



Research Networking Programmes

Short Visit Grant or Exchange Visit Grant

(please tick the relevant box)

Scientific Report

The scientific report (WORD or PDF file – maximum of eight A4 pages) should be submitted online within one month of the event. It will be published on the ESF website.

Proposal Title: Formal Properties of Information Retrieval Effectiveness Metrics

Application Reference N°: 7092

1) Purpose of the visit

Effectiveness evaluation is of paramount importance in Information Retrieval (IR), which has been one of the most evaluation-oriented fields in computer science since the first IR systems were developed in the late 1950s. All IR conferences feature evaluation sessions; papers on evaluation are continuously being published in IR journals; a recent Dagstuhl seminar <http://www.dagstuhl.de/13441> was on IR evaluation.

Within any evaluation methodology, the metric being used is a fundamental parameter. A survey in 2006 [4] counted more than 50 effectiveness metrics for IR, taking into account only the system oriented metrics. In an extended version of the survey [5], yet unpublished, about one hundred IR metrics are collected, let alone user-oriented ones or metrics for tasks somehow related to IR, like filtering, clustering, recommendation, summarization, etc.

Metric choice is neither a simple task, nor it is without consequences: an inadequate metric might mean to waste research efforts improving systems toward a wrong target. However, some researchers simply do not investigate into the suitability of the metric for the problem itself and they seem to choose just the most popular

metrics for their experiments. We cannot exclude the temptation for researchers to choose, among all available metrics, those that help corroborating their claims, or even to design a new metric to this aim. In addition, it is not clear what to do when two metrics disagree.

A better understanding of metrics, and of their conceptual, foundational, and formal properties, would help to avoid wasting time in tuning retrieval systems according to effectiveness metrics inadequate to specific purposes, and it will also induce researchers to make explicit and clarify the assumptions behind metrics.

Participant to the meetings have been: Julio Gonzalo and Enrique Amigó from UNED, Madrid, Evangelos Kanoulas from University of Amsterdam, and myself.

In the recent years, Gonzalo and Mizzaro jointly received a Google Faculty Research Award, under the sponsorship of the Kanoulas, on the topic of "Axiometrics", which is the unified view of evaluation metrics we are aiming at. The first results of the Axiometrics project have been published recently although independently by the two research groups [2, 3, 7, 6].

Within this scenario, the specific purpose of the visit was to discuss formal and axiomatic approaches to IR effectiveness metrics and to integrate the approaches.

2) Description of the work carried out during the visit

We reviewed the work that we have done almost independently so far and we defined a common notation that allows us to unify our own approaches. After having reached a consensus on the notation, we then stated the axioms and formal constraints that we had independently developed so far in the common notation, and compared them. We then turned to design a book on a formal account of IR metrics, that will summarize all our results, and that we plan to publish around mid 2015. We also discussed some other research work that can be carried on in the future but made no specific plans on that.

3) Description of the main results obtained

The main results are the notation, the analysis of the axioms, and the detailed outline of the book, specifying the content of each section and a responsible to write the various parts.

4) Future collaboration with host institution (if applicable)

The team of the four researchers will continue to collaborate in the future. Three of us are involved in a tutorial to be presented at

ECIR 2015 conference, in April 2015. All together, we will work on the book and also on other related research projects.

- 5) **Projected publications / articles resulting or to result from the grant (*ESF must be acknowledged in publications resulting from the grantee's work in relation with the grant*)**

Besides the above mentioned book, the visit led also to a submission of a tutorial proposal to the ACM SIGIR 2015 conference. If accepted we will present our approach at the conference in August 2015.

- 6) **Other comments (if any)**

None.

References:

- [1] E. Amigó, J. Gonzalo, and S. Mizzaro. A general account of effectiveness metrics for information tasks: retrieval, filtering, and clustering. In Proceedings of the 37th international ACM SIGIR conference on Research & development in information retrieval, pages 1289–1289. ACM, 2014.
- [2] E. Amigó, J. Gonzalo, and F. Verdejo. A general evaluation measure for document organization tasks. In Proceedings of the 36th International ACM SIGIR Conference on Research and Development in Information Retrieval, SIGIR '13, pages 643–652, 2013.
- [3] L. Busin and S. Mizzaro. Axiometrics: An axiomatic approach to information retrieval effectiveness metrics. In Proceedings of ICTIR 2013: 4th International Conference on the Theory of Information Retrieval, pages 22– 29, New York – USA, Oct. 2013. ACM.
- [4] G. Demartini and S. Mizzaro. A classification of IR effectiveness metrics. In M. Lalmas, A. MacFarlane, S. M. Rüger, A. Tombros, T. Tsikrika, and A. Yavlinsky, editors, Advances in Information Retrieval, 28th European Conference on IR Research, ECIR 2006, volume 3936 of Lecture Notes in Computer Science, pages 488–491, Londra, GB, Apr. 2006. Springer.
- [5] G. Demartini, S. Mizzaro, and F. Scholer. A survey and classification of information retrieval effectiveness metrics. Draft.
- [6] E. Maddalena and S. Mizzaro. Axiometrics: Axioms of information retrieval effectiveness metrics. In Proceedings of the Sixth International Workshop on Evaluating Information Access (EVIA 2014), pages 17–24, Tokyo, Japan, Dec. 9 2014. National Institute of Informatics. ISBN: 978-4-86049-066-9.

- [7] E. Maddalena and S. Mizzaro. The Axiometrics Project. In R. Basili, F. Crestani, and M. Pennacchiotti, editors, Proceedings of the 5th Italian Information Retrieval Workshop, Roma, Italy, January 20-21, 2014., volume 1127 of CEUR Workshop Proceedings, pages 11-15. CEUR-WS.org, 2014.