Multi-directional interest propagation in ontology based UM

Goal

The goal is to address the **cold-start** and the **sparsity** problem in recommender systems, by allowing interest propagation from a small number of initial concepts to other related domain concepts.

Multi-directional Propagation

We propose a multi-directional propagation process taking into account:
1. ontological structure of the domain
2. type and the amount of feedbacks
3. context-dependance, that allows to change the propagation according to various contexts for specific applications;
4. ontology modification support, i.e. the possibility to add or remove a node in the ontology.

Properties

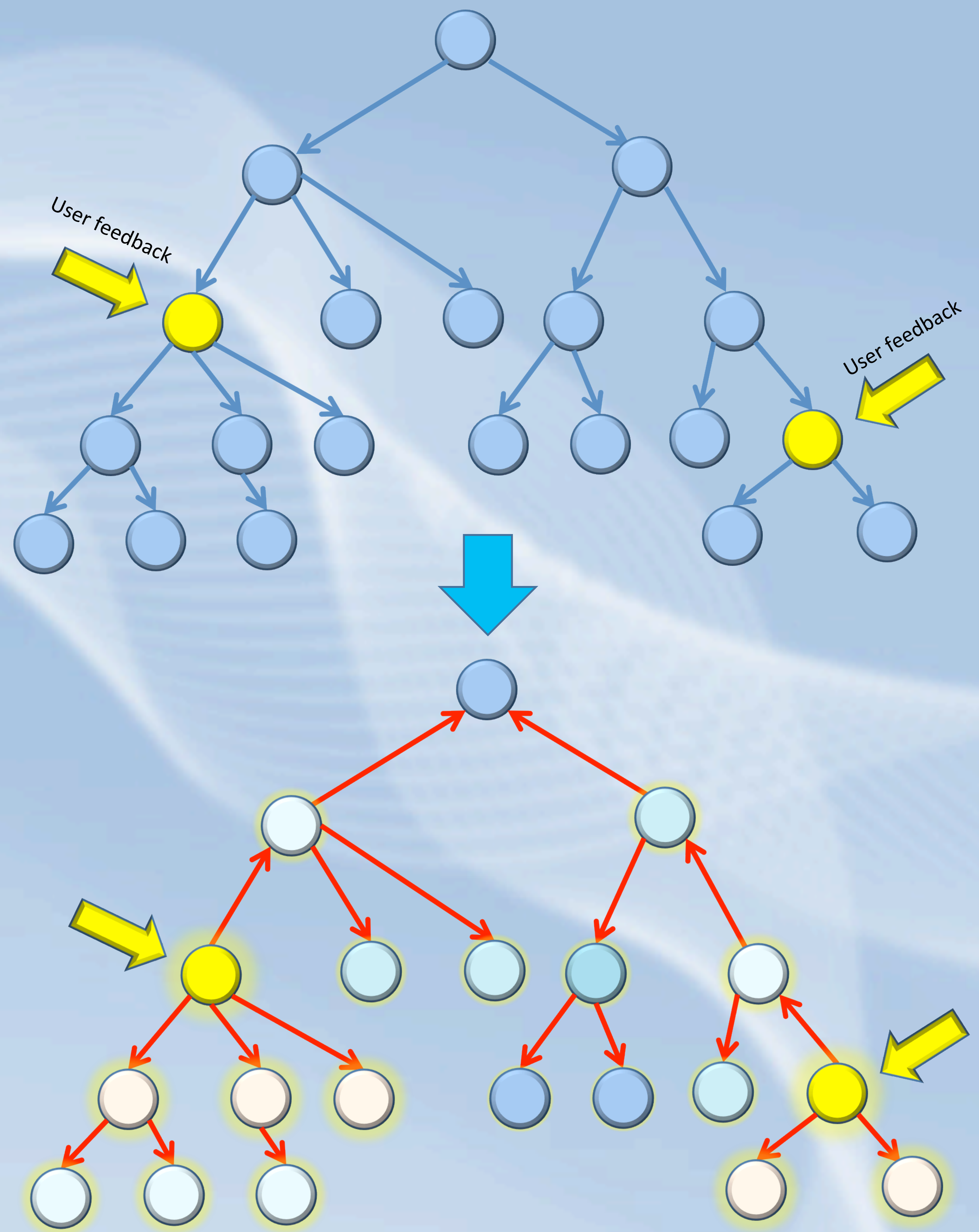The propagation algorithm is built to allow:
1. The possibility of isolating every node contribute
2. A balanced propagation ratio from every node
3. The possibility of modifying the ontology without loosing information
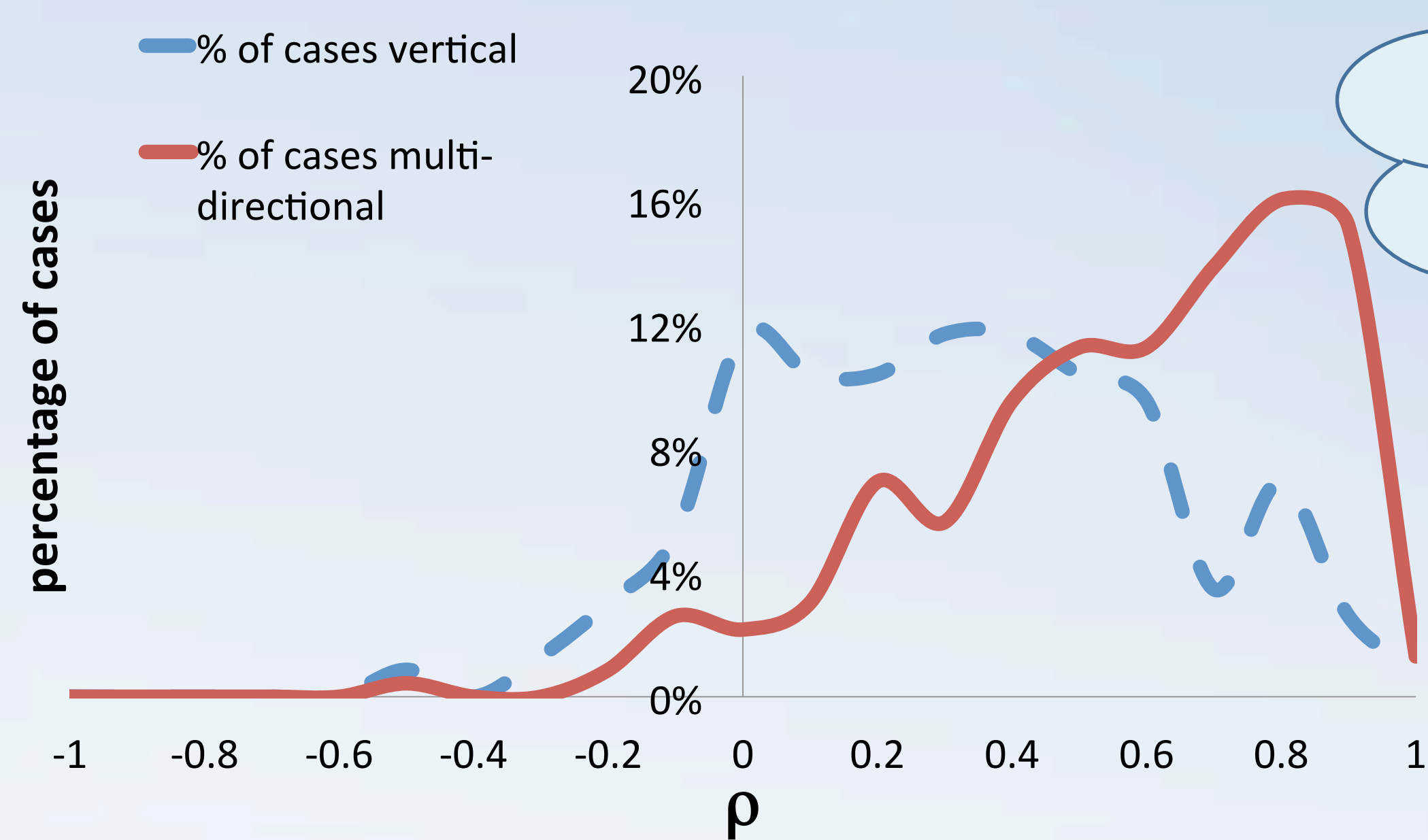
Evaluation

For this test we collected a total of 7854 ratings and calculated Spearman's rank correlation ρ coefficient for 231 pairs of lists (list obtained from half of the user's ratings vs list generated on the basis of the other half).

Downward propagation and Upward propagation: We compare this new approach which our older approach that propagates only vertically. In both cases the multi-directional approach works much better.
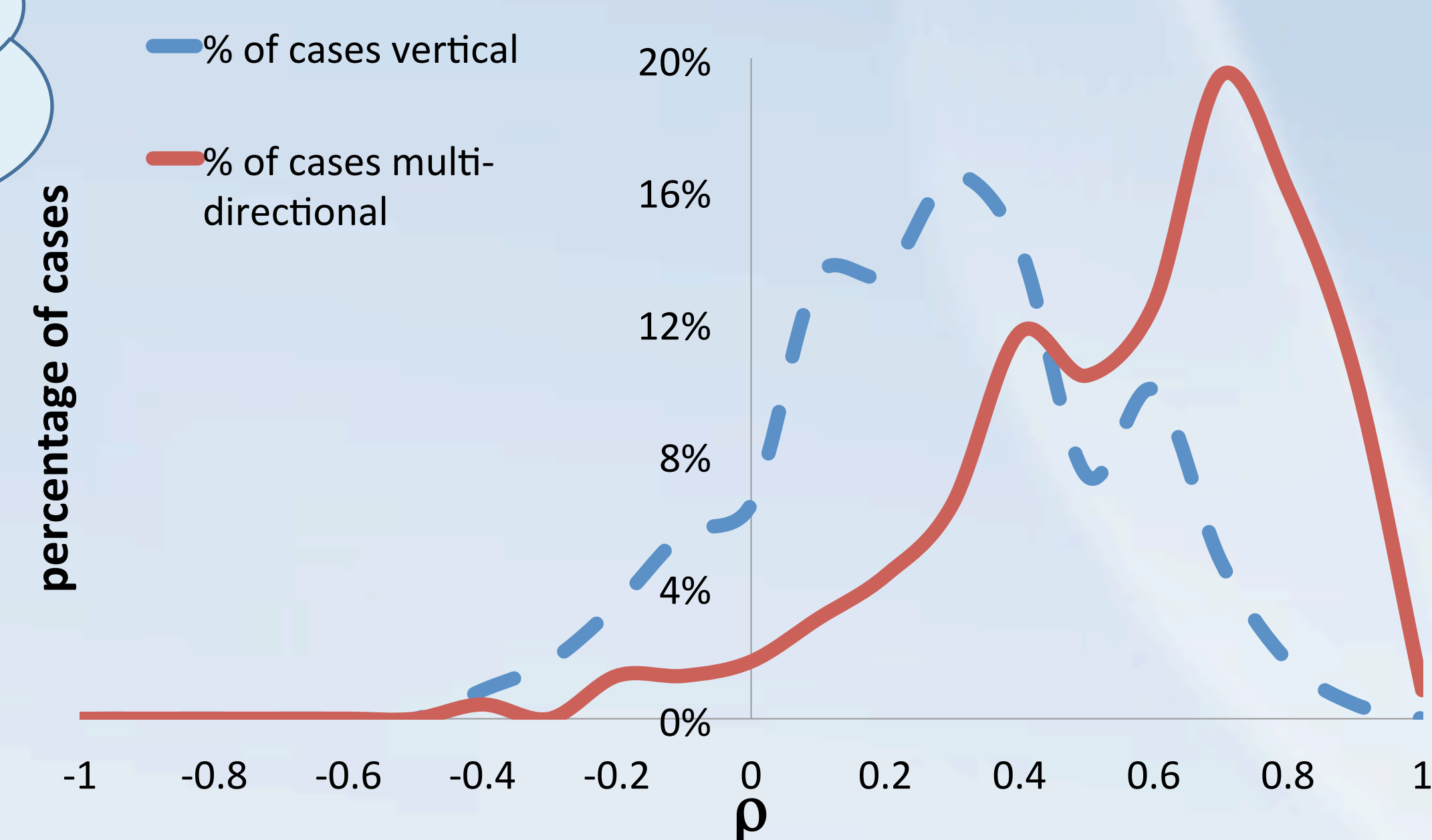
After 34 user feedbacks: We were able to generate the lists with $\rho \geq 0.5$ in 61% of the cases and $\rho \geq 0.7$ in 34% of the cases . We had no cases with a moderate or severe inverse correlaton with the user preference and just 3.5% of cases with negative ρ.

User feedback

User feedback

Upward Propagation

- % of cases vertical
- % of cases multi-directional

percentage of cases

ρ

Downward Propagation

- % of cases vertical
- % of cases multi-directional

percentage of cases

ρ
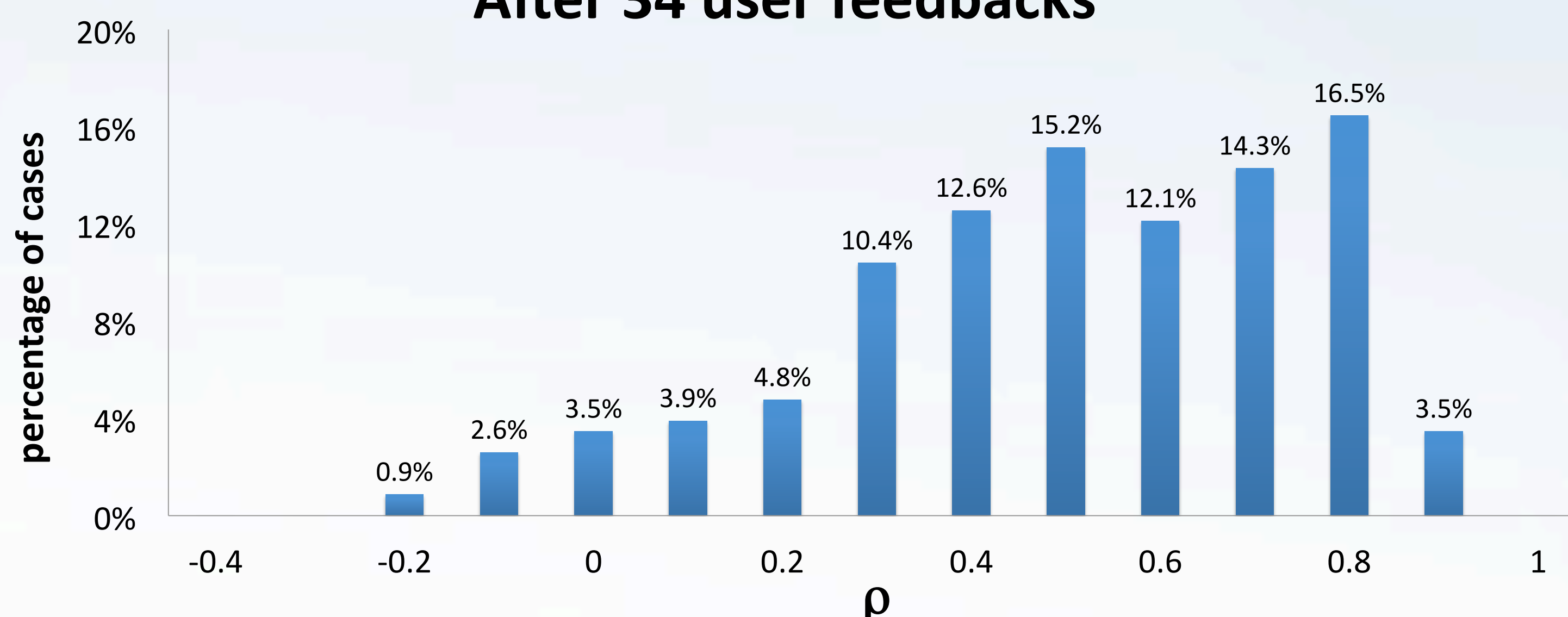
Future Developments

- Integration with properties propagation [2]
- Semantic Relationships correction
- Short/Long term interests

After 34 user feedbacks

percentage of cases

0.9% 2.6% 3.5% 3.9% 4.8% 10.4% 12.6% 15.2% 12.1% 14.3% 16.5% 3.5%

ρ

References:

*[1] Cena, F., Likavec, S., Osborne, F.: Propagating user interests in ontology-based user model. In AI*IA 2011, Palermo, Italy, (2011).*

[2] Cena, F., Likavec, S., Osborne, F.: Property-based interest propagation in ontology-based user model. In UMAP 2012, Monreal, Canada, (2012).

[3] Cena, F., Likavec, S., Osborne, F.: Anisotropic propagation of user interests in ontology-based user models. Submitted to Information Sciences.

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People Interaction with Enhanced-Multimodal Objects for a New Territory Experience