

Strategic Reasoning

Theory Online

Game

Theory

Game Theory Course:

Jackson, Leyton-Brown & Shoham

Keynes Beauty Contest Game: The Stylized Version Game

e-sum probability Online

Keynes Beauty Contest Game: The Stylized Version Game Theory and alegies of the Conline

• The player who names the integer closest to two thirds of the average integer wins a prize, the other players get nothing. • Ties are broken uniformly at random.

Strategic Reasoning Game

• Each player names an integer between I and 100.

• What will other players do?

Strategic Reasoning

What will other players do?

• What should I do in response?

Game Theory regies Online • What will other players do? • What should I do in response?

Strategic Reasoning Game

Solving the Beauty Contest Game Game Theory and the state of the sta ullet Suppose a player believes the average play will be X (including his or her own integer)

• Each player best responds to the others: Nash equilibrium

Solving the Beauty Contest Game Game

ullet Suppose a player believes the average play will be X (including

• That player's optimal strategy is to say the closest integer to  $\frac{2}{3}X$ .

his or her own integer)

has to be no more than 67.

Solving the Beauty Contest Game

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Solving the Beauty Contest Game

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X has to be less than 100, so the optimal strategy of any player

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ullet If X is no more than 67, then the optimal strategy of any player

Solving the Beauty Contest Game

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• That player's optimal strategy is to say the closest integer to  $\frac{2}{3}X$ .

ullet X has to be less than 100, so the optimal strategy of any player

• If X is no more than 67, then the optimal strategy of any player has to be no more than  $\frac{2}{3}67$ . • If X is no more than  $\frac{2}{3}67$ , then the optimal strategy of any player has to be no more than  $(\frac{2}{3})^267$ .

ullet Suppose a player believes the average play will be X (including his or her own integer) • That player's optimal strategy is to say the closest integer to  $\frac{2}{3}X$ .  $\bullet$  X has to be less than 100, so the optimal strategy of any player has to be no more than 67. ullet If X is no more than 67, then the optimal strategy of any player has to be no more than  $\frac{2}{3}67$ .

• If X is no more than  $\frac{2}{3}67$ , then the optimal strategy of any

Iterating, the unique Nash equilibrium of this game is for every

player has to be no more than  $(\frac{2}{3})^2 67$ .

player to announce 1!

Nash equilibran

Mean 34 Histogram Mode 50 Median 33 Winner 23

Histogram

Online course: more than 10000 players:

**2012 GTOC** 

2012 Again

Mean 6 Mode 1 Median 2 Winner 4

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Nash Equilibrium Game transly of the collins and the collins are collins and the collins are collins and the collins and the collins and the collins are collin • A consistent list of actions:

Nash Equilibrium • A consistent list of actions:

actions of the others.

Summary Nash Equilibrium

actions of the others.

actions of the others.

Nash Equilibrium

equilibrium profile is played.

equilibrium profile is played.

• A self-consistent or stable profile

Nash Equilibrium

• A consistent list of actions:

actions of the others.

• Each player's action maximizes his or her payoff given the

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actions of the others.

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Summary Nash Equilibrium Game

Summary Nash Equilibrium

• Each player's action maximizes his or her payoff given the

• Nobody has an incentive to deviate from their action if an

• Each player's action maximizes his or her payoff given the

• Nobody has an incentive to deviate from their action if an

• Someone has an incentive to deviate from a profile of actions that do not form an equilibrium.

• Should we expect equilibria to be played?

Nash Equilibrium

 Should we expect equilibria to be played? Stable

 Should we expect non-equilibria to be played? vanish over time - sequalibrim
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Game Theory