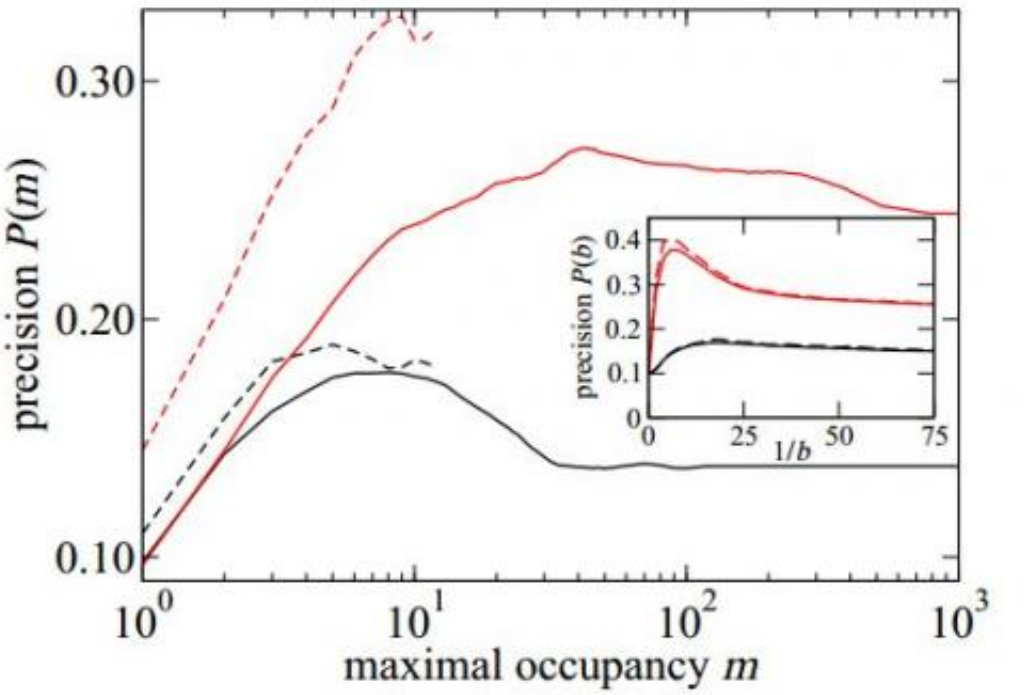
Researchers propose improvements to recommendation engines based on particle physics

January 17 2013, by Bob Yirka



Recommendation precision vs maximal occupancy m. Credit: arXiv:1301.1887 [physics.soc-ph]

(Phys.org)—A trio of researchers has uploaded a paper they've written to the preprint server *arXiv* describing a way to improve recommendation engines, using principles from particle physics. The

idea, they say, is to use crowd avoidance to maintain a resource's value.

In physics, particles tend to "want" to occupy the most favorable state but not all of them are able to achieve that state due to the presence of other particles. Bosons, such as photons, have no limit to the numbers of them that can occupy a certain state. Fermions, on the other hand, such as electrons, have properties that prevent more than one from occupying the same state. In this new research, the team applied these concepts to the problem of online recommendation engines.

When people log on to Netflix to order a DVD to watch a movie at home, as one example, they quite often don't know what they want to watch, so they turn to Netflix's recommendations list. That list is based on an engine that takes into consideration movies the user has watched before combined with the number of times a particular movie has been chosen by other Netflix customers – a measure of its popularity. The problem with this, the researchers say, is if many customers recommend the same movie, the result can be a long wait for the next customers. The same thing can happen with a restaurant recommendation site – as more people give high ratings, more recommendations for it are given, resulting in a crowded restaurant and long waiting periods to be seated – reducing its value.

The solution they say, is to apply what has been learned in physics, e.g. the example given by fermions, and prevent or limit the number of users that can have access to a resource. In practice this would mean limiting the number of people that can rent a certain movie or make a reservation at a certain restaurant. Doing so would help maintain the resource, by preventing its overuse. It would also serve to prevent unwarranted biases from creeping into recommendation engines that come about due to recommendations being made that themselves cause more people to choose the same resource.

Of course, if a recommendation engine was changed to begin using such a technique in the real world, restaurant owners or DVD providers would have to go along with the idea as well, an unlikely proposition as doing so would almost certainly limit profits.

More information: Crowd Avoidance and Diversity in Socio-Economic Systems and Recommendation, arXiv:1301.1887 [physics.soc-ph]

Abstract

Recommender systems recommend objects regardless of potential adverse effects of their overcrowding. We address this shortcoming by introducing crowd-avoiding recommendation where each object can be shared by only a limited number of users or where object utility diminishes with the number of users sharing it. We use real data to show that contrary to expectations, the introduction of these constraints enhances recommendation accuracy and diversity even in systems where overcrowding is not detrimental. The observed accuracy improvements are explained in terms of removing potential bias of the recommendation method. We finally propose a way to model artificial socio-economic systems with crowd avoidance and obtain first analytical results.

via Arxiv blog