**Chapter III**

# Techniques for Visualizing Website Usage Patterns with an Adaptive Neural Network

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## ABSTRACT

*At any given Website, the flow of users' visitations represents a valuable source of information for Web professionals. However, the identification and interpretation of Web usage patterns is not necessarily an easy task. The sheer volume and complexity of the browsing patterns captured in the Website server logs makes understanding users a difficult, time-consuming task. The present chapter explores the use of an adaptive neural network to visualize the Website usage patterns. This visual representation supports the identification of clusters of Web pages that are frequently visited together by users. A Website designer can see, at a glance, the primary groups of Web pages that visitors browse. Further, the site structure can be readily compared to the usage clusters to measure how well the links at the Website support the actual use of the site.*

# INTRODUCTION

As the importance of the Internet rises, the need to create more adaptive and more usable Websites also grows. Most improvements to a Website require some knowledge of the site's users and how they are interacting with the pages. However, Web professionals today have relatively few good options for capturing this information. Certainly, there are software and services to help summarize the basic information from the Website logs. This could mean keeping track of the frequency of visits for the individual Web pages that make up a site, counting how many times the overall Website is visited from a specific Web location, or other basic statistics.

Web usage mining refers to the application of data mining techniques to the Web server log in order to recover patterns in the use of a Website. For example, Mobasher, Cooley and Srivastava (2000) describe an automated recommender system that dynamically suggests appropriate pages for a user based on the overall Website usage patterns. The system presented in Spiliopoulou (2000) answers questions about the Website usage, when asked in an SQL-like language. An experienced user could interactively use this system to identify the Web page sequences that meet any criterion that the user specifies. Such a general tool is very powerful, but requires considerable expertise from the user.

Perotti and Burke (2001) presented a technique and visualization that offers Web developers an opportunity to easily see the pattern of usage at a Website. Unlike earlier depictions, their Web Usage Plot emphasizes the relationship between the various pages at a Website by displaying them in a topographic organization; sites that are visited together frequently appear close together, while those that are seldom visited together in the same session appear far apart. Their process to create the Web Usage Plot visualization has several steps, as depicted in Table 1.

The final visualization step relies on a multivariate statistical technique called Multidimensional Scaling (MDS). This technique allows the reduction of the high dimensional data into lower dimensional coordinates that can be more easily visualized. The Web Usage Plot created with MDS does have many advantages over earlier representations of Website usage patterns.

Unfortunately, using MDS for Web usage visualization can be tedious because the algorithms for reducing the data dimensionality are computationally expensive.

*Table 1: A Simple Process for Visualizing Web Usage (Adapted from Perotti & Burke, 2001)*

| |
|---|
| 1. Cleaning and organizing the Web server logs |
| 2. Creating an aggregate representation of all users Web page visits, the co-occurrence matrix |
| 3. Visualizing this representation |

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