

Emerging a Web Science Curriculum

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ABSTRACT

This text describes a project which aims to explore the scope of the discipline Web Science; an emerging subject which is fundamentally inter-disciplinary. There are very few definitive subject definitions currently available for Web Science. Additionally, the nature of the subject is constantly evolving as an increasing number of different disciplines begin to practice what might identifiably be called Web Science. This potentially provides educators and students with a problem; how do you teach or learn about Web Science when there is no clear definition? This text provides a brief overview of a PhD project, the final aim of which involves the emergence of a framework for a working definition of Web Science. This will be achieved by an examination and overview of current existing Web Science curricula, as well as available Web Science literature.

Keywords

Web Science, Web Science Curriculum, Education.

1. INTRODUCTION

Web Science is an emerging subject which is fundamentally inter-disciplinary. The term Web Science was first coined in 2006, with a publication by Berners-Lee, Weitzner, et al. 'A Framework for Web Science: Foundations and Trends in Web Science'. Following this, a growing number of intuitions across the world began offering taught programmes dedicated to Web Science. The majority of these are at Masters or PhD level; however a number of intuitions are now also offering Web Science undergraduate programmes. Initial attempts at creating such formal subject definition for Web Science were made during the early days of formal Web Science teaching, with the Web Science Subject Categorisation being released for public use in 2011. However, this was derived using a formal top down, theoretical approach. In practice, Web Science as it is researched and taught differs significantly from the formal model. While it is valuable for educators to have a formal definition of a curriculum, the process of manually assembling such a curriculum is onerous and time-consuming. Within a rapidly evolving field such as Web Science, the definition is highly likely to become outdated by the time it is completed. In order to address this problem, research which identifies from the ground up, the content and different types of teaching of Web Science at different academic levels, can usefully be used to define the curriculum.

In order to address this issue, we began conducting an examination of current Web Science related courses and resources available, in order to attempt to build a picture of how Web Science is currently taught, and compare and contrast this with available subject definitions for Web Science, with the ultimate aim of presenting a set of findings depicting the scope of the Web Science subject, drawn from elements common to curricula worldwide. The following sections outline the key question that the project aims to address, which is: '**What is taught as Web Science?**' The following sections provide a more detailed explanation of this question, as well as outlining some proposed research methods.

2. What is taught as Web Science?

This key question focuses on creating a picture of what is currently the taught definition of Web Science across institutions worldwide, and attempting to create a curriculum recommendation, which includes the components common to most institutions. The perspective of what constitutes a Web Science course varies according to each institution, therefore it is important to achieve an overall perspective and take biases into account in order to present a more accurate representation of what is being taught as Web Science as a whole. The study will also look at the difference between existing subject definitions, such as the Web Science Subject Categorization, [1] as well as the most frequently occurring keywords found in papers taken from the Web Science conferences, [4] comparing these results with what is taught as part of current Web Science curricula. It will also be beneficial to identify the key individuals associated with authoring and publishing Web Science content, in order to be able to identify relevant related work.

3. Comparison with Existing Curricula

The most definitive effort to define the scope of the Web Science subject curriculum is the Web Science Subject Categorization (WSSC). The WSSC [1], which was released for public use in 2011, is collaboration between academics, which aims to create a definitive subject definition or curriculum for Web Science. The WSSC was developed using a top down, theoretical approach, in a reverse engineering fashion. Academics derived a set of categories by breaking down the Web Science subject into its constitutional parts. E.g. "*computational, mathematical, social, economic and legal*" [1]. The WSSC is no longer included on the current version of the Web Science Trust Web website. It is largely acknowledged within the community that this is due to the fact that it is now outdated. This is a consequence of the rapid evolution of Web Science. However, it remains the most comprehensive attempt to define the curriculum, and still serves as a useful point of comparison which will be used as a benchmark against which current Web Science taught curricula content may be evaluated. Similar examples of existing curriculum guidelines include the ACM Computer Science curriculum [2], and the ACM Information Science curriculum [3]. These ACM guidelines will also serve as a point of comparison and reference when examining the structure of a curriculum and proposing a framework for Web Science, although a ground up methodology will be used to determine the content.

4. Data Gathering: Web Science Courses

This work gained inspiration from a previous study conducted by White et al [5] which outlined a proposal for gathering information about the Web Science curriculum, and also conducted a brief study of Web Science educational institutions. As this study demonstrated, traditional surveys often yield low response rates from participants, therefore we decided to begin with a simple desk survey of university websites. This involved manual web searches in order to identify a list of institutions

which teach an active Web Science syllabus, and also included institutions which teach a module or other content relating to Web Science. This was then expanded to include a full desk survey of modules, as well as a supplementary questionnaire based survey, which aims to provide an insight into the backgrounds from which Web Scientists originate, as well as their experiences of studying and/or teaching a Web Science related programme.

5. Initial Survey Findings

The following table shows the current list of Web Science Teaching institutions identified.

Table 1. Web Science Teaching Institutions

Web Science Teaching Institutions
Aristotle University of Thessaloniki - Thessaloniki, Greece
British university in Egypt - EL SHEROUK CITY, Cairo, Egypt
Cologne University, Germany
Eindhoven University of Technology
Georgia Tech University – Web Science Courses
Goldsmiths London
Johannes Kepler University Linz
Korea Advanced Institute of Science and Technology (KAIST)
MIT - Massachusetts Institute of Technology
Northwestern University School of Communication
Oxford Internet Institute
Rensselaer Polytechnic Institute
RWTH Aachen University
Saint-Joseph University of Beirut
The University of Edinburgh: School of Social and Political Science
UAH MediaLab, University of Alcalá (Spain)
University College London
University of Erlangen-Nürnberg
University of Koblenz-Landau, Institute for Web Science and Technologies,
University of Liverpool
University of Southampton, UK

The majority of intuitions identified currently originate in central Europe. This is likely to a result of the fact that the Web Science community is better established in Europe. While there may not be full Web Science taught programmes in other world locations, further efforts will be made in order to continue identifying additional related programs or modules worldwide, in order to provide a balanced and unbiased view of Web Science across the globe.

6. Web Science Modules Desk Survey

Having successfully compiled a list of institutions, we then expanded the study to include details of individual modules relating to Web Science. This survey included the following fields:

Table 2. Key Fields Used in the Modules Desk Survey

Intuition Location	Resource Title	Topic(s) Taught	Teaching\ Assessment format
Contributors(s)	Materials Used	Level (e.g. Masters)	Module Dates\Duration

The process involved time-consuming navigation of web pages for each of the institutions identified, in order to manually gather the information relating to the headings shown in table 1. The data was then recorded in an Excel spreadsheet with the above cell headings. This process was repeated for each of the institutions identified in the previous stage of the study. It was only possible

to gather data from institutions which provide public information relating to modules. An additional difficulty faced during the exercise, related to the fact that information is often formatted differently by each institution. For example, some universities provide detailed dates for module teaching times, whereas others only provide basic information such as semester 1 or semester 2, whilst others completely omit such information. The full results of the desk survey, as well as the questionnaire survey of Web Science academics will be analysed using a combination of thematic analysis and keyword analysis, utilising the qualitative data analysis package, NVivo. These methods will be used to pinpoint common elements between the Web Science curricula identified.

7. Conclusions and Future Work

The research question and initial research outlined above form the basis of a thesis, the aim of which is to attempt to better define Web Science as a taught subject. By addressing the answer to the key question, ‘What is Web Science?’ it should be possible to provide an overview of how Web Science is taught worldwide, and provide an example of a Web Science curriculum drawn from elements common to existing curricula. The next stage of this work will include further analysis, presentation and visualisation of the data gathered. Further work also includes the ongoing search for additional data sources, one of which may include harvesting of Tweets and Twitter content relating to Web Science. Another desired outcome would be to recommend or provide plans for an automated method for tracking the development of the Web Science subject. Finally, it is hoped that this work will inspire debate within the wider Web Science community, with the aim of fostering foundations for further future work into the definition of the Web Science curriculum. A more accessible and widely available subject definition should encourage participation and interest in Web Science, not only within the Web Science community, but also for the promotion of Web Science as a recognised taught subject worldwide.

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