Framework Proposal

COMSOC Project

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Basic Idea We construe the problem of giving a media recommendation to a group of people as the problem of finding that recommendation that maximizes readers' value while satisfying some budget side-constraint. Maximizing value (which could probably be recast as minimizing misrepresentation) will require coming up with some metric based on the profile and the recommendation; my preliminary suggestion for this is to use the Borda score.

Framework We have a set of *news items* $A = \{a_1, ..., a_m\}$, each having a specific *cost* $C : A \to \mathbb{R}$, a set of *recommended items* $W \subseteq A$, a set of *consumers* $N = \{n_1, ..., n_n\}$, a *profile of preferences* over the set of items $\mathbf{R} \in \mathscr{L}^n$ and a *budget* $B \in \mathbb{R}_{\geq 0}$.
Further, there is a *value function*, akin to a Borda vector, indicating how much a consumer values an option in her ballot amongst the recommended items. It takes as an input the consumer, the profile and an element of A, $V : \mathscr{L}^n \times N \times A \to \mathbb{R}$. It is akin to a Borda in the concrete case where V outputs the value $m-1$ for all consumers' candidates in the top position, $m-2$ for the candidates in the second position and so forth. This is very general and is perhaps more conventiently expressed with vector notation, but I could not figure out how to express the maximization problem that way, so I hope the idea is clear.

What we try to maximize is the sum of all the consumers' values by choosing W (of course this can be recast as a minimization problem by adjusting V). For each consumer we only count the value from the news items that are actually in the recommended set:

$$\max_W \sum_{j=1}^{n} \sum_{i=1}^{m} \mathbb{1}[a_i \in W] V(\mathbf{R}, n_j, a_i) \tag{1}$$

Of course, Equation 1 is trivially solved by $W = A$. But the interest in solving it comes from adding the budget constraint.

$$\max_W \sum_{j=1}^{n} \sum_{i=1}^{m} \mathbb{1}[a_i \in W] V(\mathbf{R}, n_j, a_i) \text{ subject to } \sum_{a_i \in W} C(a_i) \leq B \tag{2}$$