VIDEO ARTICLE

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Technology Informatics for Innovation Management in Nanocarbon Applications

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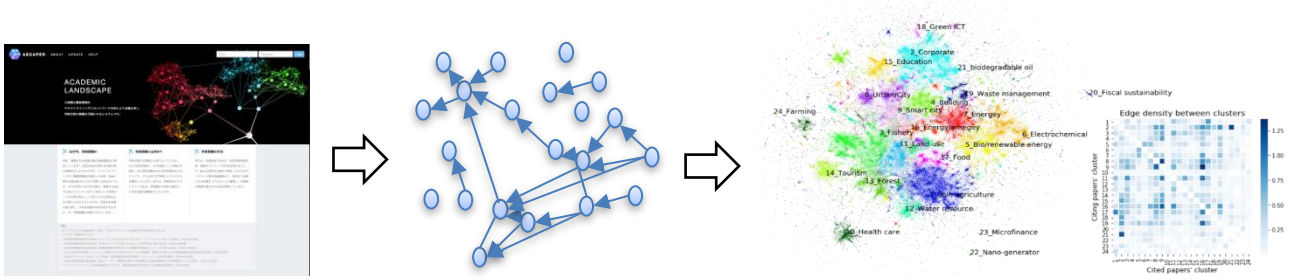
Graphical Abstract



Abstract

Nanotechnologies are one of the promising approaches for achieving the goal of formation of sustainable and well-aging societies. Nanocarbons, such as graphene, carbon nanotubes and fullerene, due to their remarkable electrical and mechanical properties and their unique morphologies, appear suitable for a wide variety of applications, include catalysts, batteries, biosensors, nanocomposites, drug deliveries, solar cells, water/air purifications and supercapacitor [**1**]. Nanocarbon technology is expected to contribute widely to SDGs by such various applications [**2**]. We report in this study [**3**] that there are some meaningful trends in researches on nanocarbons; this conclusion is made by extracting the information regarding paper citations from more than 300,000 scientific papers. A so-called node's degree of trend-followings is elected as an original indicator, denoted as intrinsic publication year (IPY). Meaningful relations between IPY and the number of paper citations are observed: top 10%-citation papers took the highest IPY values and 0%-citation papers took the lowest IPY values. This new observation implies a fact that a high-citation paper is always following the trends in researches on nanocarbons. A similar tendency is also observed in researches on solar cells and America Physical Society (APS). In other words, IPY is a meaningful indicator for predicting of future citations of academic researches. In addition, our experimental data have shown a new fact that

specified keywords with high IPY values involved in the abstracts of papers have been used frequently in the following publications. In conclusion, we have developed a comprehensive, computer-based approach by using citation network analysis, topic modeling and machine learning for identifying of knowledge structures, relevance between knowledge domains and the emerging research fronts [**4**]. As an upgraded research achievement of the data-driven approaches, we have also established a novel framework which is capable of forecasting the trends as the growing directions of paper citations via network representation learning (NRL) [**3**]. We presume that the linear growth of paper citations in latent spaces observed by NRL is the results reflecting the iterative edge-additional process of the citation networks. Other potential applications of our Technology Informatics will be also mentioned.

Keywords: Technology Informatics, Nanocarbon, intrinsic publication year (IPY), network representation learning (NRL).

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Biography of Presenting Author

Ichiro Sakata was born in Osaka, Japan in 1966. He received the BA in economics from the University of Tokyo (UTokyo), Tokyo, Japan in 1989, the M.A. in international economics and finance from Brandeis University, Boston, MA, in 1997 and the Ph.D. in environmental and ocean engineering from the UTokyo, Tokyo, Japan, in 2003. He is a Professor and a former Head of the Department of Technology Management for Innovation at Faculty of Engineering, UTokyo. He also has a joint appointment as a Vice President of UTokyo, a Director of Planning Office and a Head of Vison Formation Group of Future Society Initiative (FSI). He is a co-Head of the Advanced Bio Carbon (ABC) consortium, a Head of the Cellulose-nanofibrils (CNFs) / graphene Composite for Low Temperature FIR desiccator Consortium and a Head of Development Project of the Future Prediction Platform from Large-scale Literature Data. He served as a special advisor to the Minister of Health, Labor and Welfare and the Minister of Reconstruction, Japan. He is the author of ten book chapters and over one hundred and sixty articles and conference papers. His research interests

include innovation management, technological forecasting, computational social science and strategic research planning in the field of nanocarbon and sustainability science. He is also conducting research on nanomaterials that contribute to solving social issues and better future society.

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