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Analyzing Industry-University Collaboration Using Complex Networks and Game Theory

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Abstract : Due to the novelty of the nanotechnology science, its highly knowledge intensive content, and its invaluable application in almost all technological fields, the close interaction between university and industry is essential. A possible gap between academic strengths to generate good nanotechnology ideas and industrial capacity to receive them can thus have far-reaching consequences. In order to be able to enhance the collaboration between the two parties, a better understanding of knowledge transfer within the university-industry relationship is needed. The objective of this research is to investigate the research collaboration between academia and industry in Canadian nanotechnology and to propose the best cooperative strategy to maximize the quality of the produced knowledge. First, a network of all Canadian academic and industrial nanotechnology inventors is constructed using the patent data from the USPTO (United States Patent and Trademark Office), and it is analyzed with social network analysis software. The actual level of university-industry collaboration in Canadian nanotechnology is determined and the significance of each group of actors in the network (academic vs. industrial inventors) is assessed. Second, a novel methodology is proposed, in which the network of nanotechnology inventors is assessed from a game theoretic perspective. It involves studying a cooperative game with n players each having at most n-1 decisions to choose from. The equilibrium leads to a strategy for all the players to choose their co-worker in the next period in order to maximize the correlated payoff of the game. The payoffs of the game represent the quality of the produced knowledge based on the citations of the patents. The best suggestion for the next collaborative relationship is provided for each actor from a game theoretic point of view in order to maximize the quality of the produced knowledge. One of the major contributions of this work is the novel approach which combines game theory and social network analysis for the case of large networks. This approach can serve as a powerful tool in the analysis of the strategic interactions of the network actors within the innovation systems and other large scale networks.

Keywords : cooperative strategy, game theory, industry-university collaboration, knowledge production, social network analysis
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