Computers

Designing a Data Warehouse from the Ground Up. Krish Narayanan, Eastern Michigan University

A data warehouse is often considered as a glorified database. After all, both store large amounts of corporate data and provide reports based on that data. What is missing from this perspective is the totally different set of needs that is being met by a data warehouse and the different concepts that are used in designing and implementing one. A database is the back-end of an online transaction processing system (OLTP), which is used to store operational data. A data warehouse, on the other hand, is the backbone of an analytical system that is critical in making business decisions, also known as, Online Analytical Processing system (OLAP). A warehouse stores summarized data that is drawn from various sources and provides data for multi-dimensional analysis.

This paper will discuss the characteristics of a data warehouse and the techniques used in designing and implementing one from scratch. Data warehouse concepts, such as, dimensional modeling, denormalized data, Extract-Transform-Load process, data cleansing, metadata management, and data marts, will be discussed. This discussion will be based on the author's experience in designing a student data warehouse for Eastern Michigan University. The designs generated, problems encountered, and solutions proposed will be discussed.

Development of an Elliptic Curve Cryptosystem for Academic Optimization. Jeffrey Conner, Saginaw Valley State University

Elliptic Curve Cryptography (ECC) is a form of encryption using elliptic curves to encode messages based on public key exchange. ECC can achieve strong encryption using keys of shorter bit length than would be needed for comparable security using RSA encryption. Research will focus on the implementation of a "naïve" elliptic curve cryptosystem, which can be incrementally improved through algorithm optimization. The final project will produce functional elliptic curve encryption software which can be available for future student research.

Teaching Amortized Analysis of Algorithms Effectively. Ranjan Chaudhuri, Eastern Michigan University

In algorithm analysis, the goal of amortized analysis is to obtain an estimate for the average cost of an operation when a series of operations with varying costs are performed on a data structure. Amortized analysis differs from a traditional average cost analysis in that it does not make any probabilistic assumptions on either the data structure or the operations that are involved. Instead, in amortized analysis one attempts to show that the average cost of an operation in a sequence

of operations is small even though some of the operations are quite expensive by averaging over the entire sequence in a judicious way. There are three methods for performing an amortized analysis of an algorithm: the aggregate method, the accounting method and the potential method. Each of the above three methods is examined in an attempt to determine which one of them explains the concept of amortization in an intuitive way.

Understanding the Implication of Stuxnet. Aby Tehranipour, Eastern Michigan University

Stuxnet is the most sophisticated piece of malware in history, and it was discovered in the wild earlier this year. Stuxnet is designed to inject rogue ladder logic into PLCs in order to attack specific targets and possibly destroy critical industrial equipment that are hard to replace. Stuxnet has a very sophisticated and over the top attack sequence which includes several zero-day vulnerabilities, and the use of a stolen digital certificate for signing its component files. The threat posed by Stuxnet has mostly subsided for now, but the continuing problem remains in that the technology deployed by Stuxnet may be copied and become available within hacker toolkits. In that case, there will be enormous risk of widespread and aggressive attacks, by bored hackers and others, on control systems that manage power plants, water utilities, factories, etc.

This paper examines the time line of the Stuxnet worm/virus, and the speed with which it infected computers across the globe. It will also examine various components of the Stuxnet attack sequence in more depth, and highlight the dangerous nature of this newly discovered technology. Lastly, it outlines the necessary steps that must be put in place to protect control systems that manage vital industries and plants worldwide against similar attacks.

With AJAX, Who Needs Applets for Web Page Development? Augustine Ikeji, Eastern Michigan University

AJAX stands for Asynchronous JavaScript and XML. It was originally introduced by Microsoft as an ActiveX object in Internet Explorer 4 and later adopted by other browsers as XMLHttpRequest. AJAX is used to communicate with servers in the background and dynamically update parts or all of a web page. It became main stream when Google Maps and Gmail adopted it in the design of their web pages.

Applets on the other hand are Java programs intended for execution via web browsers. The advantage of applets includes the availability of the versatile Java class library including the Swing class which allows for a more sophisticated GUI programming. Also, signed applets may have privileges allowing them access to the client's machine as well as connecting to other servers in the background.

Both AJAX and Applets have limitations. This presentation will start with some background information on AJAX and Applets including how each technology works and then culminate with examples of web page development situations uniquely suitable to each technology.

Economics ❦

A Proposal for an Economic Development Comparative Statistic: Theory and Empirical Evidence. Shayna Stewart, Wayne State University

The purpose of this paper is to propose a comparative statistic of economic development to be used to map particular countries' paths towards development. It compares the Washington Consensus and Capabilities approaches and develops theory that they coincide. The effectiveness of these approaches can change throughout time, depending how far along a country is on the "development path". While this paper does not address country specific data, it examines the development path from a longitudinal and cross-sectional view point using 30 of the Organization for Economic Co-operation and Development (OECD) countries. This paper uses Millennium Development Goal proxies to estimate the importance of each established development goal to gross domestic product. Estimation of the importance of each goal to GDP is done using a Shapely regression. A valuation of the aggregated years 2002 to 2007 will prove to be the baseline average in which further comparative examination of the MDG importance in the years 2002 and 2007 can be derived. In essence, this paper develops the beginning of a literature of a normalized economic development comparative statistic.

Changing Racial/Ethnic Disparities in Access to Physician Care among Older Adults: 2000–2007. Elham Mahmoudi and Gail Jensen Summers, Wayne State University

Objectives. Report trends in racial/ethnic disparities in access to physician services, and identify factors driving the trends observed. **Methods**. Using 2000–2007 Medical Expenditure Panel Survey (MEPS) data, we examine two measures for adults ages 65 and older: whether the individual reports having a usual source of care, and whether he/she has had any doctor visits during the past year. We calculate disparities in access between African Americans and Whites, and between Hispanics and Whites, applying the Institute of Medicine definition of a disparity. Oaxaca-Blinder regression decomposition (RD) is then used to quantify how changes in personal characteristics over this period helped shape the trends observed. **Results**. Among older adults large disparities were evident for both minority groups in 2000 and 2007. Disparities in access worsened for both minority groups over the period, but in different ways, i.e., they worsened for different measures of access. Important contributing factors to the growing