Interpreting Decision-Making in Interactive Visual Dialogue
U. Sharma

Abstract

Dialogue systems that involve long-term planning can strongly benefit from a high-level notion of dialogue strategy and can avoid making poor decisions early in the game and opt for broadly successful strategies instead. A strategy-signal can additionally be used as a conditioning input on the dialogue generation mechanism allowing better training and generalization over a vastly smaller generation space.

In this work, we first analyze the human game-play strategy, using regular expression-based strategy labels, to understand the selection and time-evolution of human-strategy in an object-discovery setup. Subsequently, we examine variational inference-based controlled text generation models as natural language generation models to generate language with precisely controlled semantic features and examine their applicability to generating questions with designated semantics. Finally, we propose a strategy-conditional framework that generates interpretable conditioning signals for a multi-modal question generation mechanism in a GuessWhat?! game. We explore variants with conditioning on gold and generated strategy-conditioning labels. These signals improve the performance of the question generation module with stronger conditioning while additionally enforcing a stricter compliance with human game-play strategy. The discrete nature of these labels provides an interpretable readout into the model's current questioning strategy. As a part of this conditioning setup, we also introduce a strategy-prediction module trained on a multi-task learning setup that can generate these conditioning signals autonomously and ahead-of-time allowing the encoder to generate conditioning signals for the decoder through an intermediate transformation to a strategy-label. We also present a detailed examination of optimization policies, strategy-predictor architectures and gradient propagation depth on the training of such models and show that while strategy conditioning improves model performance, it degrades generation ability due to weak strategy prediction accuracy.