

Murat Ali Bayir

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Research Interests

Ubiquitous Computing, Data Mining, Pocket Switched Networks, Large Scale Data Processing with Map/Reduce, Graph Theory, Social Networks

Education

- 2007-present** **University at Buffalo, SUNY**, Buffalo, NY
◊ *Ph.D. in Department of Computer Science and Engineering*
◊ *Expected to finish in Summer 2010*
- 2003-2006** **Middle East Technical University**, Ankara, Turkey
◊ *M.Sc. in Department of Computer Engineering*
Thesis Topic: "A New Reactive Method for Processing Web Usage Data"
- 1999-2003** **Middle East Technical University**, Ankara, Turkey
◊ *B.Sc. in Computer Engineering with Minor in Math*
- 1998-1999** **Middle East Technical University**, Ankara, Turkey
◊ *Department of Basic English*

Honors and Awards

- ◊ Best Research Project Award with Bilgi.com Turkish Search Engine Project by Elginkan Foundation, 2008.
- ◊ The Industrial project titled "A Framework for Intelligent Web Analysis System" originated from my MS Thesis is funded 300\$K by Scientific and Technological Council of Turkey (NSF of Turkey), 2007.
- ◊ Accepted to PhD program in Computer Science in several USA and Europe Universities with scholarship, 2006-2007
- ◊ Graduated as a honor student from Computer Engineering Department, METU, 2003.
- ◊ Ranked 582th in university entering exam among 1.4 million candidates, 1998.

Publications

M.S. Thesis

- ◊ Murat Ali Bayir, "A New Reactive Method For Processing Web Usage Data", MS Thesis, Middle East Technical University, June 2006.

Papers Under Submission

- ◊ Murat Ali Bayir, Murat Demirbas, "Learning Social Interactions for Intelligent Routing in Pocket Switched Networks", (Submitted to **ACM/IEEE Infocom 2010**).
- ◊ Murat Ali Bayir, Ismail Hakki Toroslu, Murat Demirbas, Ahmet Cosar, "A Link Based Approach to Session Construction Problem". (submitted to **Information Systems Journal**, Elsevier).

- ◇ Murat Ali Bayir, Murat Demirbas, Ahmet Cosar, "A Web Based Personalized Mobility Service for Smartphone Applications", (submitted to **The Computer Journal**, British Computer Society)
- ◇ Murat Ali Bayir, Ismail Hakki Toroslu, "The Design and Evaluation of New Session Model for Web Usage Mining Applications". (Under Submission).
- ◇ Enis Soztutar, Ismail Hakki Toroslu, Murat Ali Bayir, "Semantically Enriched Event Based Model for Web Usage Mining". (Submitted to **WWW 2010**).

Journal Publications

- ◇ Murat Ali Bayir, Murat Demirbas, Nathan Eagle. "Mobility Profiler: A Framework for Discovering Mobile User Profiles", (accepted to **Pervasive and Mobile Computing Journal**, Elsevier).
- ◇ Murat Ali Bayir, Dogacan Guney, Tolga Can "Integration of Topological Measures for Eliminating Non-Specific Interactions in Protein Interaction Networks". **Discrete Applied Mathematics Journal**, Elsevier, Volume 157, Issue 10, Pages 2416-2424.
- ◇ Murat Ali Bayir, Ismail H. Toroslu, Ahmet Cosar, "Genetic Algorithm for Multiple Query Optimization problem". **IEEE Transactions on Systems, Mans and Cybernetics**. Part C. Volume:37, Issue:1 page(s): 147-153.

Conference and Workshop Publications

- ◇ Murat Ali Bayir, Murat Demirbas, Nathan Eagle "Discovering Spatiotemporal Mobility Profiles of Cell Phone Users". **IEEE WOWMOM 2009**, (acceptance rate = 24%).
- ◇ Murat Ali Bayir, Ismail H. Toroslu, Ahmet Cosar, Guven Fidan, "SmartMiner: A New Framework for Mining Large Scale Web Usage Data". **ACM WWW 2009**: 161 - 170, (acceptance rate < 13%).
- ◇ Murat Ali Bayir, Murat Demirbas, Ahmet Cosar, "TRACK ME! A Web Based Location Tracking and Analysis System for Smart Phone Users". **IEEE ISICIS 2009**.
- ◇ Murat Demirbas, Carole Rudra, Atri Rudra, Murat Ali Bayir. Imap: Indirect measurement of air pollution with cellphones. **IEEE PerCom 2009**: 537-542.
- ◇ Murat Ali Bayir, Ismail H. Toroslu, Ahmet Cosar, Guven Fidan "Discovering More Accurate Frequent Web Usage Patterns". **Text-Mining & Link-Analysis at IJCAI 2007**.
- ◇ Murat Ali Bayir, Ismail H. Toroslu, Ahmet Cosar, "A New Approach for Reactive Web Usage Data Processing," icdew, p. 44, **22nd International Conference on Data Engineering Workshops, ICDE 2006**.
- ◇ Murat Ali Bayir, "BASKIN: Small Scale Combat Simulation System", **ITEC 2006**, European Conference on Simulation and Training Systems.
- ◇ Murat Ali Bayir, Ismail H. Toroslu, Ahmet Cosar, "A Performance Comparison of Pattern Discovery Methods on Web Log Data", **IEEE AICCSA 2006**: 445-451.

Other Publications

- ◇ Murat Ali Bayir, Murat Demirbas. "On The Fly Learning of Mobility Profiles for Intelligent Routing in Pocket Switched Networks", Technical Report, 2009-03, Department of Computer Science and Engineering, University at Buffalo.
- ◇ Murat Ali Bayir, "Introduction to Web Programming", online course book for web Programming course of IDEA of CENG-METU, 2003. (in Turkish)

Conference Presentations

- ◇ SmartMiner: A New Framework for Mining Large Scale Web Usage Data, WWW 2009, Madrid, Spain.
- ◇ Imap: Indirect measurement of air pollution with cellphones, PerCOM 2009, Galveston, TX, USA.

- ◇ Bilgi.com Turkish Search Engine, AB 2007, National Academic Conference on Information Systems, Kutahya, Turkey.
- ◇ Web Usage Mining, ISTEK 2006, Helsinki, Finland.
- ◇ BASKIN: Small Scale Combat Simulation System, USMOS 2005, National Conference of Turkey on Simulation and Modeling Systems, Ankara, Turkey.

PROFESSIONAL R&D AND TEACHING EXPERIENCE

University at Buffalo, SUNY, Ubiquitous Computing Lab, Buffalo, NY, USA

Research Associate

August, 2007 - present

Includes current Ph.D. research related to Pervasive Computing, Data Mining and Social networks. Developed novel framework for location analysis of Smart Phone Users. Developed pervasive applications including air pollution exposure estimation, novel context aware routing for Smart Phone Networks by utilizing human interaction networks.

Bloomberg L.P., New York City, NY, USA

Financial Software R&D Intern

May, 2008 - Aug, 2008

Data Mining and Machine Learning Techniques for Bond Pricing & Stock Market Prediction. Worked on offline framework which prices active bonds based on the most recent historical data. Developed an application for bond and stock trend visualization with several Filtering options using C++ programming language. Worked in the Development of new bond pricing algorithms by using Collaborative Filtering Techniques.

AGMLAB Information Technologies, Ankara, Turkey

Research Engineer & Team Leader

Apr, 2006 - Aug, 2007

Participated in Development of Bilgi.com Turkish Search Engine Project. Implemented link based scoring system for Turkish Web by using Hadoop Map/Reduce framework. Implemented link based spam detection and ranking software for increasing quality of search engine results. Developed an evaluation system for measuring quality of search engine results for mostly used query keywords. Developed several distributed applications by using Hadoop Map/Reduce framework for large scale data analysis.

Havelsan Inc., Ankara, Turkey

Software Engineer

Apr, 2004 - Apr, 2006

Participated in the development of two different software projects which are listed below:

BASKIN (Small Scale Combat Simulation Project for Office of Naval Research),

UYAP project (which is a part of National E-Government Project of Turkey for Information System Management of Department of Justice).

Ideal Technology, Ankara, Turkey

Software Engineer

Jun, 2003 - Apr, 2004

Participated in the development of Hipfoto.com photography sharing portal. This project is developed for web users who is interested in photography. Hipfoto.com provides processing, editing and sharing photos online.

SELECTED RESEARCH PROJECTS

TRACK ME!

Feb, 2009 - August, 2009

In this project, we propose a Web Based Mobility Analysis System which collects location data from cell phone users via opportunistic Internet connections and convert these low level location data to high level mobility profiles as well as adding temporal dimension. Our system provides query interface for accessing mobility profiles of cell phone users for different applications such as air pollution exposure risk estimation, location based advertisement systems etc... We have also

illustrated the benefits of our systems on the MIT Reality Mining data set containing 350K hours of cell tower connection data.

PRO: Profile Based Routing in Social Networks

Aug, 2008 - Jan, 2009

In this project, we learn social interactions between people by collecting blue tooth proximity data from smart phones carried by human. We learn the evolution of the social network and propose a new context aware routing algorithm for message communication between two pairs via adhoc protocol. Our experimental results shows that using contextual data related to the social network and mobility profiles improves the performance of routing process significantly.

Mobility Profiler

Jan, 2008 - May, 2008

In this project, we focus on the problem of discovering mobility patterns and mobility profiles of mobile users from the cellphone-based location logs. We define the mobility path concept used for representing users travel path from one location to another location. We generated frequent mobility patterns from mobility paths and propose a formal model for mobile user profiles that integrates both frequent mobility patterns and temporal information. We also present a complete framework, Mobility Profiler, for discovering mobile user profiles starting from cell based raw location data. Our analysis of mobility profiles of cellphone users expose a significant long tail in a user's location-time distribution.

Link Scoring System for Bilgi.com Search Engine

Apr, 2006 - Aug, 2007

In this project, we have implemented iterative page importance calculation algorithm which is an extended version of the PageRank. In contrast to ordinary PageRank algorithm, we pumped extra information about web domains and assign weights to edges by analyzing different properties of the domain name (such as their trust (gov, edu domain) or existence in the DMOZ category). In order to measure the performance we have implemented user based tests on top Turkish search terms to calculate the search quality. Form the experimental results we conclude that we have significantly improve the search quality of Bilgi.com search Engine.

Noisy Link Elimination in Protein Interaction Graphs

Sep, 2006 - Dec, 2006

In this project, we have proposed a new link scoring system for protein Interaction networks. Our approach is based on Integration of several topological metrics. By using our new link Scoring function, we have removed non-specific interactions in a large-scale protein-protein networks. Here we have transformed the whole interaction networks into a line graphs and compute betweenness and other clustering coefficients for all the edges in the network. We have also used confidence estimates and validate their method by comparing the results of a test case relating to the detection of a molecular complex with reality.

Smart Miner

Jun, 2004 - May, 2006

In this project, we propose a novel framework called SmartMiner for web usage mining problem which uses link information for producing accurate user sessions and frequent navigation patterns. Unlike the simple session concepts in the time and navigation based approaches, where sessions are sequences of web pages requested from the server or viewed in the browser, Smart Miner sessions are set of paths traversed in the web graph that corresponds to users navigations among web pages. We have modeled session construction as a new graph problem and utilized a new algorithm, Smart-SRA, to solve this problem efficiently. For the pattern discovery phase, we have developed an efficient version of the Apriori-All technique which uses the structure of web graph to increase the performance. From the experiments that we have performed on both real and simulated data, we have observed that Smart-Miner produces at least 30% more accurate web usage patterns than other approaches including previous session construction methods. We have also studied the effect of having the referrer information in the web server logs to show that different versions of SmartSRA produce similar results. Our another contribution is that we have implemented distributed version of the Smart Miner framework by employing Map/Reduce Paradigm. We conclude that we can efficiently process terabytes of web server logs belonging to multiple web sites by our scalable framework.

MQO problem is a well-known database research problem, and the database community has studied it since 1980s. The goal of MQO is to reduce the execution cost of a set of queries by performing their common tasks only once. In this project, We have proposed Genetic Algorithm for MQO problem. In the context of MQO, a chromosome corresponds to a solution instance for the set of queries of the MQO problem. In a chromosome, each gene of a chromosome represents a plan to the corresponding query. Under this modeling, it is shown that MQO is also very suitable for genetic operations. Crossover and mutation operations can easily be defined to produce new valid solution instances. It is shown that by using GA, it is possible to obtain total execution times for MQO very close to optimum execution value in polynomial time.

Computer Skills

- ◇ Languages: C, C++, Java, PHP, ASP.Net, advanced Unix shell scripts, Matlab, SQL, HTML.
- ◇ Applications/Libraries: Hadoop, Lucene, OpenGL, MFC
- ◇ Operating Systems: Unix/Linux, Windows.