Observe:

Watch the clip from the 2022 FIFA world cup final game between Argentina and France: https://youtu.be/MCWJNOfJoSM?t=293.

Research Question:

Are penalty kicks played in a *mixed strategy equilibrium?*

This is the question asked by Ignacio Palacios-Huerta. [1] He gathers data on penalty kicks from 1995-2000 from professional games in England, Italy, and Spain. The table below (from Harrington) shows his estimates for the payoff matrix of penalty kicks.

		Goalie		
		Left	*Center*	*Right*
Kicker	*Left*	.65, .35	.95, .05	.95, .05
	Center	.95, .05	0, 1	.95, .05
	Right	.95, .05	.95, .05	.65, .35

Hypothesize / Make a prediction:

1. Solve for the Mixed Strategy Nash Equilibrium of this game using the method we learned in lecture 6.

2. Generate predictions of how often we should see each outcome realized using your answer from above.

Goalie	**Kicker**	**Probability**
Kick Left	Intercept Left	
Kick Left	Intercept Center	
Kick Left	Intercept Right	
Kick Center	Intercept Left	
Kick Center	Intercept Center	
Kick Center	Intercept Right	
Kick Right	Intercept Left	
Kick Right	Intercept Center	
Kick Right	Intercept Right	

[1] Palacios-Huerta, Ignacio. "Professionals Play Minimax," *Review of Economic Studies*, 70 (2003), 395-415

Test your prediction:

Compare your predictions with the actual choices of Kickers and Goalkeepers recorded by Palacios-Huerta:

Goalie	**Kicker**	**Frequency (Percent)**
Kick Left	Intercept Left	19.6
Kick Left	Intercept Center	0.9
Kick Left	Intercept Right	21.9
Kick Center	Intercept Left	3.6
Kick Center	Intercept Center	0.3
Kick Center	Intercept Right	3.6
Kick Right	Intercept Left	21.7
Kick Right	Intercept Center	0.5
Kick Right	Intercept Right	27.6

Discuss

1. How well do the data fit your theoretical predicitons?

2. Would you expect this result to hold in other settings? For example, among amateur soccer players instead of pros? What if we made the same professional players play other games with mixed strategy equilibria?