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## Neuro-Evolution for Emergent Specialization in Collective Behavior Systems

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## SUMMARY

The title of this thesis is: *Neuro-Evolution for Emergent Specialization in Collective Behavior Systems*. The main contribution of the thesis is a novel method called: *Collective Neuro-Evolution* (CONE) that operates within computer simulation to solve collective behavior problems. A collective behavior problem is a task that can only be solved by multiple agents (computer programs) working cooperatively. The thesis topic is situated in the *neuro-evolution* research field: the intersection of *evolutionary computation*, and *neural computation* research. Given a collective behavior problem, CONE designs multi-agent behavior such that agents cooperate in order to optimally solve the problem. CONE works via adapting agent behavior and agent interactions during a computer simulation, and purposefully facilitates and uses specialization which emerges as agents interact. Emergent specialization refers to specialized problem solving behaviors adopted by agents. Using emergent specialization as a problem solving mechanism allows CONE to outperform related methods that also solve computer simulated collective behavior problems.