



ELSEVIER

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

# Transportation Research Part A

journal homepage: [www.elsevier.com/locate/tra](http://www.elsevier.com/locate/tra)

## Coauthorship network in transportation research

Lijun Sun<sup>a,\*</sup>, Iyad Rahwan<sup>a,b</sup><sup>a</sup> The Media Laboratory, Massachusetts Institute of Technology, Cambridge, MA 02139, USA<sup>b</sup> Institute for Data, Systems & Society, Massachusetts Institute of Technology, Cambridge, MA 02139, USA

### ARTICLE INFO

#### Article history:

Received 17 January 2017

Received in revised form 8 April 2017

Accepted 12 April 2017

#### Keywords:

Coauthorship network  
 Transportation research  
 Scientific collaboration  
 Social network analysis

### ABSTRACT

The field of transportation research has been accelerating in the last decade. In this paper, we examine the structure of scientific collaboration in transportation research by building a coauthorship network using publication metadata from 22 transportation journals. In this network, a vertex represents a researcher and an edge represents the collaboration (coauthorship) between a pair of researchers. To build an accurate network, we propose and apply an efficient author name correction algorithm. The obtained network provides us with a tool to understand patterns of collaborations in transportation research. The results show an increasing trend of collaboration over the studied period (1990–2015), but different journals exhibit different patterns. We characterize the structural properties of this network and compute several centrality measures to quantify the performance/impact of researchers and their collaborations in the research community. This study could serve as a tool to qualitatively and quantitatively understand scientific collaborations in transportation research.

© 2017 Elsevier Ltd. All rights reserved.

## 1. Introduction

Scientific research is becoming increasingly multi-disciplinary, requiring a broad range of intellectual frameworks, skills, and techniques. With this trend, scientific collaboration has become a dominant mechanism to bring about important research advances (Katz and Martin, 1997; Wuchty et al., 2007). Collaboration is beneficial to both researchers and the progress of modern science. As a result, scientific collaborations also make teams more productive, accelerating the speed of scientific progress. Besides the rising demand for collaboration, advances in ICT (information and communications technology) also reduce the cost of communication, making international and multi-disciplinary collaborations easier than ever before.

Scientific publication is the most important proxy to access scientific advances and to understand scientific collaborations. With the trend of increasing collaboration, more research publications are now created by teams of researchers instead of single individuals (Greene, 2007). In the field of *scientometrics*, researchers have been using publication data to investigate the pattern and trend of scientific collaboration for a long time. Among different methodologies for studying collaborations, an effective approach is to investigate coauthorship networks, since joint papers are the most straightforward proxy of successful formal collaboration.

\* Corresponding author at: 75 Amherst Street, E14-474D, Cambridge, MA 02142, USA.

E-mail address: [sunlijun@mit.edu](mailto:sunlijun@mit.edu) (L. Sun).

A coauthorship network can be seen as a social network built on scientific collaborations, and thus it is amenable to social network analysis (Wasserman and Faust, 1994; Barabási, 2016). With the development of complex network theories, researchers have been using network science to re-investigate the structural properties of coauthorship networks. Newman is among the first to apply complex network analysis on coauthorship networks (Newman, 2001a,b, 2004). He studied several large coauthorship networks in physics, biomedical research and computer science. In these studies, he defined different metrics to quantify the importance of vertices and edges in the network.

Subsequently, researchers in other fields started exploring other aspects of coauthorship networks. For example, For example, Barabási et al. (2002) re-investigated the structure of coauthorship network from an evolutionary perspective. investigated the structure of coauthorship networks from an evolutionary perspective. The authors considered a coauthorship network as a complex evolving network and studied the dynamics driving the evolution of the network's topology. Wagner and Leydesdorff (2005) studied the patterns of international collaboration using data from *Science Citation Index* and showed that the trend of international collaboration could be explained by the organizing principle of preferential attachment, whereby highly-connected authors tend to attract more new collaborators. To quantify authors' impact, Yan and Ding (2009) applied four centrality measures (degree, betweenness, closeness, and pagerank index) in the coauthorship network of "library and information science", and found that these measures are significantly correlated with citation counts. There are also some works focusing on particular research fields and trying to find some field-specific insights. For example, Liu et al. (2005) conducted a comprehensive analysis of the coauthorship network in "digital library". Besides network analysis, the authors also developed a new measure called *AuthorRank* to quantify authors' impact. Acedo et al. (2006) investigated coauthorship network constructed from 10 top journals in "management and organizational studies" from 1980 to 2002. Liu et al. (2005) also did a good overview of coauthorship network research. We refer the interested readers to this reference for a comprehensive literature review on coauthorship network studies.

Scientific publication in the field of transportation research has increased dramatically in the last decade, both in terms of the number of journals and articles per journal (Button, 2015). Meanwhile, the diversity of topics within transportation research has also increased, due to advances in technology and methodology. Yet, scientometric studies of the field of transportation research remain limited. Hanssen and Jørgensen (2014) studied the effect of author and article characteristics on a paper's citation counts using data from several transportation journals. The results show that articles written by authors from more than one country and articles with shorter titles tend to be more cited. Heilig and Voß (2015) systematically studied the field of public transport using historical literature data from 2009 to 2013. The authors investigated how public transport research has evolved in terms of the development of publication patterns and major topics. Using an article abstract data set extracted from 22 transportation journals, Sun and Yin (2017) detected research themes using 'topic modeling' techniques, and quantified how topic distributions evolve over time and across different journals. To the best of our knowledge, no systematic empirical research has investigated the patterns of collaboration in the transportation research community and the structure of the coauthorship network.

To fill this gap, the present study focuses on building the coauthorship network of transportation research and analyzing its structural properties using social network analysis. The remainder of this paper is organized as follows. Section 2 introduces the publication metadata used in this study and presents in detail an algorithm to correct author names. We also list several metrics in network analysis to measure the impact/importance of researchers and their collaborations. Section 3 shows the statistical properties of the obtained coauthorship network. We applied various centrality measures to identify those most influential researchers and collaborations. Section 4 concludes this study, and discusses limitations and potential future directions.

## 2. Methodology

In this section, we first introduce the publication data set used in building the coauthorship network. Next, we present a network-based author name correction algorithm, which can distinguish authors with identical initials and merge names referring to the same researcher but in different formats. Finally, we describe several measures quantifying the importance of authors (vertices) and their collaborations (edges) in the coauthorship network.

### 2.1. Data

The data set is the same as the one used for discovering research themes and trends in transportation research (Sun and Yin, 2017). The publication metadata is obtained from Web of Science (<https://apps.webofknowledge.com/>), consisting of articles from 22 journals in the fields of transportation research from 1990 to 2015. The 22 journals are selected as top tier in the *Science Citation Index* (SCI) under category "Transportation Science & Technology" and in the *Social Science Citation Index* (SSCI) under category "Transportation". Fig. 1 shows the number of articles of each selected journal during 1990–2015, highlighting a clear and substantial increase in volume.

Download English Version:

<https://daneshyari.com/en/article/4928967>

Download Persian Version:

<https://daneshyari.com/article/4928967>

[Daneshyari.com](https://daneshyari.com)