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Title : Bibliographically coupled patents: Their temporal pattern and combined relevance

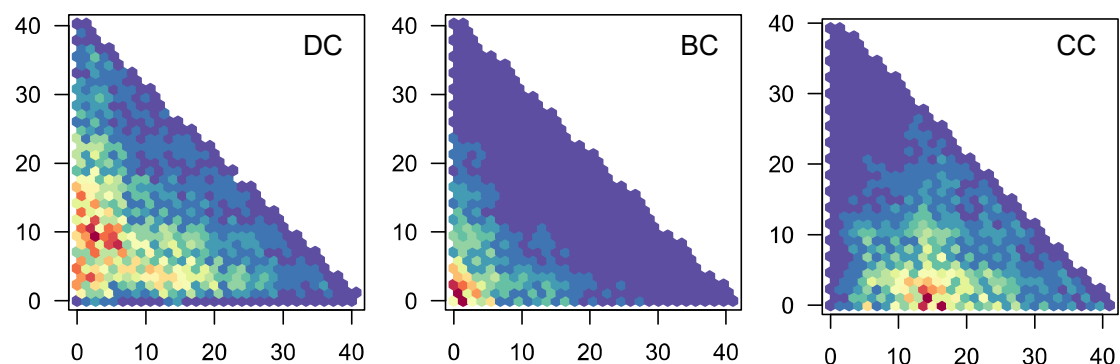
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Bibliographically coupled patents and improvement on its strength measurement

Bibliographical coupling (BC) is popular citation-based mechanism in detecting document similarity or relatedness. BC and another similar mechanism, co-citation (CC) are often applied to investigate latent relationship among documents, or to measure their degrees of relatedness. Through BC and/or CC, an analyst may more fully and more comprehensively capture the reality embodied in the documents.

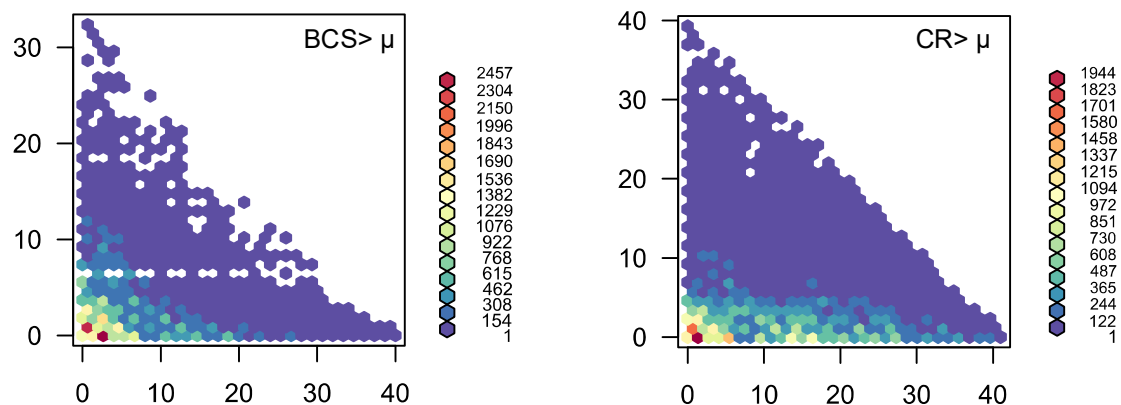
This study first find that patents' BC has a special temporal pattern different from those of direct citation (DC) and CC. This temporal pattern involves (1) the time difference, or *span*, between the BCed patents; and (2) the time distance, or *age*, between when BC occurs and now. The following figures show the frequency distributions of patent pairs having DC, BC, and CC relationship in accordance with their span (vertical axis) and age (horizontal axis), where the redder dots denote higher frequencies. It can be seen that BC patent pairs are especially concentrated on patents that are close in time (i.e., short-spanned) and close to the present (i.e., young-aged)



This study then indicates that the temporal pattern is very possibly resulted from that patents and their references are both expanding as time progresses. In other words, two patents that are closer to now and to each other has a greater chance to form BC and to have a greater intersection.

Conventional measurements to the BC strength are often based on the size of the intersection between two documents. These measurements, due to the above-described temporal pattern, are inevitably biased towards to those pairs having short spans and low ages. Those of older ages or longer spans are overlooked, even though they reflect true relatedness. In other words, BC's temporal pattern would lead to distortion if conventional strength measurement is applied.

This study therefore provides a simple improvement and observe its performance. As illustrated in the figure below, the left and right panes respectively show the frequency distributions of BC pairs having above average strength using a conventional measure and the proposed improvement. It can be seen that the improvement can include more pairs of greater spans (there are less blank spots in the vertical direction) and of older ages (there are also less blank spots along the horizontal direction, and there are also higher frequencies for older aged pairs). These pairs, however, may be overlook if conventional measurement is adopted.



The major contribution of this study is the discovery of BCed patents' temporal pattern, and an explanation is attempted. Even though the improvement is not perfect, it demonstrates that some significant enhancement may be achieved even with such simple adjustment. This would lay a sound foundation and confidence as well for future study.