UNDERSTANDING REFERENTIAL COORDINATION AS A PARTICLE SWARM OPTIMIZATION TASK

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Supervisor: Dr. Hannah Rohde

CONTENTS

1. Referential Coordination
   - Rohde et al. 2012

2. Particle Swarm Optimization

3. Modeling Referential Coordination using Particle Swarm Optimization

REFERENTIAL COORDINATION

REFERENTIAL COORDINATION

Chocolate lab

REFERENTIAL COORDINATION

Chocolate lab

Corgi

REFERENTIAL COORDINATION

Chocolate lab

Corgi

American water spaniel / German longhaired pointer mix

REFERENTIAL COORDINATION

Chocolate lab

Corgi

American water spaniel / German longhaired pointer mix

REFERENTIAL COORDINATION

Chocolate lab

Corgi

~~American water spaniel / German longhaired pointer mix~~

"That brown dog"

REFERENTIAL COORDINATION

Chocolate lab

Corgi

~~American water spaniel / German longhaired pointer mix~~
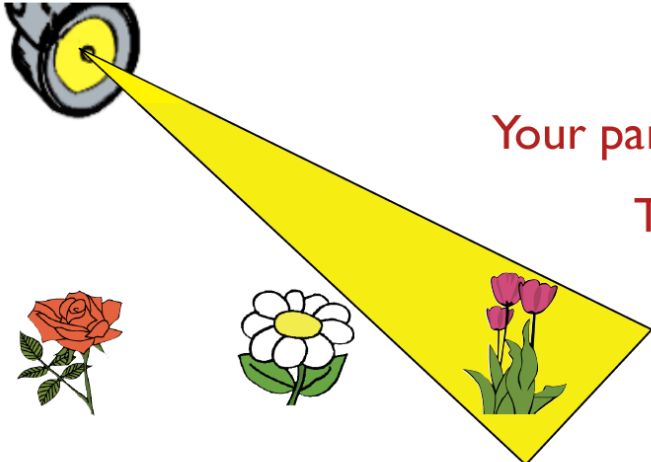
"That brown dog"?

"That brown dog"

ROHDE ET AL. 2012

ROHDE ET AL. 2012

Name	Study 1 Cost	Study 2 Cost
"Flower"	**80**	**80**
"Rose"	60	80
"Daisy"	120	140
"Tulip"	280	165
"Tree"	**80**	**80**
"Apple Tree"	60	80
"Pine Tree"	120	135
"Palm Tree"	250	170
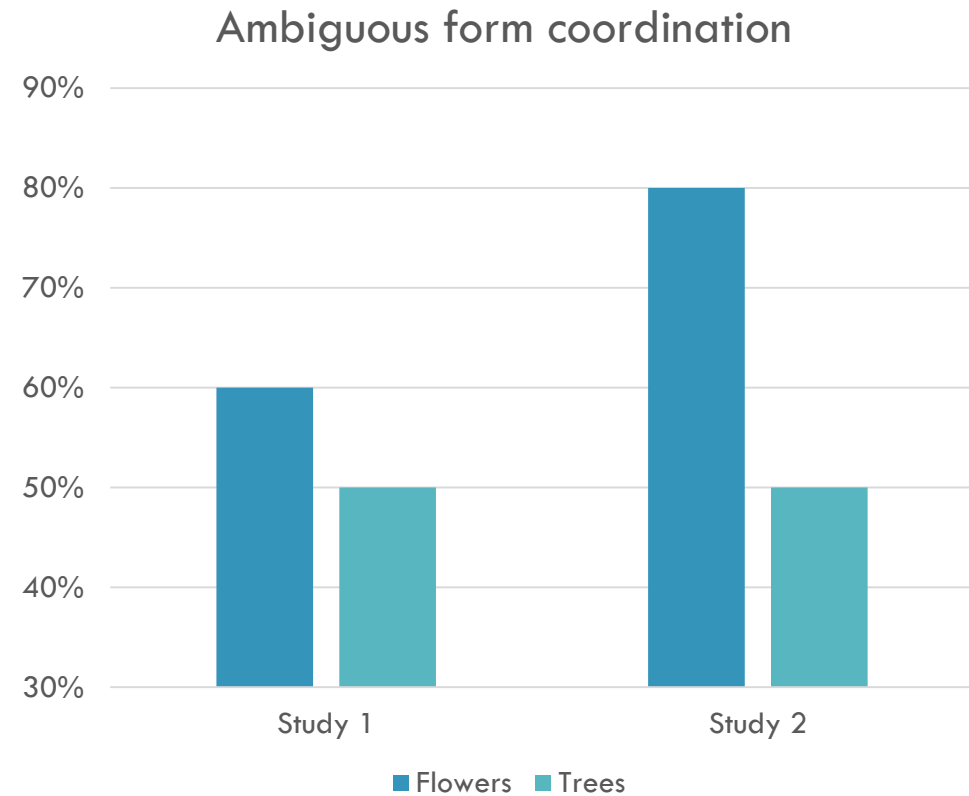
Ambiguous form coordination

PARTICLE SWARM OPTIMIZATION

PARTICLE SWARM OPTIMIZATION

Bird flocking simulations

Heppner & Grenander. (1990). A Stochastic Nonlinear Model for Coordinated Bird Flocks.

PARTICLE SWARM OPTIMIZATION

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Bird flocking simulations

Heppner & Grenander.
(1990). A Stochastic
Nonlinear Model for
Coordinated Bird Flocks.

Human behaviour

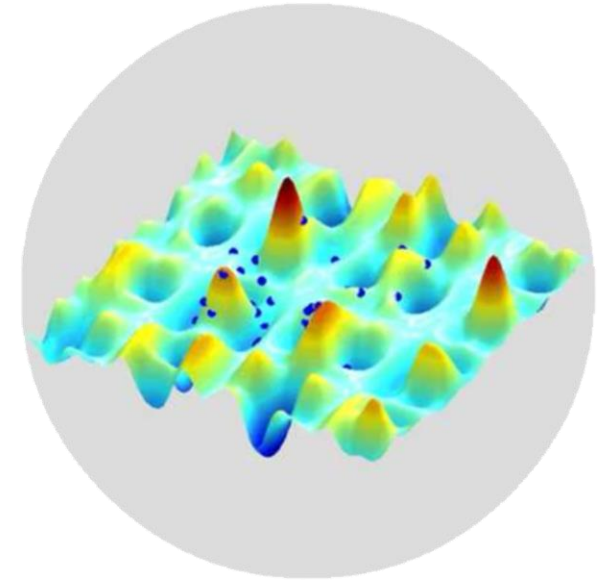# PARTICLE SWARM OPTIMIZATION

Bird flocking simulations

Heppner & Grenander. (1990). A Stochastic Nonlinear Model for Coordinated Bird Flocks.
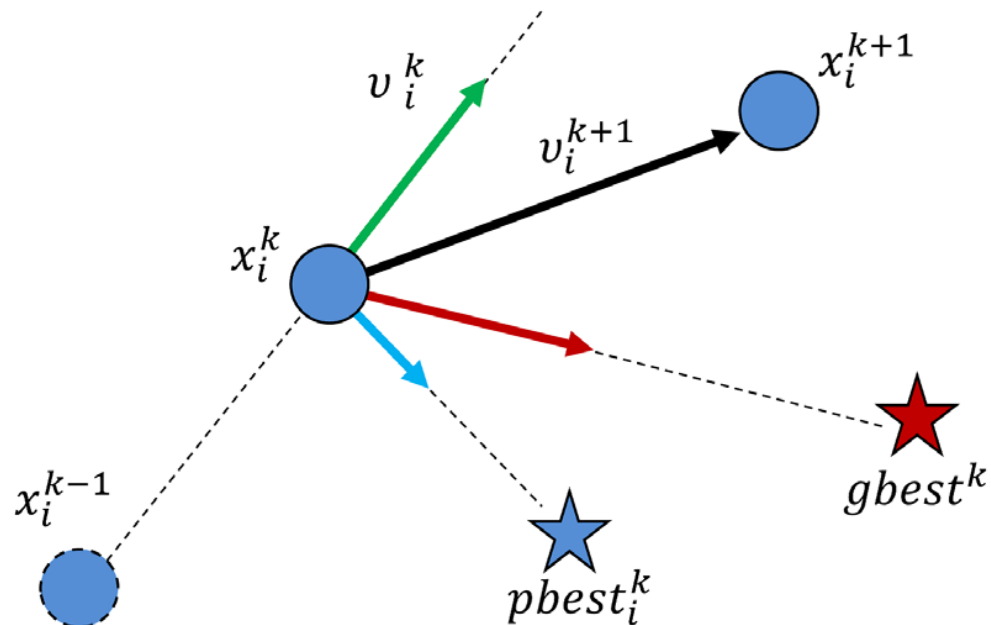
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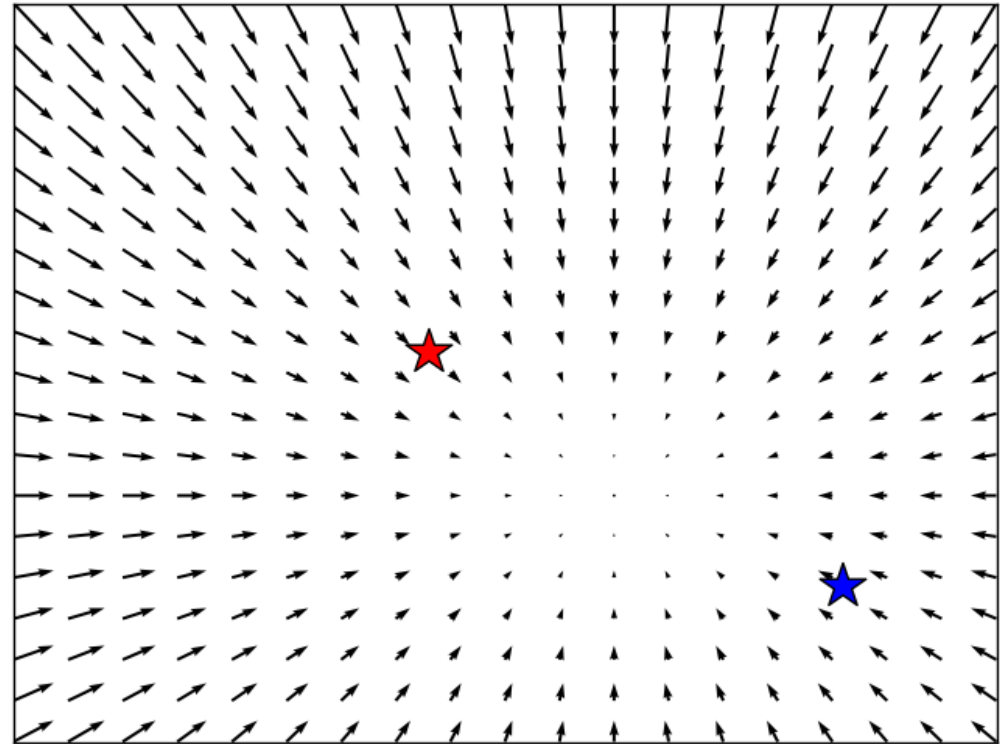**Human behaviour**

=

PSO

Kennedy & Eberhart. (1995). Particle Swarm Optimization.

PARTICLE SWARM OPTIMIZATION

$force_{gbest} = 2$, $force_{pbest} = 2$, $|\vec{v}| = 0$

Noto et al. (2013). Agent-based Social Simulation Model for Analyzing Human Behaviours using Particle Swarm Optimization.

PARTICLE SWARM OPTIMIZATION

$$force_{gbest} = 4, force_{pbest} = 1, |\vec{v}| = 0$$

v_i^k

x_i^{k+1}

v_i^{k+1}

x_i^k

x_i^{k-1}

$gbest^k$

$pbest_i^k$

Noto et al. (2013). Agent-based Social Simulation Model for
Analyzing Human Behaviours using Particle Swarm Optimization.
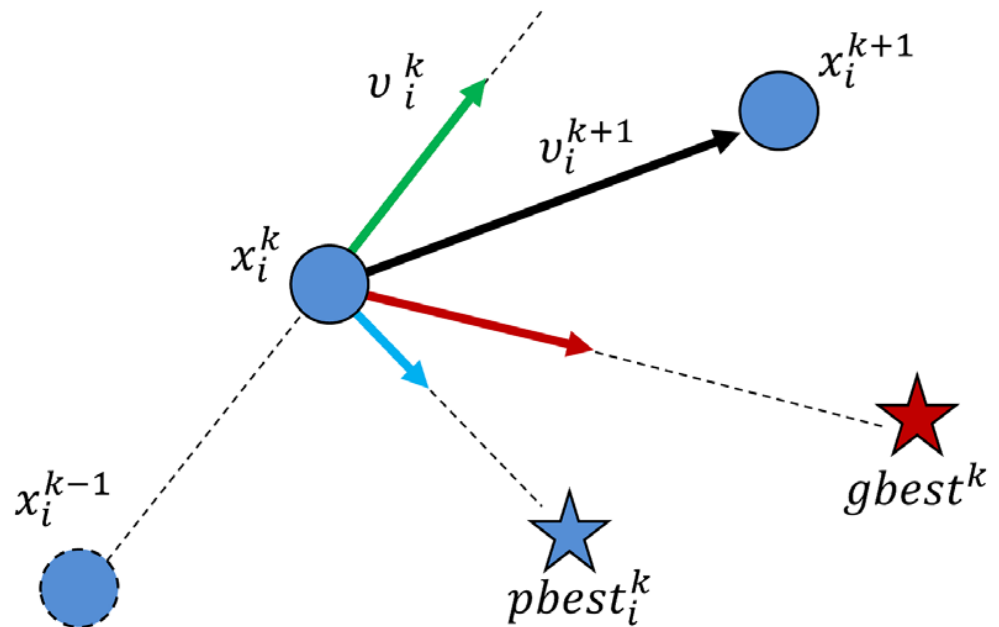
PARTICLE SWARM OPTIMIZATION

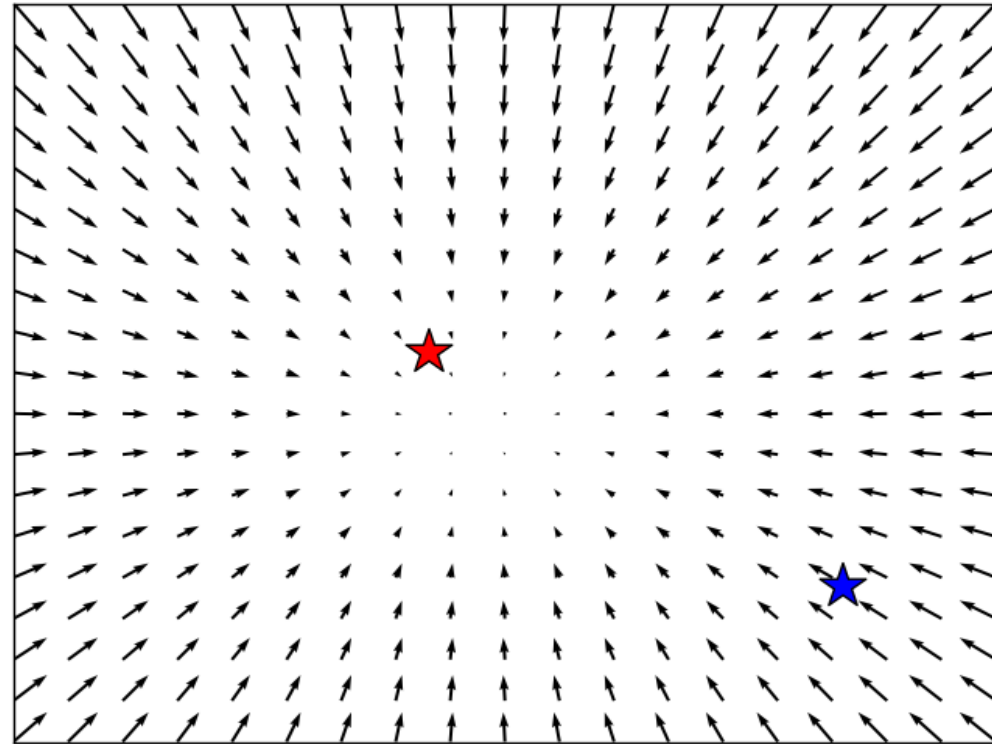$$force_{gbest} = 4, force_{pbest} = 1, |\vec{v}| \approx 7$$

Noto et al. (2013). Agent-based Social Simulation Model for
Analyzing Human Behaviours using Particle Swarm Optimization.
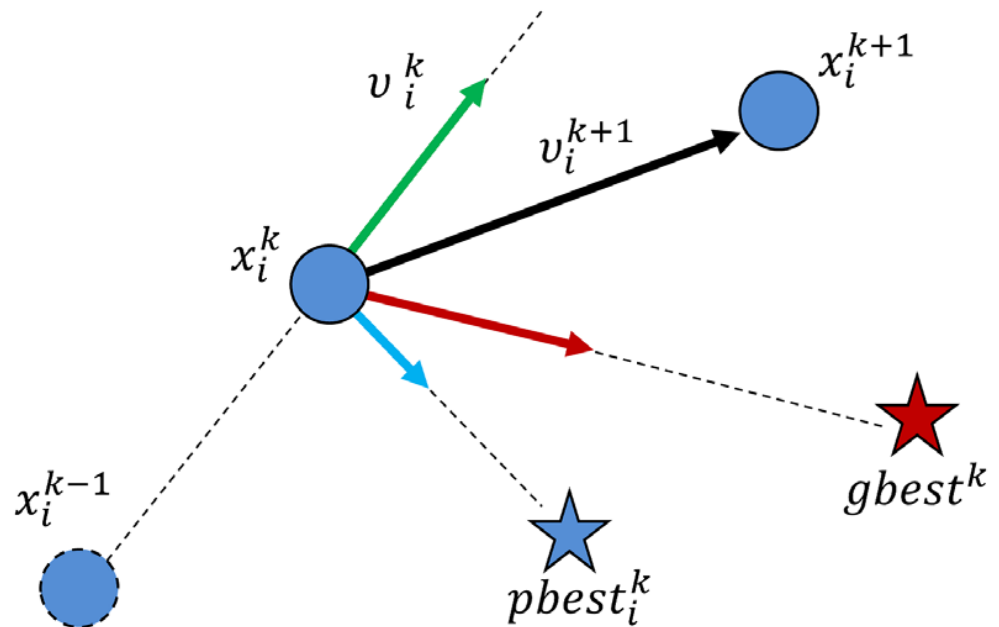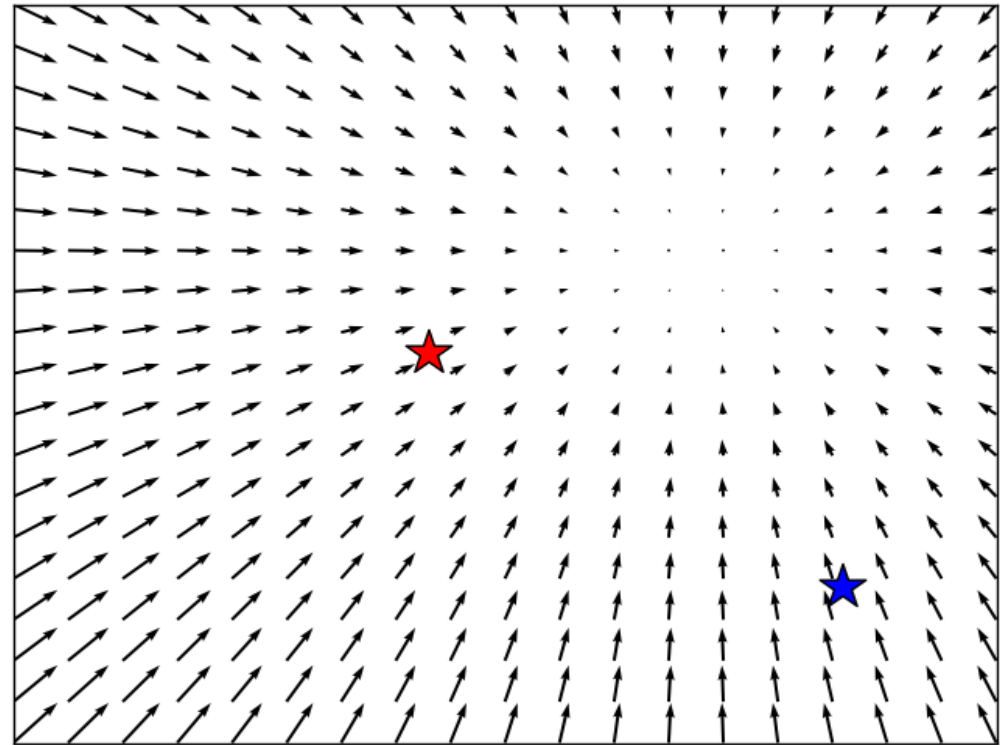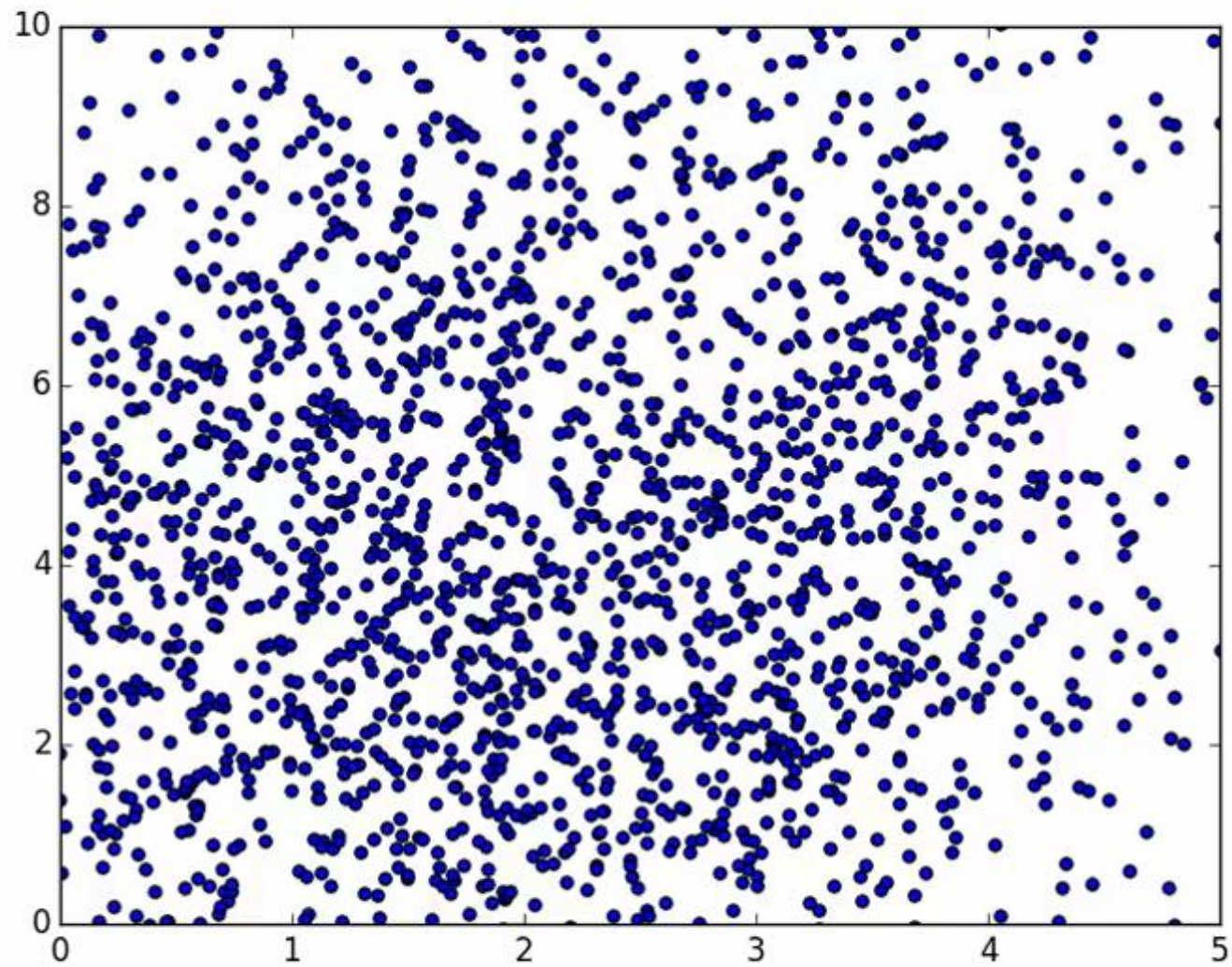
PARTICLE SWARM OPTIMIZATION

$$x^2 = y$$
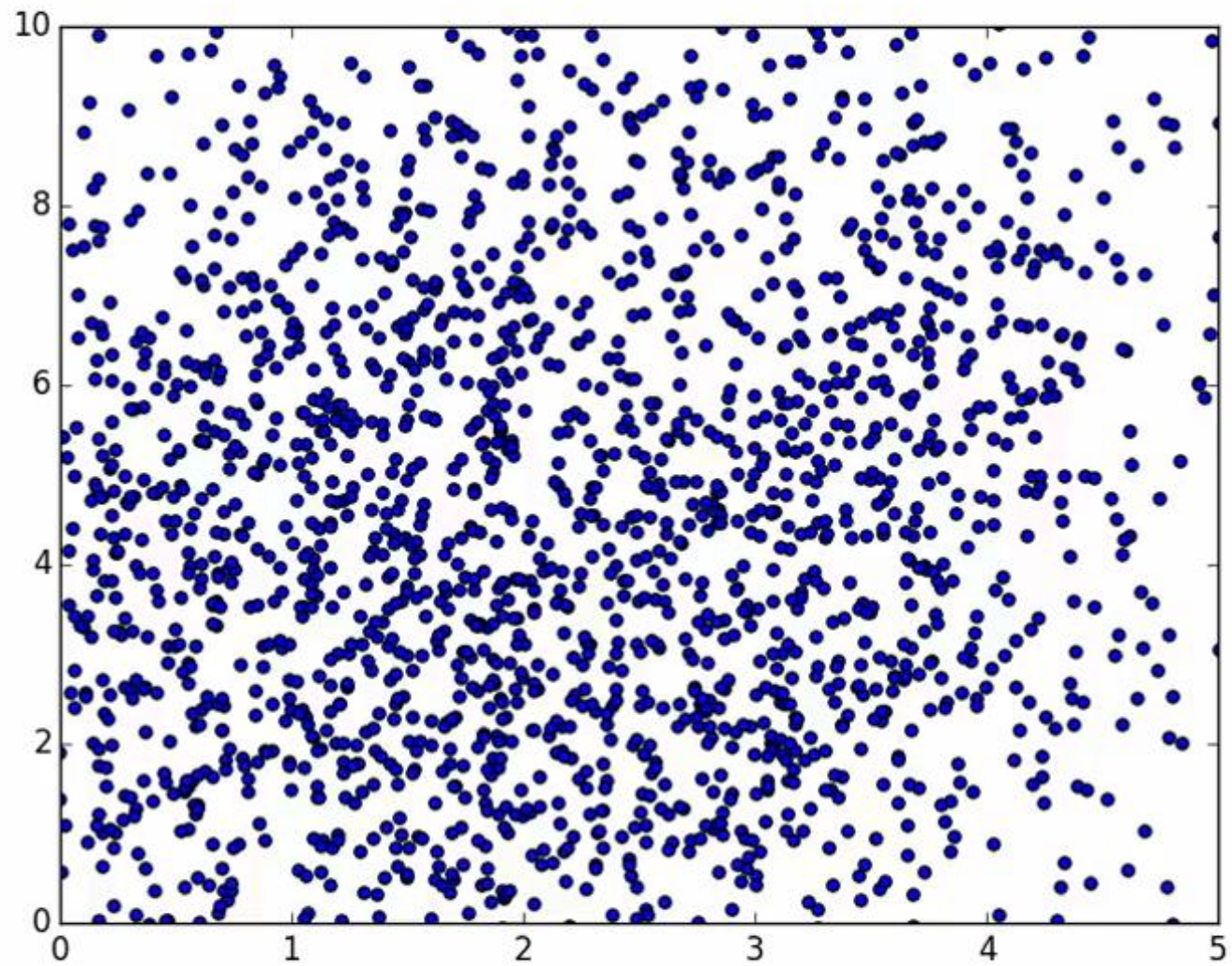
PARTICLE SWARM OPTIMIZATION $\quad\Big|\quad f(x, y) = -|x^2 - y|$
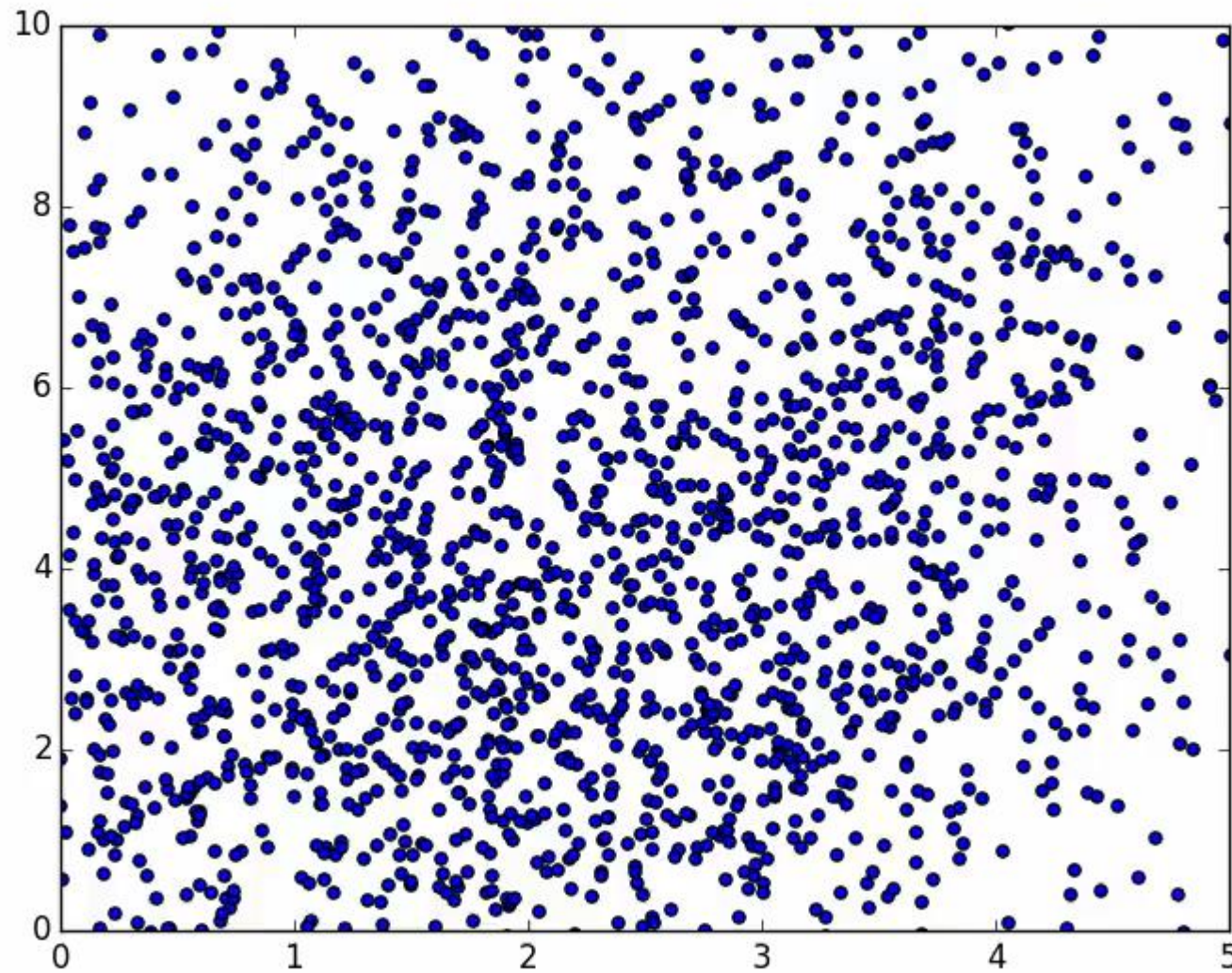
PARTICLE SWARM OPTIMIZATION

$f(x, y) = -|x^2 - y|$

APPLYING PSO TO REFERENTIAL COORDINATION

Pair of interlocutors is group of two particles

Game strategy is expressed as three numbers, e.g.
1. Probability of using "Flower" for "Rose"
2. Probability of using "Flower" for "Daisy"
3. Probability of using "Flower" for "Tulip"

APPLYING PSO TO REFERENTIAL COORDINATION
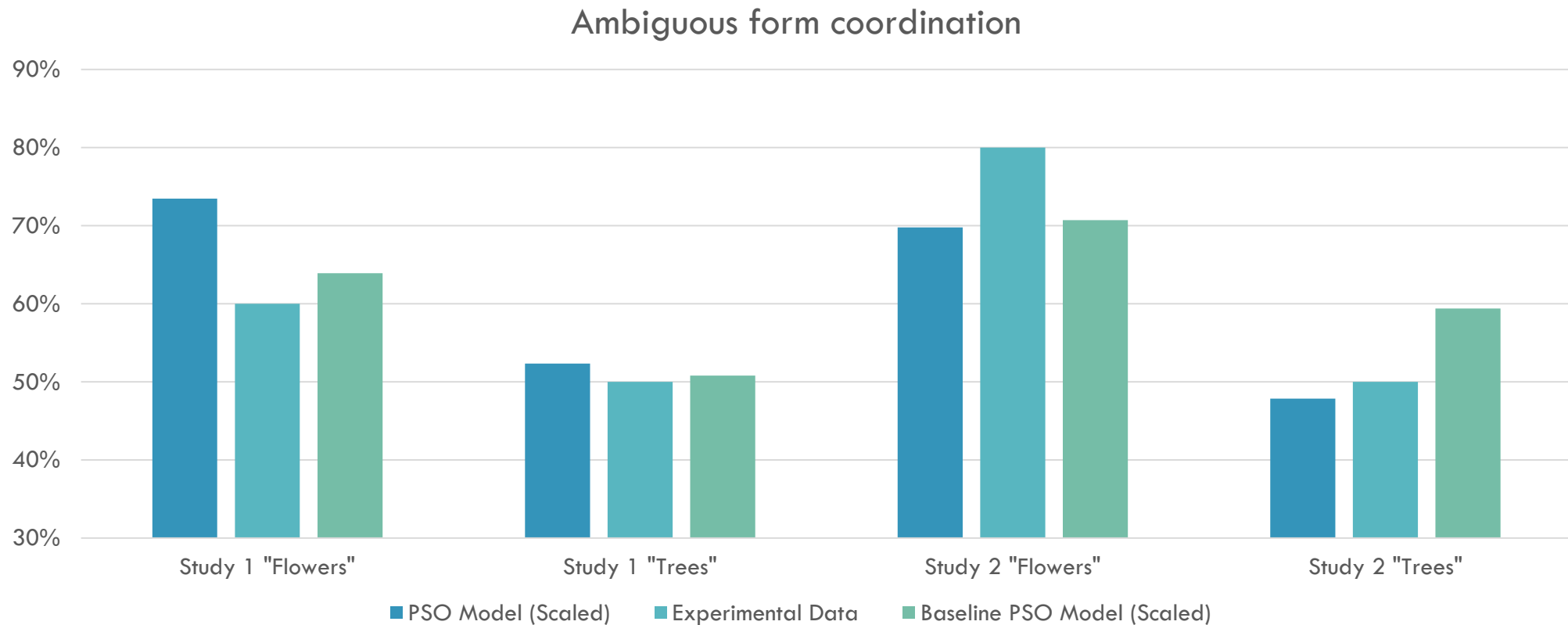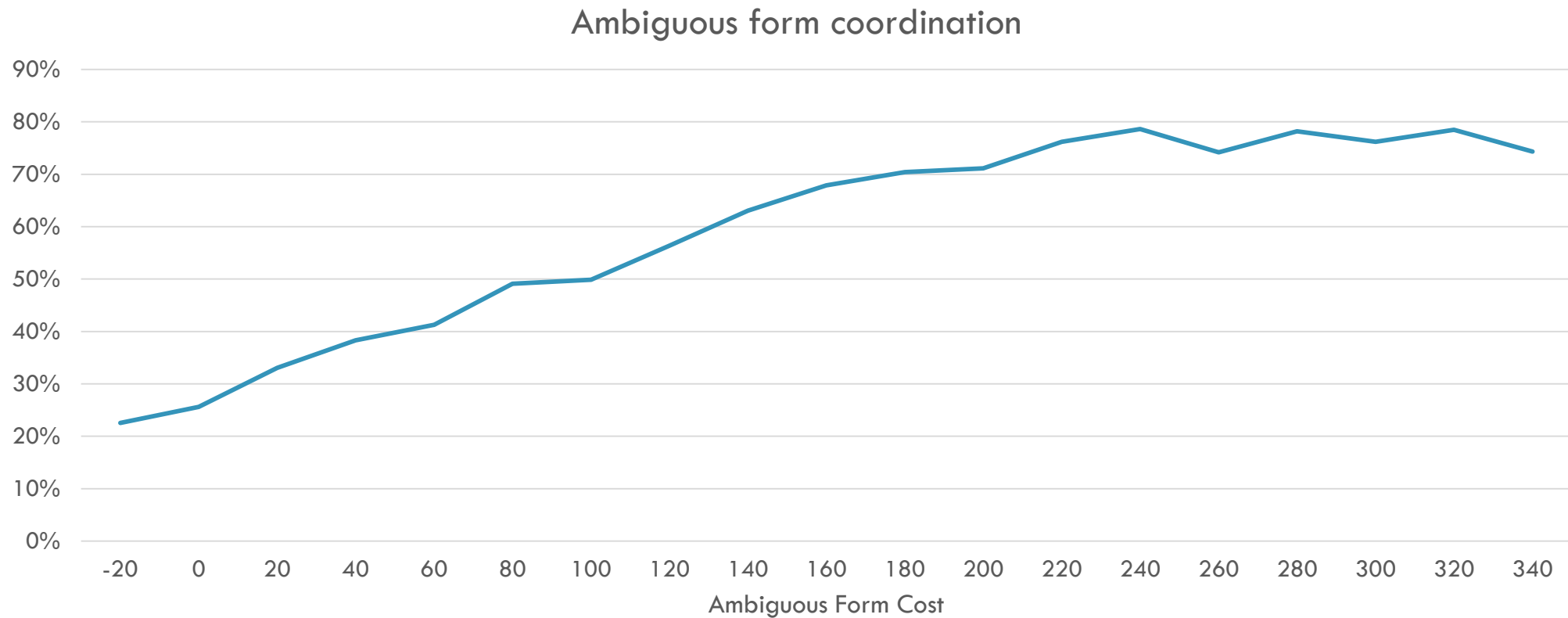
Ambiguous form coordination

APPLYING PSO TO REFERENTIAL COORDINATION

Ambiguous form coordination

APPLYING PSO TO REFERENTIAL COORDINATION

Brennan & Clark. (1996). Conceptual Pacts and
Lexical Choice in Conversation.

APPLYING PSO TO REFERENTIAL COORDINATION

Car

Brennan & Clark. (1996). Conceptual Pacts and
Lexical Choice in Conversation.

APPLYING PSO TO REFERENTIAL COORDINATION

Car

Fish

Brennan & Clark. (1996). Conceptual Pacts and Lexical Choice in Conversation.

APPLYING PSO TO REFERENTIAL COORDINATION

Car

Fish

Shoe

Brennan & Clark. (1996). Conceptual Pacts and
Lexical Choice in Conversation.

APPLYING PSO TO REFERENTIAL COORDINATION

Brennan & Clark. (1996). Conceptual Pacts and
Lexical Choice in Conversation.

APPLYING PSO TO REFERENTIAL COORDINATION

High heel

Brennan & Clark. (1996). Conceptual Pacts and
Lexical Choice in Conversation.

APPLYING PSO TO REFERENTIAL COORDINATION

High heel

Sneaker

Brennan & Clark. (1996). Conceptual Pacts and
Lexical Choice in Conversation.

APPLYING PSO TO REFERENTIAL COORDINATION

High heel

Sneaker

Loafer

Brennan & Clark. (1996). Conceptual Pacts and
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APPLYING PSO TO REFERENTIAL COORDINATION

High heel

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APPLYING PSO TO REFERENTIAL COORDINATION

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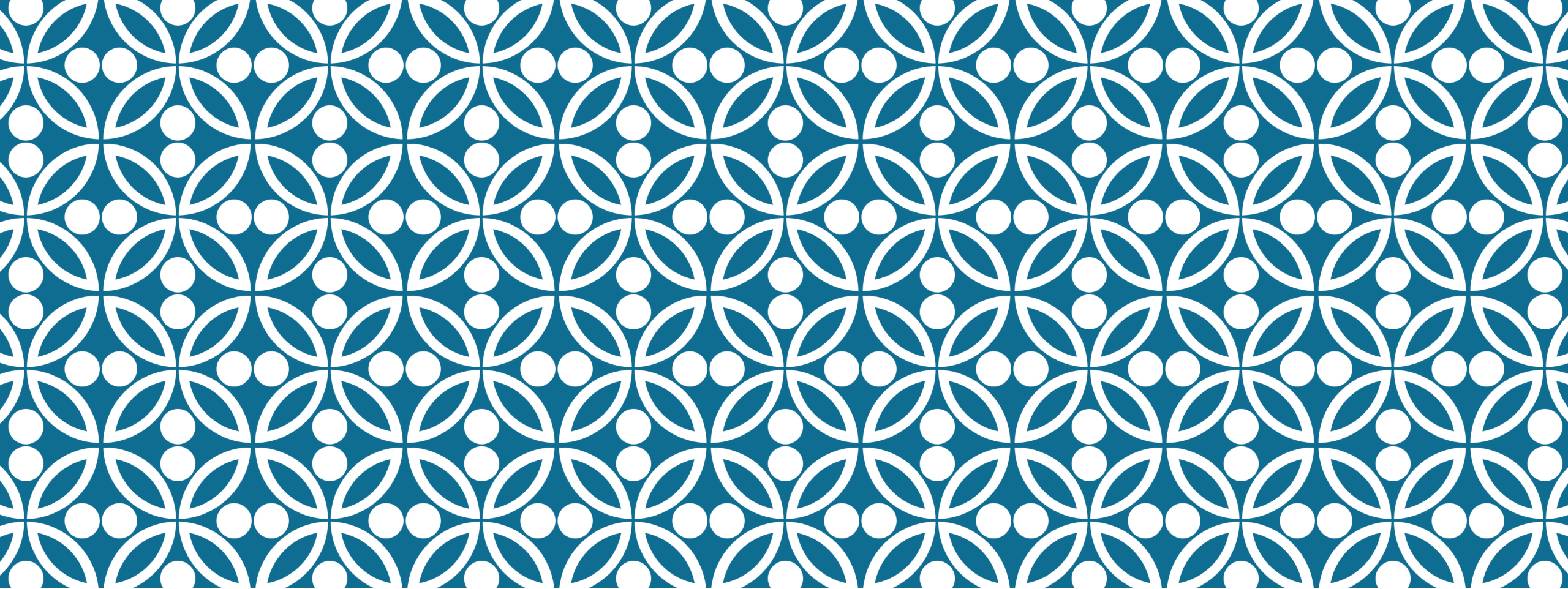
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Questions?

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