UNIVERSIDADE ESTADUAL DE MARINGÁ
DEPARTAMENTO DE INFORMÁTICA

PROGRAM: MASTER PROGRAM IN COMPUTER SCIENCE
COURSE: TOPICS IN COMPUTATIONAL INTELLIGENCE
PROFESSOR: MARCOS AURÉLIO DOMINGUES

COURSE PROJECT
(Score from 0 to 10, corresponding to 50% of the final score)

Your course project is an opportunity for you to explore an interesting subject about recommender system, i.e., about context-aware recommender systems. In this project, you will run a set of experiments by using 5 contextual recommenders and 1 un-contextual/traditional recommender system. The goal is to analyze whether the contextual recommenders provide better recommendations than the un-contextual recommender.

To perform this project, you must use the software CARSKit available at the address https://www.dropbox.com/s/a5e5v9zfhzdn8gw/carskit.jar?dl=0. Note that you must download the version available in the previous address, otherwise you will not be able to run the 5 contextual recommenders. After downloading the software, you can get more information about it in https://arxiv.org/abs/1511.03780.

The un-contextual recommendation algorithm that must be used in this project is the well know **BPR: Bayesian Personalized Ranking**, described in *Rendle, Steffen et al. "BPR: Bayesian personalized ranking from implicit feedback." Proceedings of the Twenty-Fifth Conference on Uncertainty in Artificial Intelligence. AUAI Press, 2009*.

On the other hand, the 5 contextual algorithms will be:

1. **ItemSplitting:** *Baltrunas, Linas and Ricci, Francesco. "Context-based splitting of item ratings in collaborative filtering." Proceedings of the third ACM conference on Recommender systems. ACM, 2009*;
2. **UserSplitting:** *Said, Alan; De Luca, Ernesto W. and Albayrak, Sahin. "Inferring contextual user profiles-improving recommender performance." Proceedings of the 3rd RecSys Workshop on Context-Aware Recommender Systems. 2011*;
3. **UISplitting:** *Zheng, Yong; Burke, Robin and Mobasher, Bamshad. "Splitting approaches for context-aware recommendation: An empirical study." Proceedings of the 29th Annual ACM Symposium on Applied Computing. ACM, 2014*;
4. **CombinedRedution:** *Adomavicius, Gediminas; Sankaranarayanan, Ramesh ; Sen, Shahana and Tuzhilin, Alexander. 2005. Incorporating contextual*

information in recommender systems using a multidimensional approach. ACM Trans. Inf. Syst. 23, 1 (January 2005), 103-145;

5. **DaVIBest:** *Domingues, Marcos Aurélio; Jorge, Alípio Mário and Soares, Carlos. 2013. Dimensions as virtual items: improving the predictive ability of top-N recommender systems. Information Processing & Management, 49 (3), 698–720*.

These 5 algorithms are considered pre-filtering meta-algorithms, which means that they pre-process the data and that to provide the contextual recommendation they use an un-contextual recommendation algorithm (in our case, the BPR).

By using the software CARSKit, each student will run the 6 previous algorithms in 1 out of 3 datasets. Each student must chose the dataset that he/she will run his/her course project and send an e-mail to the professor to inform him. The datasets are:

Movie_DePaulMovie.zip - https://github.com/irecsys/CARSKit/blob/master/context-aware_data_sets/Movie_DePaulMovie.zip

Music_InCarMusic.zip - https://github.com/irecsys/CARSKit/blob/master/context-aware_data_sets/Music_InCarMusic.zip

Travel_TripAdvisor_v1.zip - https://github.com/irecsys/CARSKit/blob/master/context-aware_data_sets/Travel_TripAdvisor_v1.zip

For the course project, each student must setup the empirical experiment to use 5-fold cross validation (as the evaluation methodology) and to recommend 5 and 10 recommendations (you will have 2 different setups). The following instructions can help you to carry out the experiments. More information can be found in https://github.com/irecsys/CARSKit.

```
evaluation.setup=cv -k 5 -p on --rand-seed 1 --test-view all
item.ranking=on -topN 5

evaluation.setup=cv -k 5 -p on --rand-seed 1 --test-view all
item.ranking=on -topN 10

recommender=bpr

recommender=itemsplitting -traditional bpr -minlenu 2 -minleni 2

recommender=usersplitting -traditional bpr -minlenu 2 -minleni 2

recommender=uisplitting -traditional bpr -minlenu 2 -minleni 2

recommender=davibest -traditional bpr -minlenu 2 -minleni 2

recommender=combinedreduction -tp 5 -traditional bpr
-innerfolds 5
```

After running the empirical experiment, each student must compare the 5 contextual algorithms against the un-contextual one in terms of Precision and MAP evaluation metrics. After all analysis, each student must write a short article summarizing the work carried out. The article must include an introduction, a section describing each algorithm used in the work, a section describing the empirical evaluation, a section describing the results, and finally, conclusion and future work. The results must be presented by using tables and graphics. Besides your article, you must also prepare a set of slides to perform an oral presentation of your course project.

Thus, your project will have 2 deliverables:

1. Article: 4-6 pages due November 15, 2017;
2. Oral Presentation due November 22, 2017.

Note that the article should be in an IEEE template format (4-6 pages in IEEE format, including references). The page limits are strict! Papers out of the limit will not be considered. IEEE Templates are available in https://www.ieee.org/conferences_events/conferences/publishing/templates.html.

SUBMISSION: The article (deadline: November 15, 2017) and the slides (deadline: November 22, 2017) of your project should be submitted in the moodle system.

DELIVERABLES: The article and the slides produced by your project.