MULTI-AGENT REINFORCEMENT LEARNING IN FLOW MODELLING AND CONTROL

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What is the best way to learn fluid mechanics: by observing or by interacting with the flow field? Reinforcement Learning (RL) caters to the later approach for the modeling and control of fluid flows. Both problems can be cast in a similar formalism implying agents that provide either a closure or a control mechanism. Agents learn to optimize the long term consequences of their actions to the environment resulting in policies that map states to actions. We demonstrate how this can be a potent way of discovery of effective modeling and control strategies in turbulent flows. I will analyse success and failures of RL in collective swimming, navigation and closures for wall bounded flows. I will argue that while RL is a potent modality for discovery of (causal?) flow processes progress hinges on the proper incorporation of fluid mechanics knowledge in its algorithmic components.