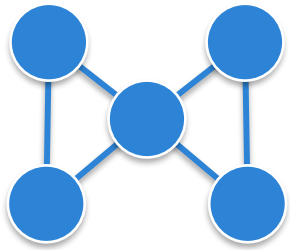
Coordination Connectivity:

Shared Initialization
Shapes the Joint-Policy Landscape in MARL

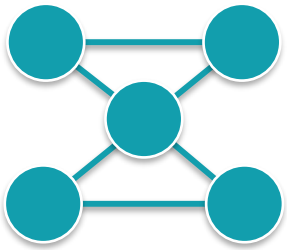
Two successful teams may fail when mixed.

Team A



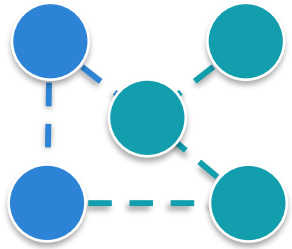
Works well

Team B



Works well

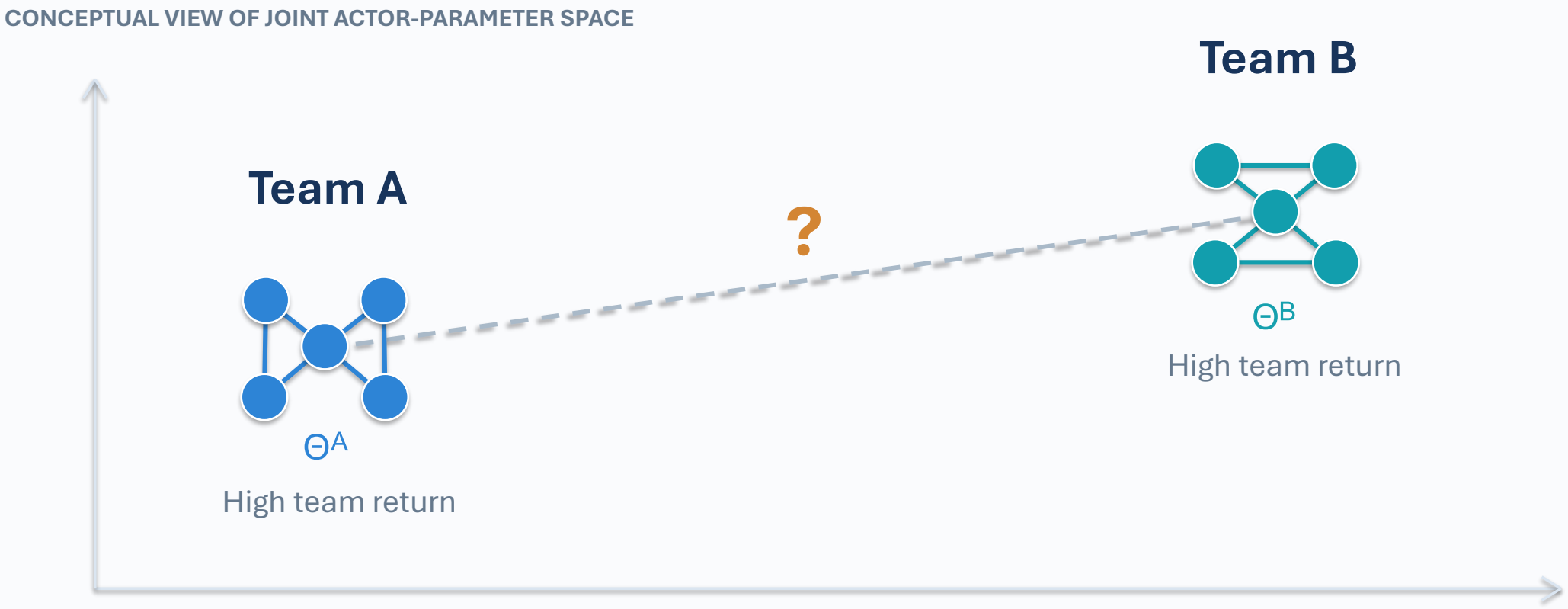
Mixed team



May fail

When cooperation is specialized, unfamiliar teammates may be incompatible.

Are successful policy teams isolated in parameter space?



From mode connectivity to linear mode connectivity.

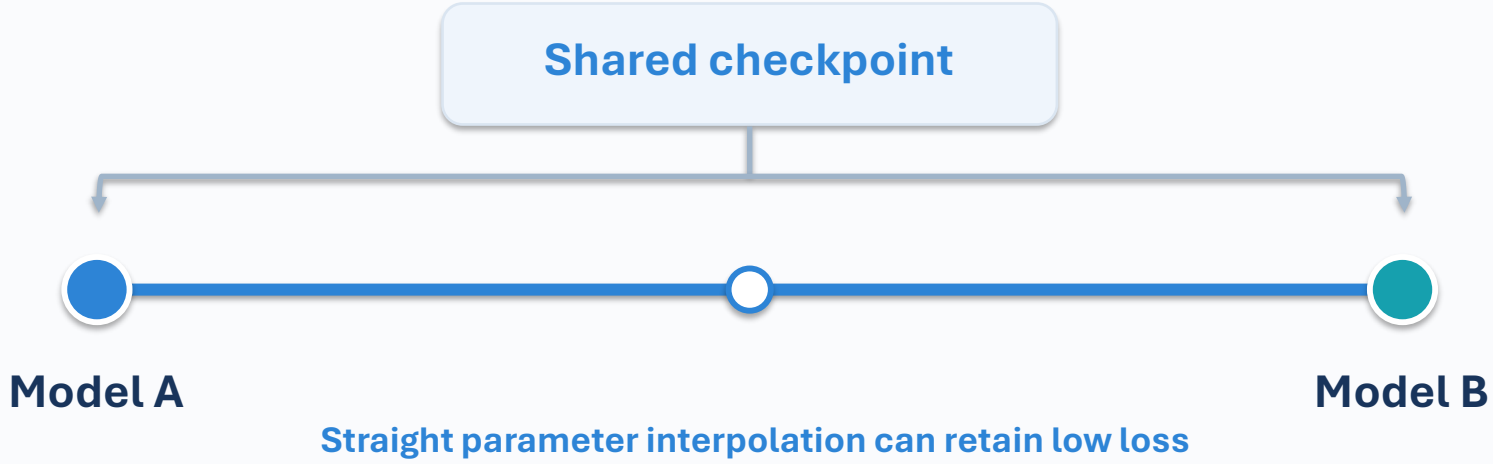
2018 Mode Connectivity

High-performing solutions can be connected by low-loss paths.



2020 Linear Mode Connectivity

With shared early training, later parameter solutions can remain linearly connected.

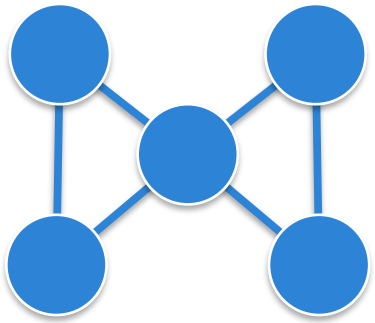


Garipov, T., Izmailov, P., Podoprikhin, D., Vetrov, D. P., & Wilson, A. G. NeurIPS 2018. Loss Surfaces, Mode Connectivity, and Fast Ensembling of DNNs

Frankle, J., Dziugaite, G. K., Roy, D. M., & Carbin, M. ICML 2020. Linear Mode Connectivity and the Lottery Ticket Hypothesis

Can linear connectivity extend from one model to a team?

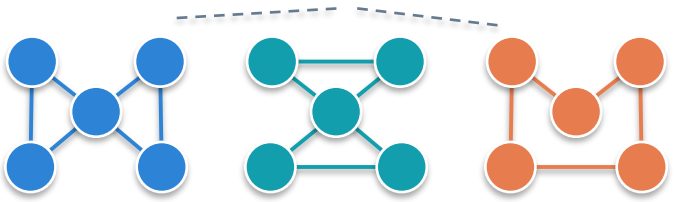
Single neural network



Loss or accuracy



Decentralized policy team



Team win rate / return

What's the relationship between the policies learned by two different teams?

Coordination Connectivity

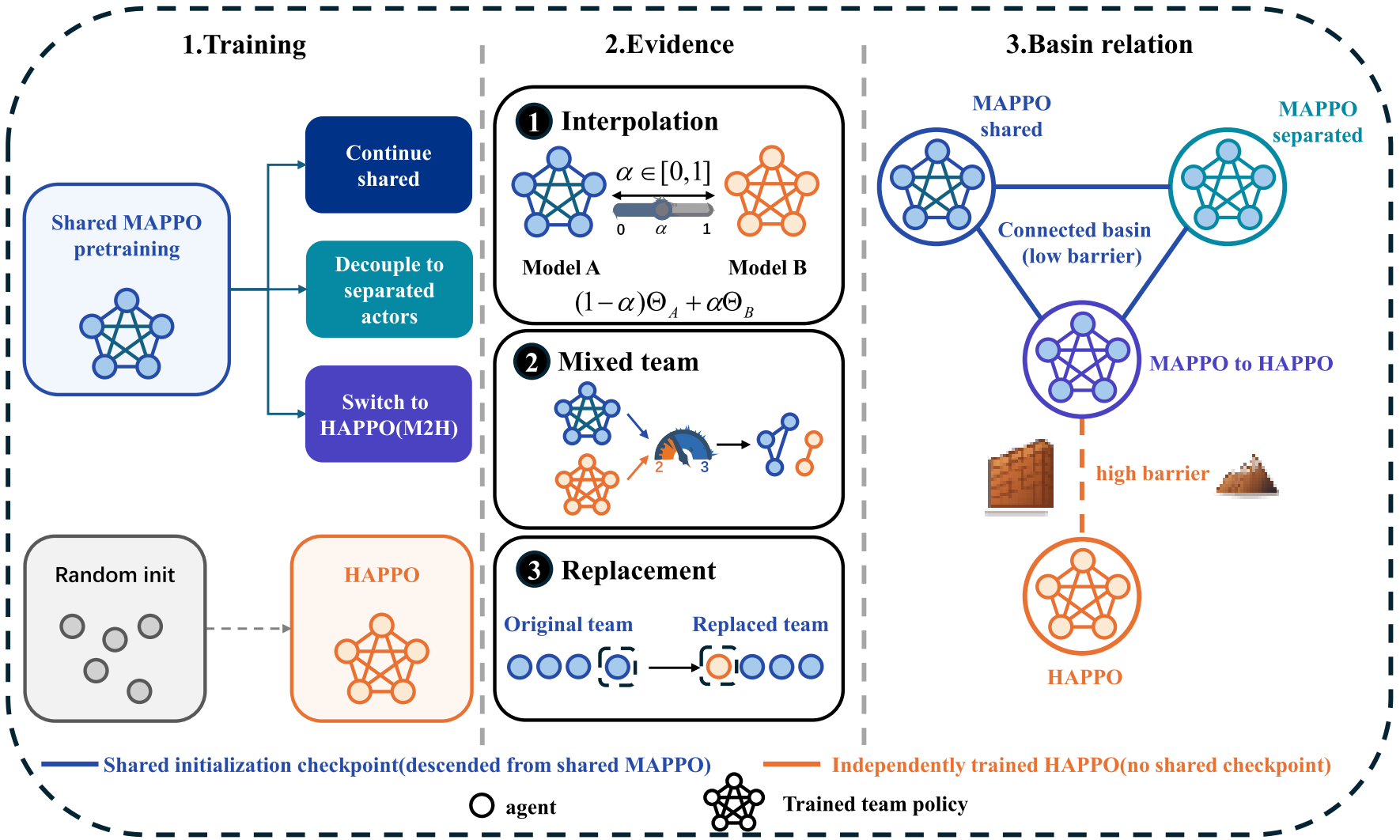
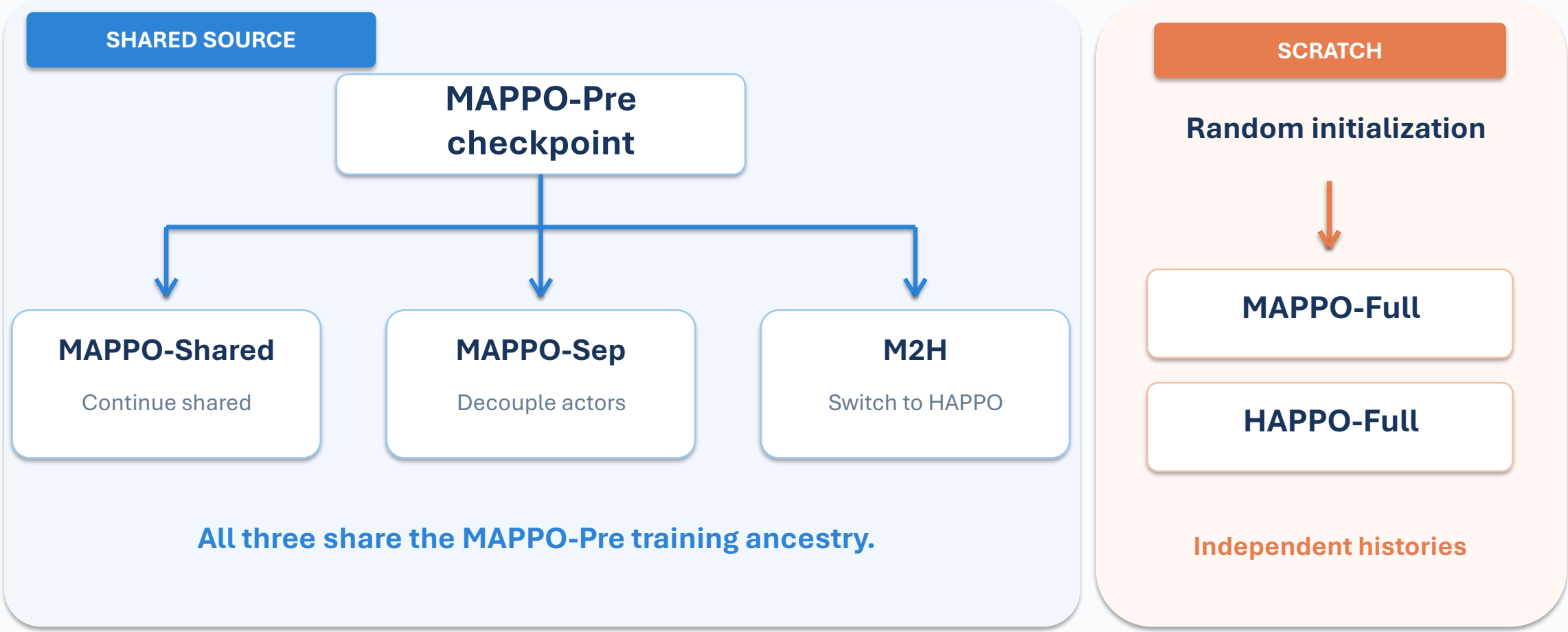
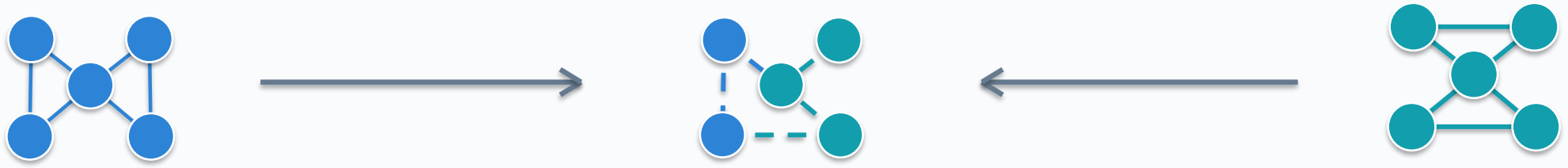


Figure 1 · Camera-ready overview

One checkpoint. Three branches. Two scratch baselines.



Coordination connectivity tests a linear path in actor parameter space.



Team A

Interpolated team

Team B

$$\theta_i(\alpha) = (1 - \alpha)\,\theta_i^A + \alpha\,\theta_i^B$$

Low barrier

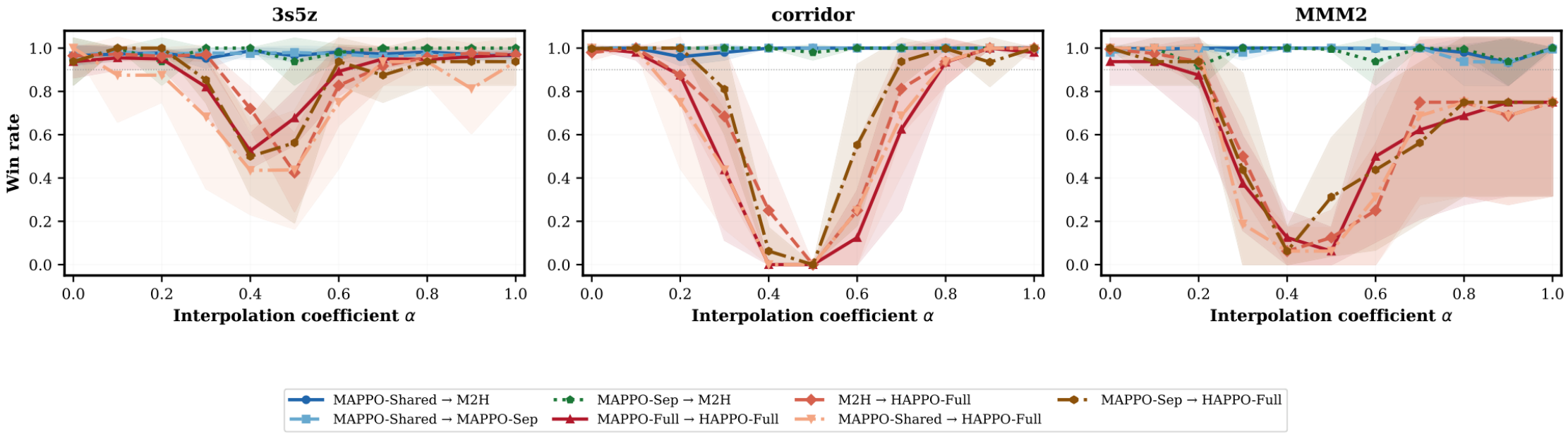


High barrier



Test the interpolated teams directly: no retraining, no partner adaptation.

Shared-source paths stay low-barrier; HAPPO cross-history paths show cliffs.



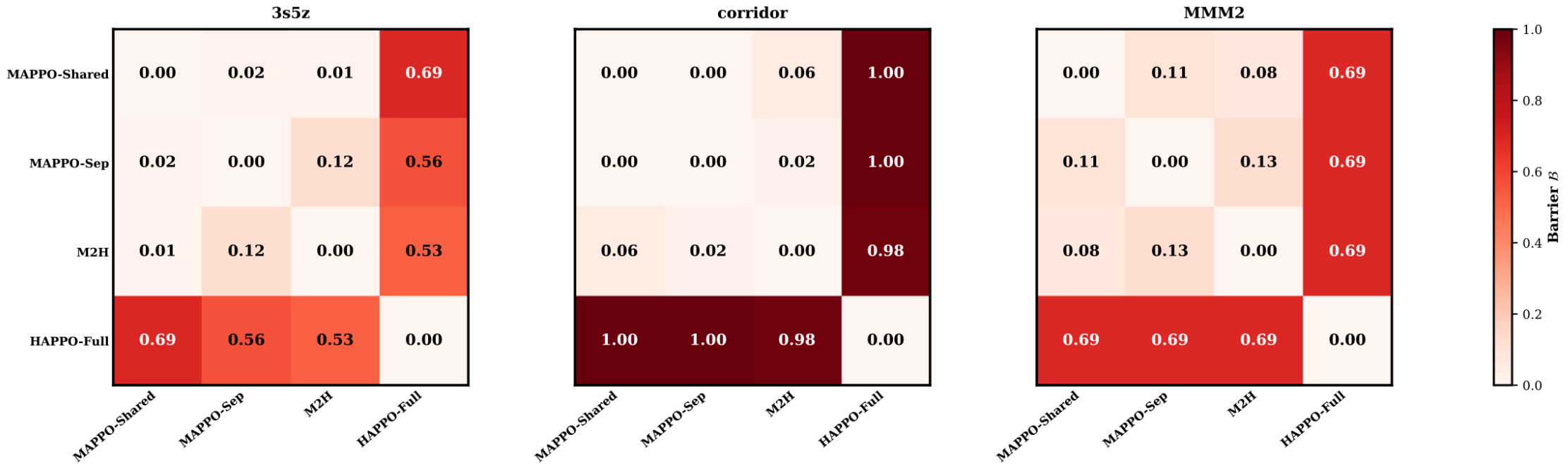
Same-source on corridor

Barrier = 0.06 ± 0.03

M2H → HAPPO-Full on corridor

Barrier = 0.98 ± 0.03

The shared-source descendants form a low-barrier block.



This pattern is also clear in the barrier matrices.

The geometric pattern is reflected in actual teamwork.

Mixed-team assembly



CORRIDOR WIN RATE

93.8%

Same-source

31.2%

Cross-history

Single-agent hot-swap



CORRIDOR WIN RATE

100%

Same-source

50%

Cross-history

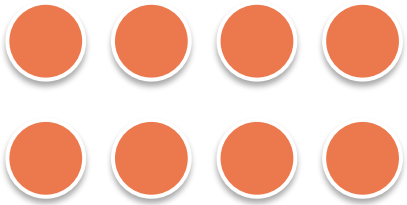
But have these same-source agents learned different roles?

Original M2H team



99.5% win rate

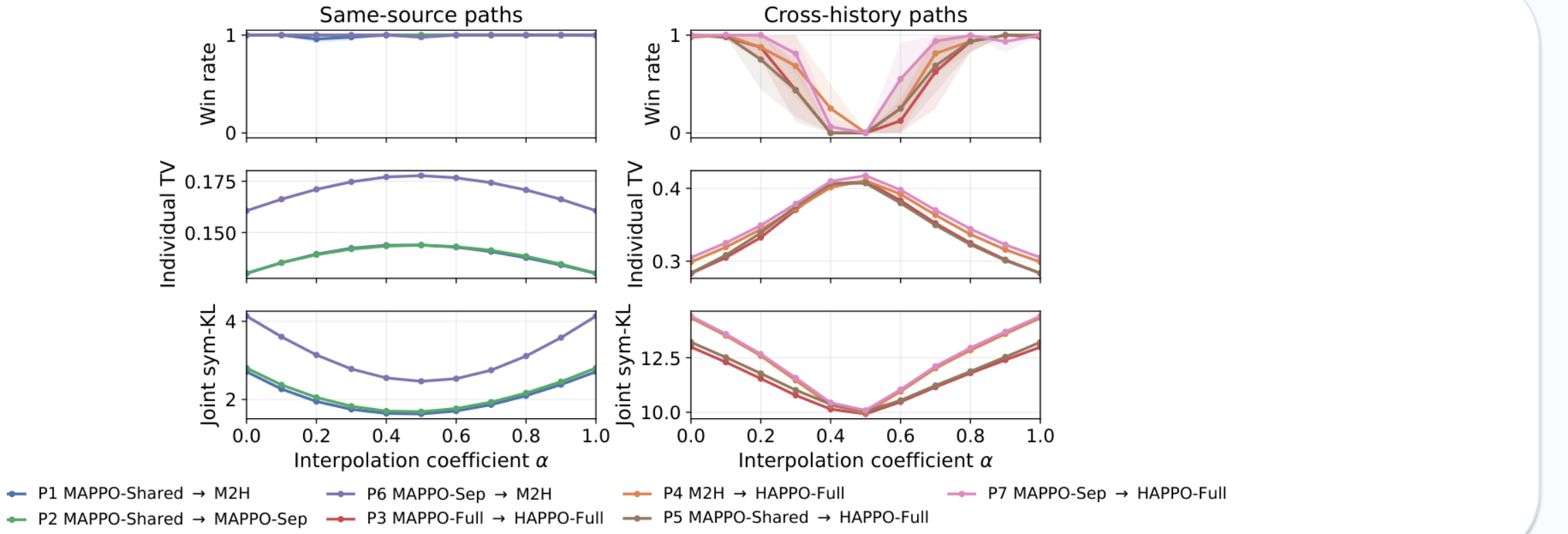
Clone one actor to all positions



3.1% win rate

Clone-all disrupts coordination: the specialized policies are not interchangeable.

Behavioral differences remain smaller on same-source paths.



Individual TV < 0.18

Individual TV up to 0.41

Why coordination connectivity matters

GEOMETRIC INSIGHT

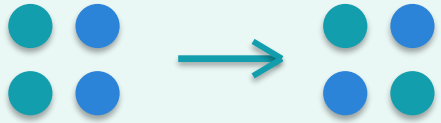


A linear interpolation B

Low-barrier paths link specialized teams

High return along the path

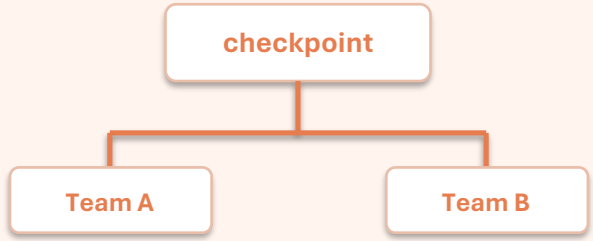
TEAM COMPATIBILITY



Mix and replace without retraining

Tested same-source teams

FUTURE SYSTEMS



Independent upgrades and agent replacement

Potential applications

Shared history can preserve both connectivity and compatibility.

Thank you for your listening