The Intellectual Structure of Health and Medical Informatics

Wallianallur Raghupathi, Fordham University, USA
Sridhar Nerur, University of Texas at Arlington, USA

ABSTRACT

This paper presents the results of an author co-citation analysis of the health and medical informatics discipline. It updates a smaller study that focused on health information systems. Drawing on such sub-fields as bioinformatics, clinical decision support systems, computational genomics, e-health, health informatics, and others, this body of knowledge defines the core internal structure of the discipline and delineates its sub-fields. An author co-citation analysis was performed for a nine-year period using the members of editorial boards of several medical informatics-related journals as an initial author sample (N = 272). Several multivariate analyses, including cluster analysis, factor analysis and multidimensional scaling, were performed. The authors results confirm that several established sub-fields still stand but a number of new sub-fields are emerging. Future research can build on this work and examine other journals and additional authors to gain insights into the collaborative and interdisciplinary nature of the health and medical informatics discipline.

Keywords: Author Co-Citation Analysis (ACA), Bibliometrics, Discipline, Health & Medical Informatics, Intellectual Structure

INTRODUCTION

In this article we present a contemporary view of the intellectual structure of the health & medical informatics discipline by analyzing co-authored papers for the nine-year period, 1998 to 2006. The study described here builds on a prior smaller study that looked at health information systems and was published in Methods of Information in Medicine (Raghupathi & Nerur, 2008). Editorial board members of various health & medical informatics-related journals shown in Table 1 served as proxies for leading researchers/authors. We gathered co-citation data from the Web of Science’s Science Citation and Social Science Citation Indexes. The results of our research confirm the historically dominant fields, emerging topics, leading researchers, as well as the relationships among researchers and topics over a nine-year period. The study, therefore, is an attempt to map the overall structure of the health & medical informatics discipline. Our primary objective is to develop a benchmark that may be used to develop taxonomies and frameworks of future research topics, investigate changes in the discipline as a whole, and document the emergence of new research areas and the decline of established areas of research. This study also updates the findings of prior studies that used

DOI: 10.4018/jhisi.2010100102
different methodologies including co-citation
analysis to elucidate the intellectual structure of
health & medical informatics (Andrews, 2002;

The rest of the paper is organized as fol-
lows. First, we discuss the research objectives
and methodology of this study, focusing on the
bibliometric technique of author co-citation
analysis (ACA). Subsequently, we analyze and
discuss the results of various statistical methods
employed and weigh in on the scope and limi-
tations of this study. Finally, we offer conclu-
sions and directions for future research.

While there is no clear definition of health
& medical informatics, several definitions and
descriptions of the medical informatics disci-
pline exist (Morris & McCain, 1998; Shortliffe,
1987) and these are consolidated in (Morris &
McCain, 1998). Amore recent study also looked
at the domain of medical informatics (Schuemie
et al., 2009). As Morris and McCain suggest,
“medical informatics draws on, and contributes
to, multiple disciplines in the health sciences
and information sciences” (Morris & McCain,
1998). They also report on other definitions, for
example, that of Lincoln and Korpman who
defined it as “the hybrid child of medicine and
those logical sciences that are suggested by
computer technology” (Lincoln & Korpman,
1980). They point out that Shortliffe affirmed the
‘information’ dimension of medical informatics,
observing an NLM note that “medical informat-
ics is the study of biomedical information, data
and knowledge – their storage, retrieval, and
optimal use for problem solving and decision
making” (Shortliffe, 1988). Morris and McCain
also indicate that Greenes and Siegel visualized
medical informatics as “the field concerned
with the cognitive, information processing, and
information management tasks of medical and
health care, and biomedical research, and with
the application of information sciences and
technology to those tasks” (Greenes & Siegel,
1987). Building on prior work, as reported in
Morris and McCain, Lincoln included additional
fields that linked to medical informatics observ-
ing that it drew on “various branches of logic,
mathematics, computer science and behavioral
science as well as focused disciplines such as
decision theory, artificial intelligence, systems
analysis, and industrial psychology” (Lincoln,
1990). Another discussion is by Blois who
described the field observing that “medical
information science (medical informatics) may
be viewed as a discipline with several sub-fields,
some of which (e.g., biostatistics) are already
in the standard medical curriculum, while oth-
ers (e.g., inference methods, decision theory)
are not” (Blois, 1986) (as reported in Morris &
McCain, 1998). Morris and McCain conclude
that one can anticipate that the discipline bor-
rows from numerous other disciplines (Morris

As indicated by the multiple definitions
and the variety of journals that exist, health
& medical informatics is interdisciplinary and
poses special problems for study (Morris & Mc-
Cain, 1998). New sub-fields, domains and topics
emerge from old ones “when the paradigms
followed by existing disciplines no longer meet
the needs of their researchers” (Kuhn, 1970). In
contrast, Morris and McCain (1998) point out
that inter-disciplines form when themes from
existing disciplines are consolidated (Klein,
Related Content

The Gap between What is Knowable and What We Do in Clinical Practice
[www.irma-international.org/chapter/gap-between-knowable-clinical-practice/49263/](www.irma-international.org/chapter/gap-between-knowable-clinical-practice/49263/)

Overcoming the Quality Gap and Ethics in M-Health: MobileDiagnosis-Innovation and Quality to All

Secure Exchange of Electronic Health Records
[www.irma-international.org/chapter/secure-exchange-electronic-health-records/73896/](www.irma-international.org/chapter/secure-exchange-electronic-health-records/73896/)

Extending Lifetime of Biomedical Wireless Sensor Networks using Energy-Aware Routing and Relay Nodes
Carlos Abreu and P. M. Mendes (2014). *International Journal of E-Health and Medical Communications* (pp. 39-51).

A Tool for Automatic Hammersmith Infant Neurological Examination
[www.irma-international.org/chapter/tool-automatic-hammersmith-infant-neurological/72984/](www.irma-international.org/chapter/tool-automatic-hammersmith-infant-neurological/72984/)