UNIVERSITY OF SOUTH FLORIDA

Defense of a Master's Thesis

Task Progress Assessment and Monitoring using Self-Supervised Learning

by

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For the MSCS degree in Computer Science

Robotic manipulation for cooking requires a thorough understanding of the cooking environment. The robot needs to understand the cooking objects and their states at each intermediate level as the process continues. To understand these states, we need frame-level annotations. To overcome this frame-level dependency, we introduce a self-supervised learning method to obtain the frame-level state representation with "temporal video alignment" and "contrastive learning". In this work, we use self-supervised learning to train a model using multiple videos of the same action being performed in various settings. This model can be used to extract frame-level embedding space, which can then be used to align videos via simple distance-based matching. We show that this learned embedding space can be used to perform state and progress estimation and anomaly detection. Finally, we demonstrate how these embeddings can be used to perform robotic mixing by capturing state progression from offline videos. We use Q-learning and UR5 robotic arm to perform mixing.

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Online (Microsoft Teams)

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THE PUBLIC IS INVITED

Examining