Four Degrees of Separation

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Abstract

Frigyes Karinthy, in his 1929 short story "Láncszemek" (in English, "Chains"), suggested that any two persons are distanced by at most six friendship links. Inspired by this suggestive hypothesis, Stanley Milgram [3, 4] in his famous 1967 experiment challenged people to route postcards to a fixed recipient by passing them only through direct acquaintances. Milgram found that the average number of intermediaries on the path followed by the postcards lay between 4.4 and 5.7, depending on the sample of people chosen.

Following in Milgram's footsteps, we recently [1] studied the friendship relations in the Facebook network, performing the first world-scale social-network graph-distance computation, on a graph of ≈ 721 million users with ≈ 69 billion friendship links. The average distance we observed in our experiment was 4.74, corresponding to 3.74 intermediaries or "degrees of separation": in a way, our experiments showed that the world is even smaller than we expected!

These and other findings were made public by Facebook through its technical blog on November 19, 2011. Immediately after the announcement, the news appeared in the general press (starting from the New York Times [2]) immediately giving rise to a number of interesting observations and criticisms about the meaningfulness, methods and consequences of the experiment we performed.

In my opinion, our experiment (and the discussion that it produced) is an example of something new and exciting in the world of engineering and computer science, that is worth more than one reflection.

- The first remark is that, whether we like it or not, modern social sciences and computer science form a (somehow odd, but inseparable) couple. On one hand, modern social scientists can no longer draw their conclusions only on small (or tiny) groups of people: today they can (and should, when possible) rely on large datasets provided by electronically-mediated social networks and communities. On the other hand, a larger and larger portion of engineering problems have to deal with the behavior of individuals, either because they try to exploit it to obtain useful information (like in the wisdom-of-crowds) or in order to design tools that make those individuals interact.

- Crowds produce large data! In fact, search engines and social network sites are the places where the largest repositories of information need to be processed and mined; the only other kind of experiment where data with similar size are produced is particle physics. Now, mining such big data is a challenge under many aspects: it calls for completely new techniques of compression, job distribution, algorithm design, approximation and so on. I believe that these challenges offer the kind of stimuli that should drive modern computer science.
- Computer scientists in the past used to study and analyze artifacts that they themselves had produced; nowadays, they need to put their knowledge at good use in studying the inexplicable products of human interactions. This is an example of a new and unexpected convergence: computer science, for the first time in its existence, is becoming more and more an experimental science, like physics or chemistry.

References

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