Social GANv2: Improved Socially Acceptable Trajectories with Safety-compliant Generative Adversarial Networks

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Abstract
Human trajectory forecasting presents the challenges of modelling social interactions and outputting collision-free multimodal distributions. Following the success of Social Generative Adversarial Networks (SGAN), recent works propose various GAN-based designs to better model human motion in crowds. Despite superior performance in reducing distance-based metrics, current networks fail to output socially acceptable trajectories, as evidenced by high collisions in model predictions. To counter this, we introduce SGANv2: an improved safety-compliant SGAN architecture equipped with spatio-temporal interaction modelling and a transformer-based discriminator. The spatio-temporal modelling ability helps to learn the human social interactions better while the transformer-based discriminator design improves temporal sequence modelling. Additionally, SGANv2 utilizes the learned discriminator even at test-time via a collaborative sampling strategy that not only refines the colliding trajectories but also prevents mode collapse, a common phenomenon in GAN training. Through extensive experimentation on multiple real-world and synthetic datasets, we demonstrate the efficacy of SGANv2 to provide socially-compliant multimodal trajectories.