OVERARCHING GOAL:
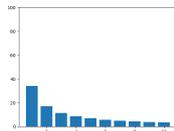
To Emerge General Communication Skills for Embodied Agents (through *Movement*)

RESEARCH QUESTION:

Under what *realistic, minimal* common-knowledge constraints can we obtain zero-shot coordination for embodied communication protocols?

Physical Energy Exertion
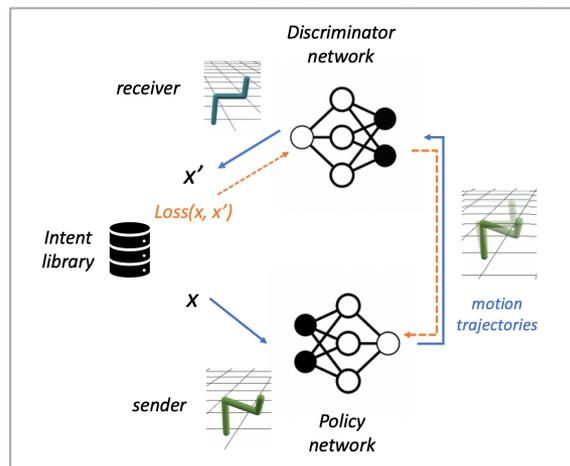
Nonuniform Distribution over Intents

KEY CHALLENGE:

High Dimensional Continuous Channel + Self-Play
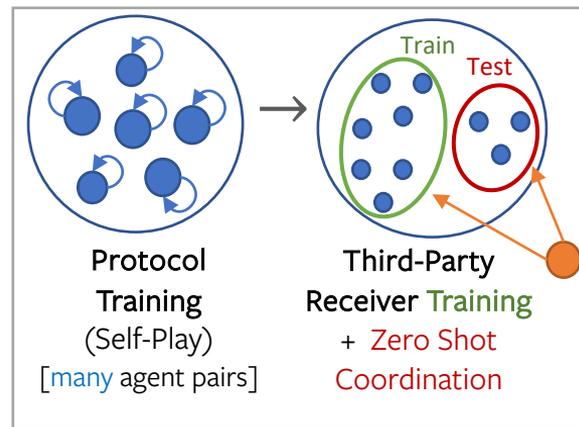$\implies$ *Highly Nonconvex* Optimization Landscape

GENERAL APPROACH:

Induce high mutual information I -- between Intents G and Energy Exertion $\mathbf{E}$ of Trajectories τ

GOAL: $I(G, \tau) = I(G, \mathrm{E}(\tau)) \gg 0$
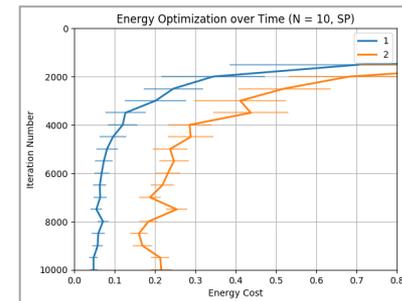
Game (Self-Play) [*one* agent pair]

Discriminator network

receiver

Intent library

x'

Loss(x, x')

x

motion trajectories

sender

Policy network

Overall Method

Protocol Training (Self-Play) [many agent pairs]

Train

Test

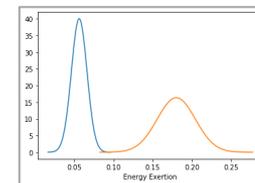Third-Party Receiver Training + Zero Shot Coordination

Analysis (*Proof-Concept* 2-Intent Task)

Intent Distribution

Energy Cost over Training (by Intent)

Energy Exertion $E(\tau)$ -- by Intent [*End* of Training]

ZS Coordination (by *Test* Input)

Max Class (Baseline): *0.67*	τ	$\mathbf{E}(\tau)$
	0.75	**0.97**