

## Hybrid Collaborative-Context Based Recommendations for Civil Affairs Operations

**Authors :** Patrick Cummings, Laura Cassani, Deirdre Kelliher

**Abstract :** In this paper we present findings from a research effort to apply a hybrid collaborative-context approach for a system focused on Marine Corps civil affairs data collection, aggregation, and analysis called the Marine Civil Information Management System (MARCIMS). The goal of this effort is to provide operators with information to make sense of the interconnectedness of entities and relationships in their area of operation and discover existing data to support civil military operations. Our approach to build a recommendation engine was designed to overcome several technical challenges, including 1) ensuring models were robust to the relatively small amount of data collected by the Marine Corps civil affairs community; 2) finding methods to recommend novel data for which there are no interactions captured; and 3) overcoming confirmation bias by ensuring content was recommended that was relevant for the mission despite being obscure or less well known. We solve this by implementing a combination of collective matrix factorization (CMF) and graph-based random walks to provide recommendations to civil military operations users. We also present a method to resolve the challenge of computation complexity inherent from highly connected nodes through a precomputed process.

**Keywords :** Recommendation engine, collaborative filtering, context based recommendation, graph analysis, coverage, civil affairs operations, Marine Corps

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