

# Active Collaborative Filtering using Bayesian Networks

**Équipe d'accueil :** DECISION - LIP6

**Laboratoire d'accueil :** LIP6

**Lieu :** Paris

**Encadrants :** Paolo Viappiani / Pierre-Henri Wuillemin

**Gratification :**  $\approx$  550 euros / mois

Collaborative filtering (CF) is a class of methods to produce personalized recommendations that have obtained widespread adoption in electronic commerce websites. While the most popular methods are based on matrix factorization, recently Langseth and Nielsen (2012) have provided a probabilistic method for collaborative filtering, offering the advantage of measuring the uncertainty with respect to the acquired model.

Another aspect of recommender systems of current interest is that of active learning methods : it is possible to improve the recommendation quality by asking specifically targeted questions to the user (Elahi, Riccin and Rubens, 2016). This can be crucial in some situations (new user / new item problem) and also to provide "contextual" recommendations. The internship will deal with Bayesian methods for collaborative filtering in particular considering the following two axes : - providing a collaborative filtering model based on discrete latent variables using Bayesian networks, allowing for fast Bayesian updates. - providing efficient active learning methods, that can exploit the probabilistic model to identify the next question to ask using a principled approach based on value of information (See also Jin and Si, 2004). It is expected that the student intern will provide new algorithmic methods and will evaluate them by comparing to the state of the art. Good implementation skills are required in addition to an excellent technical background in Bayesian methods.

## Ressources

Elahi, Ricci and Rubens. A survey of active learning in collaborative filtering recommender systems, Computer Science Review, Vol. 20, Pages 29-50, 2016

Helge Langseth, Thomas Dyhre Nielsen: A latent model for collaborative filtering. Int. J. Approx. Reasoning 53(4): 447-466 (2012)

Jin and Si. A Bayesian Approach toward Active Learning for Collaborative Filtering. UAI 2004