pi(z^{KG} + \varepsilon) \cdot c_N(z^{KG})$$

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5. So $z_N \uparrow z^{KG}$ by convergence of values.

Result 2: Convergence of Frequentist to Bayesian Persuasion

Definition

A function sequence $V_N : X \rightarrow \mathbb{R}$ *hypo-converges* to $V : X \rightarrow \mathbb{R}$ iff for all $x \in X$:

1. For **every** convergent $x_N \rightarrow x$, $\limsup V_N(x_N) \leq V(x)$.
2. For **some** convergent $x_N \rightarrow x$, $\liminf V_N(x_N) \geq V(x)$.

In this case we write $V_N \xrightarrow{h} V$.

*Assumption 3 in [Best and Quigley \(2023\)](#)

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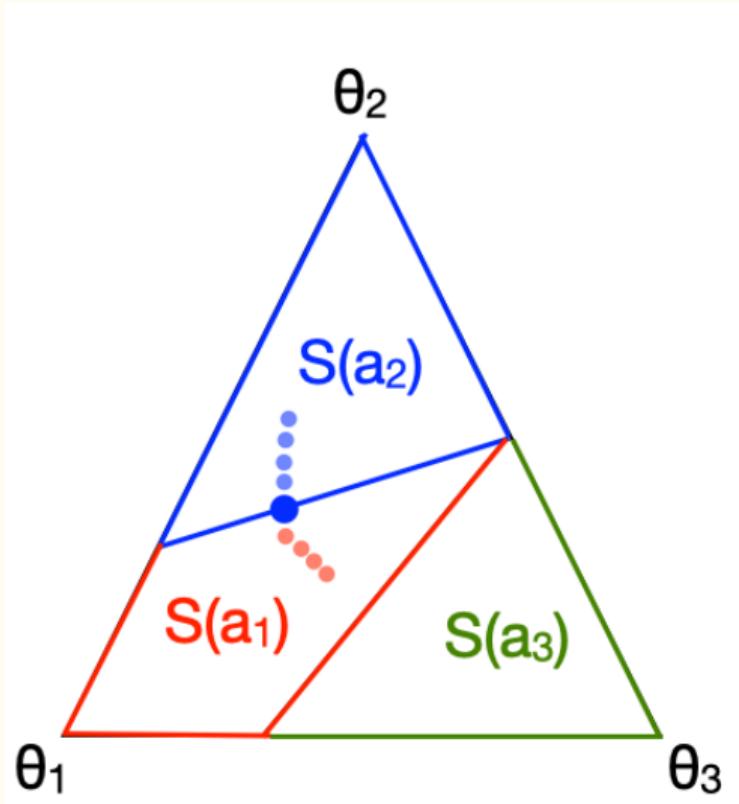
Theorem

Let $V_N(\sigma)$ be the frequentist objective function for arbitrary (N, μ_0, U^R, U^S) and consistent and asymptotically normal ℓ . Let payoffs satisfy a regularity condition.*

Then $V_N(\sigma) \xrightarrow{h} V^{KG}(\sigma)$. Which means (by Theorem 7.33 in Rockafellar and Wets (1998)), $z_N \rightarrow z^{KG}$ and $\max V_N \rightarrow \max V^{KG}$.

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Result 2: Visualization



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So a_K is an M -estimator, and converges whenever M -estimators converge (van der Vaart, 1998).

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That is, when expected utilities converge uniformly over A and optimal actions can't be approximated outside ε -neighborhoods.

Conclusion and Related Literature

Related Literature

Bayesian Persuasion	Kamenica and Gentzkow (2011)
Misspecified Persuasion	de Clippel and Zhang (2022); Eliaz et al. (2021); Dworczak and Pavan (2022)
Noisy Persuasion	Le Treust and Tomala (2019); Tsakas and Tsakas (2021)
Persuasion by Experiment	Ball and Espin-Sanchez (2021); Patil and Salant (2023); Kolotilin et al. (2017)
Persuasion with Learning	Lin and Chen (2024)

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Result 2A Actions in SADPs converge when Bayesian DMs aren't indifferent

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