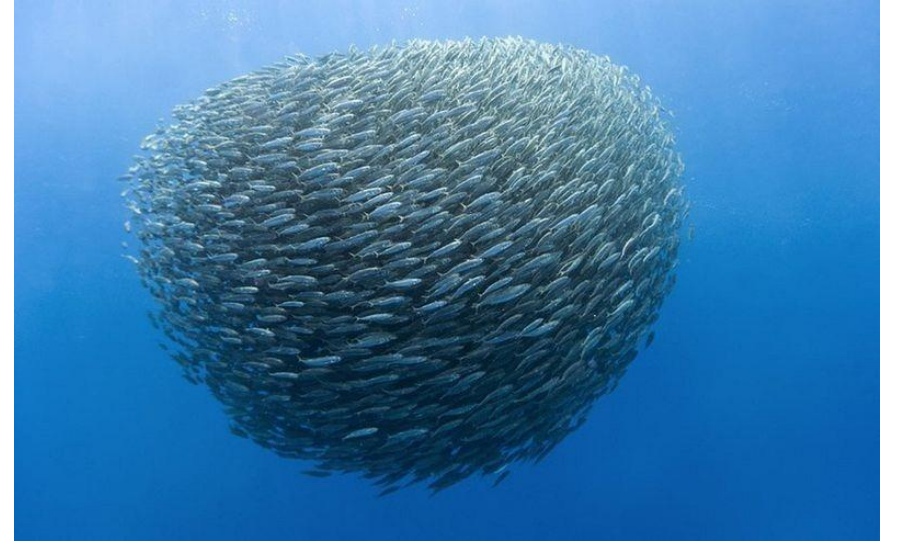


Modelación, Simulación y Control de Fenómenos Complejos



Universidad del
Rosario

Escuela de Ingeniería,
Ciencia y Tecnología



MACC
Matemáticas Aplicadas y
Ciencias de la Computación

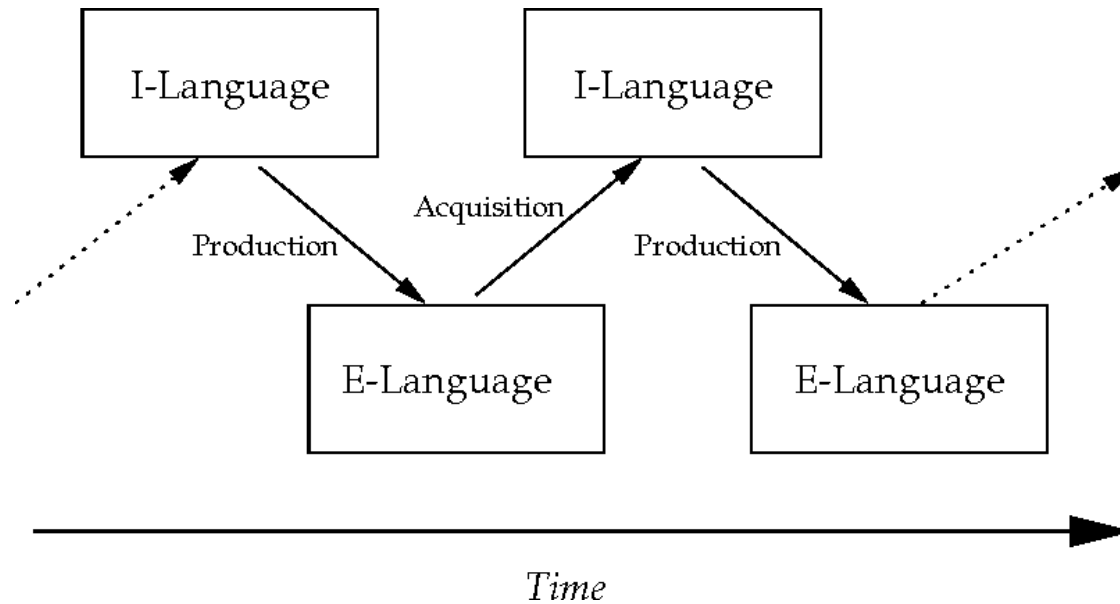
Fenómenos complejos (1/3)

- Juego de la vida:
 - Any live cell with two or three neighbors survives.
 - Any dead cell with three live neighbors becomes a live cell.
 - All other live cells die in the next generation. Similarly, all other dead cells stay dead.
 - <https://bitstorm.org/gameoflife/>

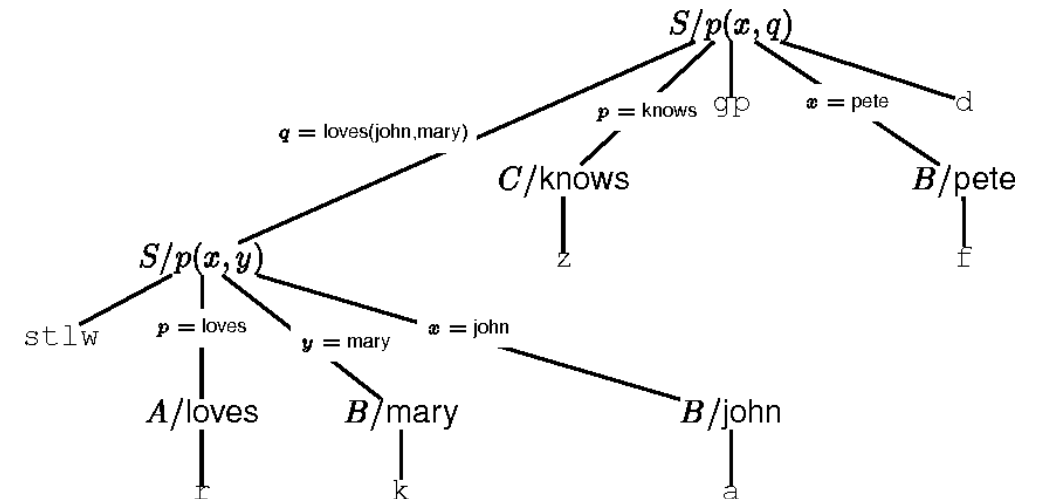
Fenómenos complejos (2/3)

- Segregación racial:
 - Two types of agents: X and O (might represent different races, ethnicity, economic status, etc.)
 - A **satisfied** agent is one that is surrounded by at least t percent of agents that are like itself.
 - When an agent is not satisfied, it can be moved to any vacant location in the grid.
 - <https://www.youtube.com/watch?v=dnffIS2EJ30>
 - <https://www.youtube.com/watch?v=0p7JC5gEyzM>

Fenómenos complejos (3/3)



Varias formas gramaticales son copiadas de una generación a otra. Sólo las formas más sencillas de aprender son seleccionadas.



El Farol



100 people decide independently each week whether to go to a bar. Space is limited, and the evening is enjoyable if fewer than 60% of the possible 100 are present.

Teoría de juegos para “El Farol” (adaptado)

- Supongamos 2 jugadores
- Cada jugador tiene 2 “estrategias” posibles: ir o no ir al bar El Farol
- Cada jugador tiene la misma función de pagos: 1 si va y el otro jugador no va; -1 si va y el otro jugador también va; 0 si no va.

Jugador 1

	IR	NO IR
Jugador 2 IR	$(-1, -1)$	$(0, 1)$
NO IR	$(1, 0)$	$(0, 0)$

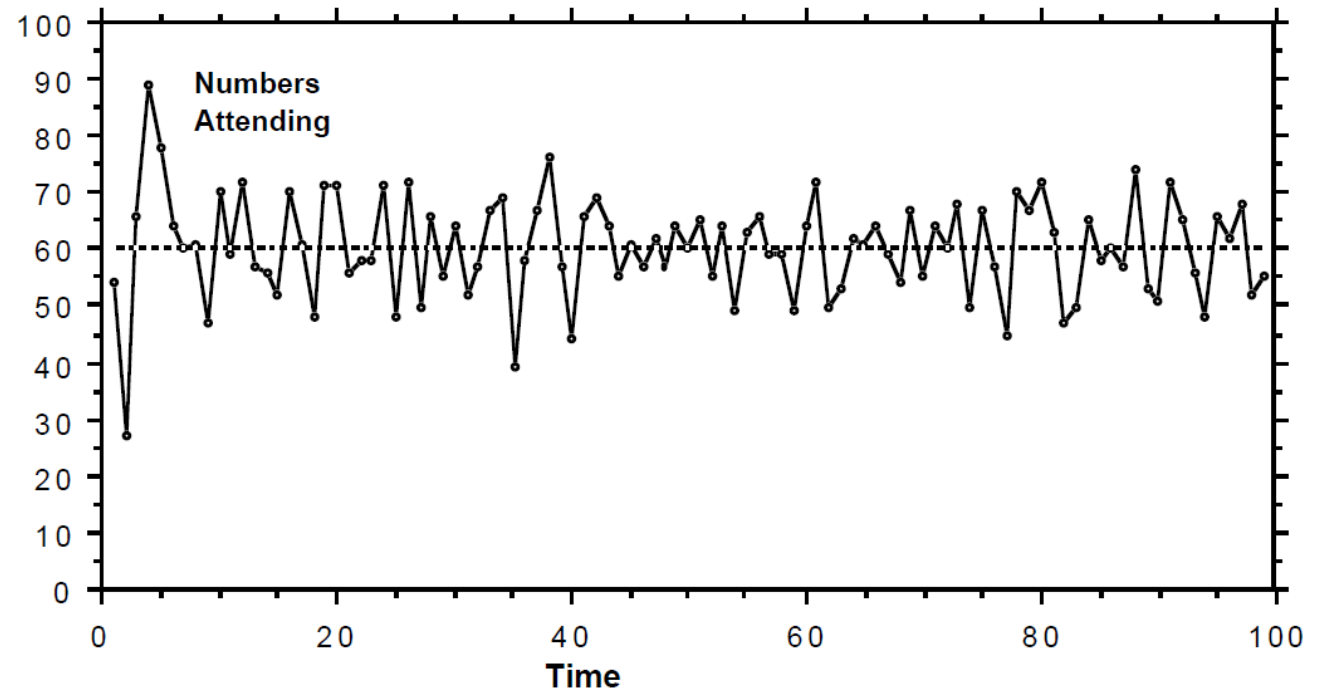
¡Múltiples equilibrios de Nash!

Bounded rationality

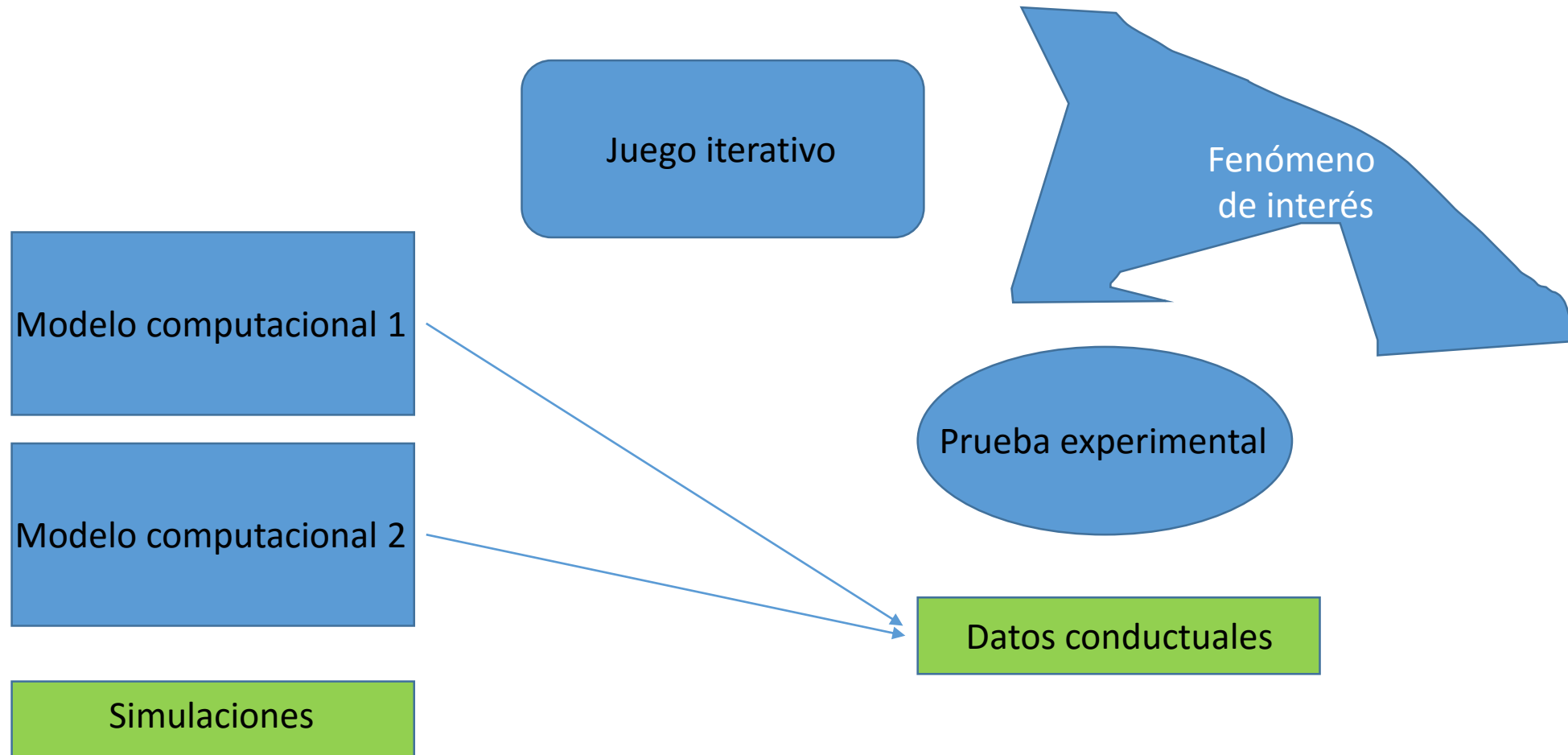
Particular hypotheses or predictors: *predict next week's number to be:*

- the same as last week's
- a mirror image around 50 of last week's
- 67
- a (rounded) average of the last four weeks
- the same as 2 weeks ago (2-period cycle detector)
- etc. ...

Heurística: WinStay-LoseShift

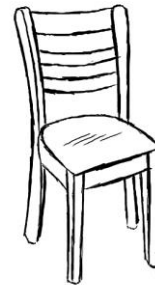


Explicación basada en modelos



¿Cómo surge la división del trabajo?


Fenómeno
de interés



¿Cómo surge la división del trabajo?

Seeking the Unicorn

Click on squares to tell whether the unicorn is present or absent:
Important: A blue square means that both players have visited it.

						Empty	Empty
						Empty	Empty
						Empty	Empty
						Empty	Empty
							Empty
							Empty
							Empty
							Empty



<= Points based
on common
locations

My current guess is that the unicorn is:

Your current decision is: **Present**

Your partner's current decision is: **Present**

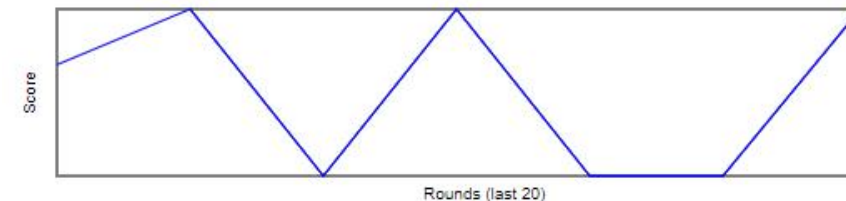
Seeking the unicorn

Your answer is correct

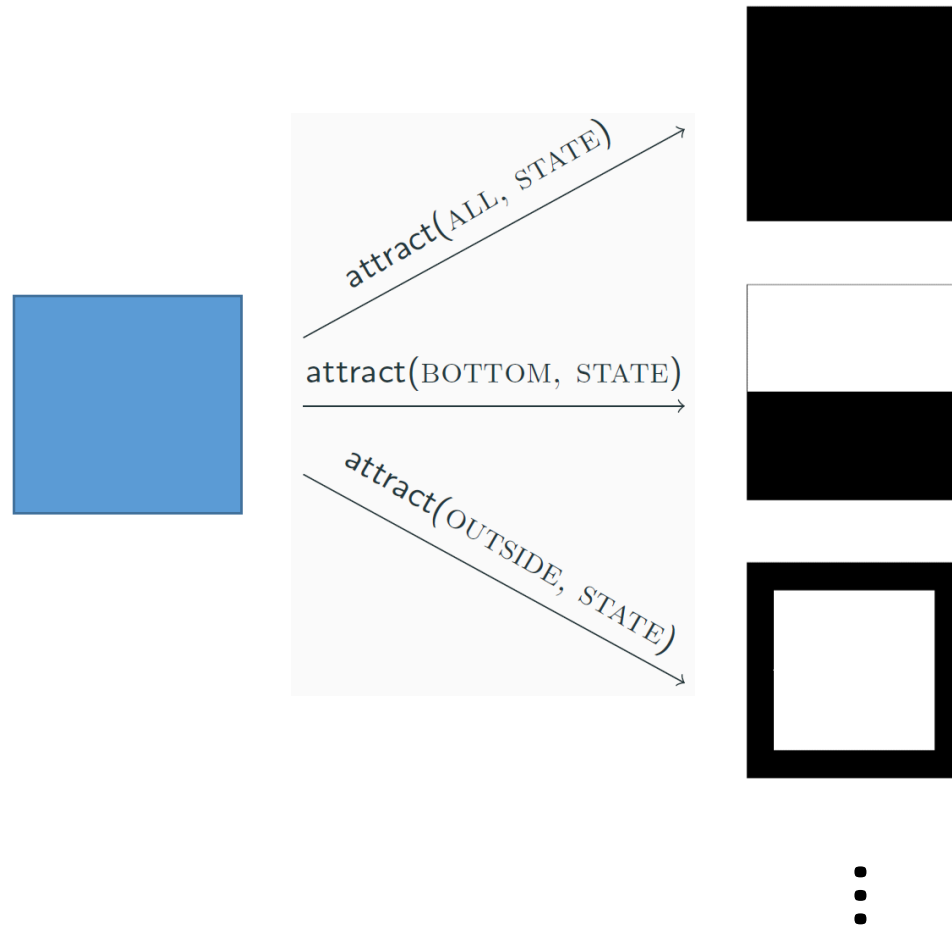
You get 32 points - 3 points = 29 points

for
correct
answer
with
unicorn
present
for
common
locations

You and your partner clicked on the same locations 3 time(s).

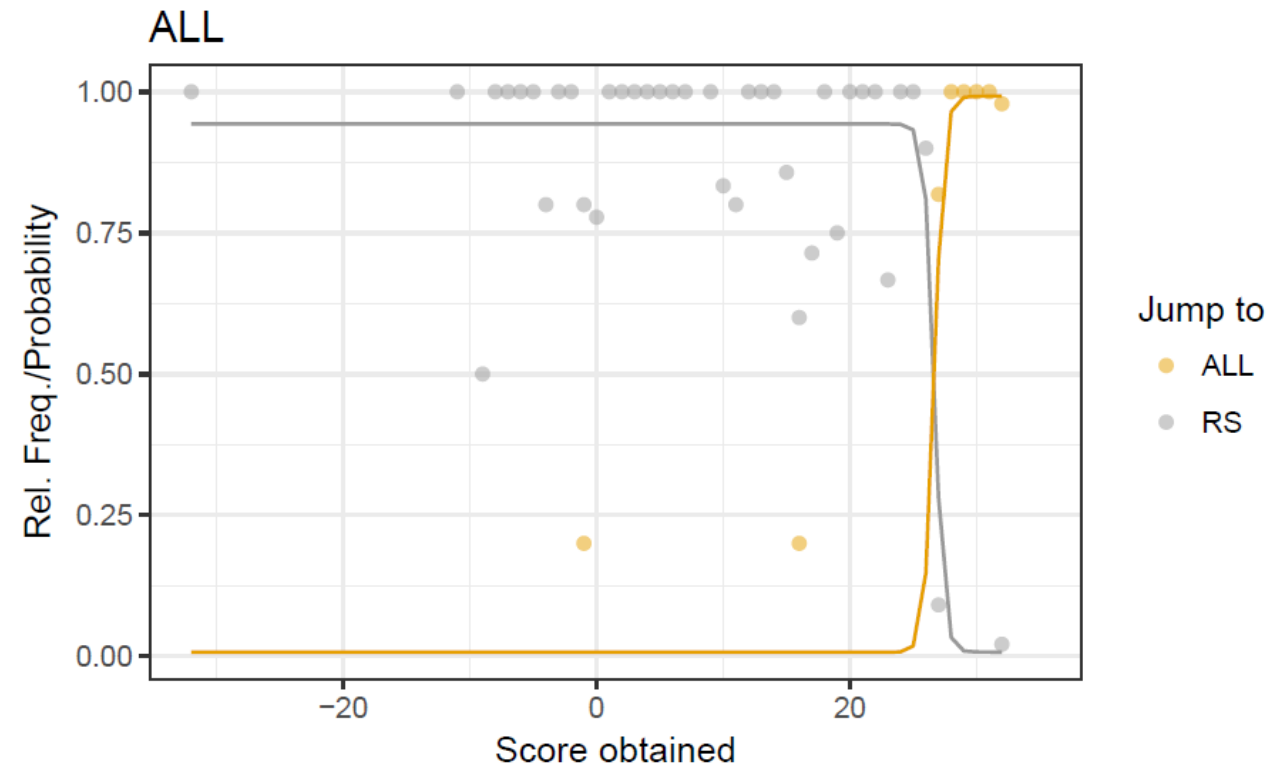
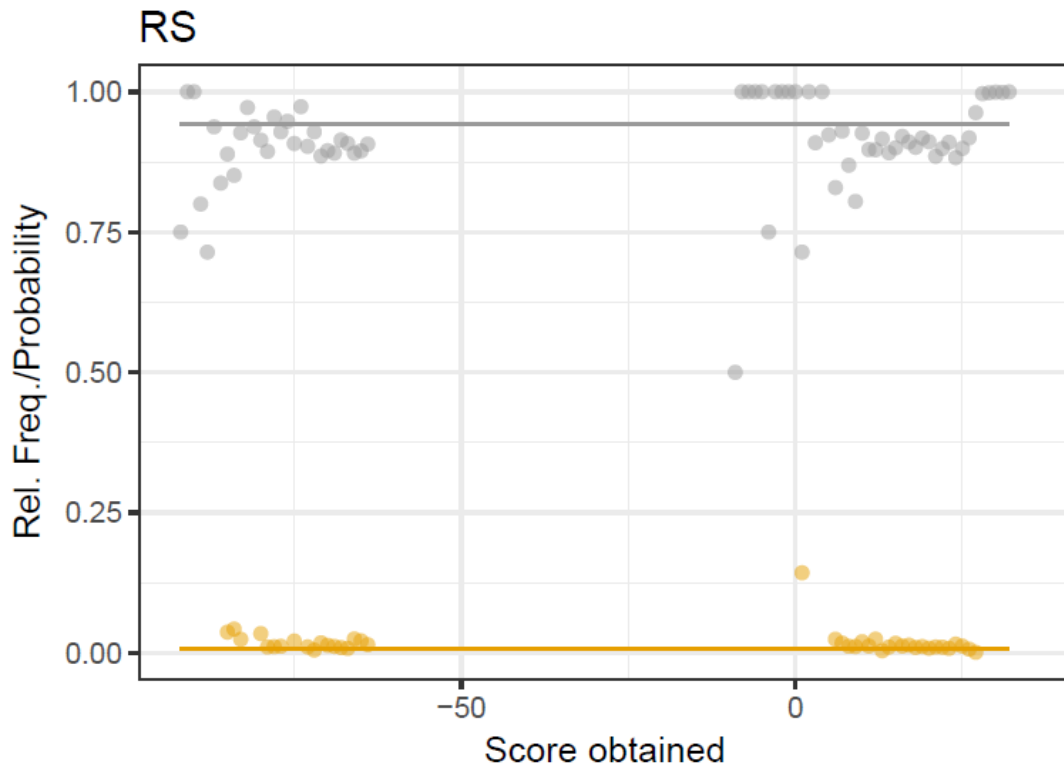


Heurísticas de racionalidad acotada

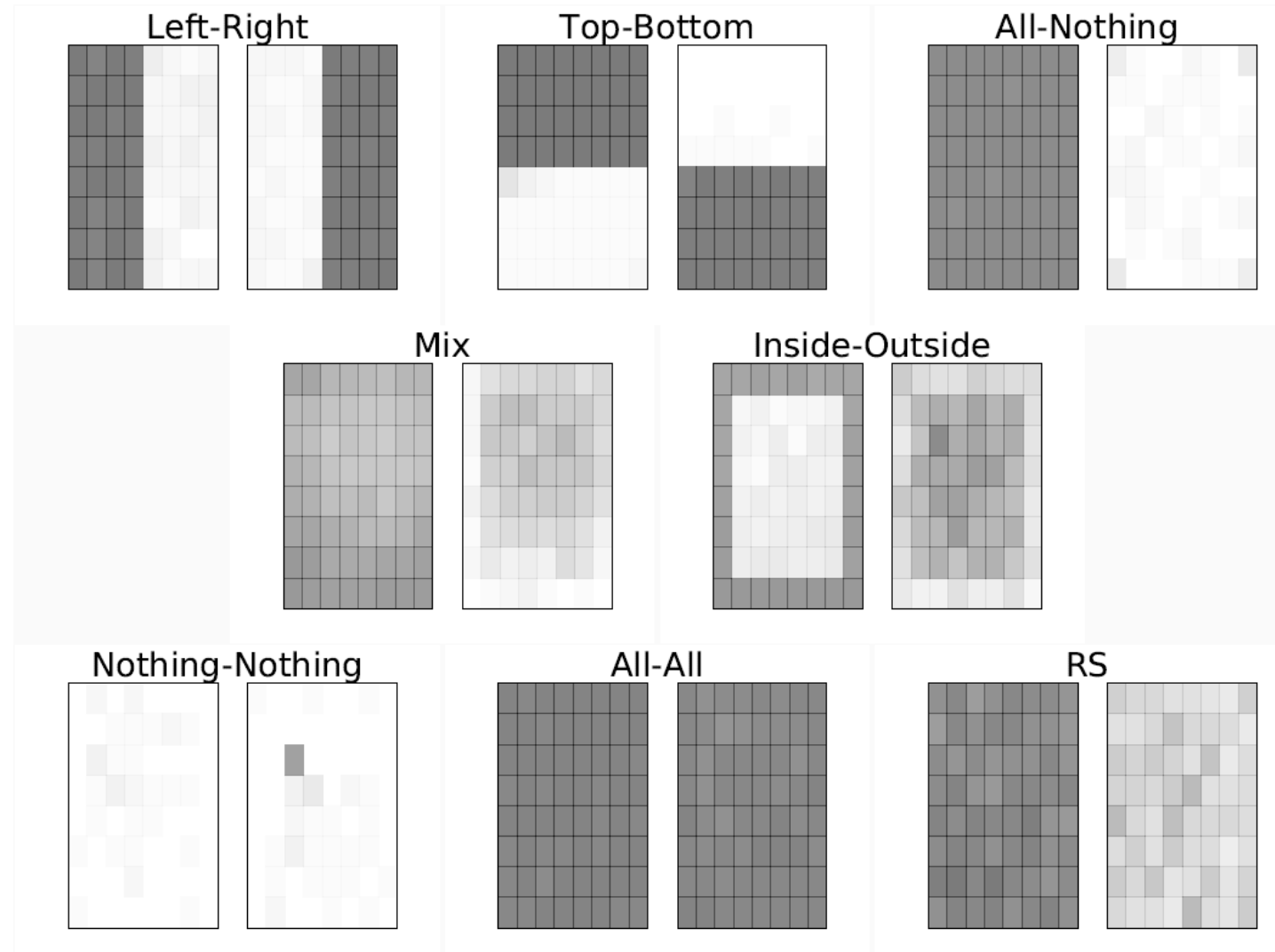


Heurísticas de racionalidad acotada

Win-Stay-Lose-Shift
STATE = (Región, Puntaje)



Datos conductuales



Datos conductuales

