Improving AR/VR experiences with deep learning
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Abstract
In the near future, augmented/virtual reality (AR/VR) characters might be used for tasks in the home that are currently performed through cell phones or laptop computers - ranging from checking the weather or news to performing banking, visiting a doctor, or going to school. Instead of a keyboard or touch screen interface, the user will interact with a virtual or real person, visualized life-size, with high quality through large screens or AR/VR devices. User satisfaction for such applications depends on delivering high-quality content with minimum latency. In this poster we describe a technique where we predict the user’s future requests, use the prediction to prefetch the data from the network, cache it on a local device and show it to the user at the right time with minimum latency and maximum quality.

We describe a deep learning technique to predict the AR/VR experiences that the users are most likely to access at a specific time of the day and develop several different caching techniques. We rely on real-world smart home datasets, augmented with synthetic data created to match the essential attributes of the real-world data. We evaluate the proposed prediction methods and calculate the user’s experience scores in terms of caching costs and user satisfaction. Finally, we compare our results with other baselines such as random caching, caching everything, and oracle. We found that our predictive approaches outperform the baselines, the difference being especially significant for the high-quality format deliveries.

User Modeling
- Learning models of the user behavior to predict the experiences the user will request.
- Scarcity of training data is a major challenge.
- Proposed solution: Creating synthetic data from real-world and simulated datasets of human daily activities. How?
- We probabilistically associate certain experiences with activities that are present in the dataset using common-sense associations.
- Example: weather forecast might be more likely to be accessed before leaving home.

Intelligent Controller for Predictive Caching in AR/VR
We implement three different approaches to predict users’ future requests:
1. Probability-based: is based on the probability of a specific request in a specific time interval.
2. LSTM-based: can not only process single data point, but also the entire sequences of data.
3. Majority vote-based: uses 15 different LSTM-based classifiers (by altering the hyperparameters).

Conclusions & Future Work
- We proposed an approach to perform a local caching of AR/VR experiences for a household scenario.
- We compared 3 different approaches: probability-based, LSTM-based and majority vote-based.
- Future work may include i) creating dataset of users’ daily requests by considering the privacy and security of the users and ii) designing a collaborative learning prediction system among users.

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References