Thomas Tiahrt – Curriculum Vitae

Division of Economics
and Decision Sciences
Department of Decision Sciences
Beacom School of Business
The University of South Dakota

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Education

Ph.D., Computational Science and Statistics, The University of South Dakota.
M.A., Computer Science, The University of South Dakota.
B.S.B.A., Accounting, The University of South Dakota.

Research

Peer Reviewed Journal Publications

Tiahrt, Thomas ; Hanus, Bartlomiej ; Porter, Jason C.; *Transitioning a Traditional
Introductory Information Systems Course to a Data Analytics Focused Course.*
Decision Sciences Journal of Innovative Education, (2022) Vol. 20 (4), p. 176-189

Hanus, Bartlomiej; Tiahrt, Thomas; "A Review of Software Tools Used in Research."
Pathways to Research / EBSCO

Oztekin, Asil, Serhat Simsek, Ali Dag and Thomas Tiahrt *A Probabilistic Data Analytic Mechanism
to Determine Patient No-Show Risk Categories* Omega 100 (2021): 102296.

Serhat Simsek, Ali Dag and Thomas Tiahrt *Stratifying No-show Patients into Multiple Risk
Groups via a Holistic Data Analytics-based Framework* Decision Support Systems 132 (2020): 113269.

South-Winter, Carole and Thomas Tiahrt. *Opening Clinics in the Developing World: Lessons from Ghana*
Global Journal of Business Disciplines (2018) Vol. 2 (1), p. 106-114.

Porter, Jason C. and Thomas Tiahrt. *That's a Wrap: Evaluating Different Methods for Creating
Video Lectures.* (2016). Business Education Innovation Journal, 8 (1), 56-66.

Tiahrt, Thomas and Jason C. Porter. *What Do I Do with this Flipping Classroom: Ideas for Effectively
Using Class Time in a Flipped Course.* (2016). Business Education Innovation Journal, 8 (2), 85-91.

Theses

Ph.D. Dissertation: *Bitwise-AND Sifting Set Intersection Trees*
Algorithm and data structure using a non-comparison approach to the solution
of the set intersection problem. Replaces individual element selection with
bitwise elimination of either elements or subtrees, reducing search complexity
by resolving intersections set by set instead of element by element.

Master's Thesis: *A Decision Support Forecasting Tool for a Temporal Database*
Integrated three forecasting models into a simulated temporal database.

Presentations

Analysis of Injuries in NCAA Interdivisional Games: Ethical Considerations when David Plays Goliath,
62nd Annual Mountain Plains Business Conference, Kearney, NE, October 14, 2022

A Data-centric Information Systems Course;

51st Annual Decision Sciences Conference, November 21, 2020.
NCAA Interdivisional Games: An Examination of Ethical Concerns when David Plays Goliath,
    60th Annual Mountain Plains Business Conference, Brookings, SD, October 19, 2019
Opening Clinics in the Developing World: Engaging Students in Meaningful Research with Industry Partners.
    59th Annual Mountain Plains Business Conference, Omaha, NE, October 26, 2018
Opportunities for High School Students at in Business. Annual Conference,
    SD Department of Education Career and Technical Education Annual Conference, July 31, 2017
What Do Analytics Programs Teach?
    INFORMS Annual Conference November 14, 2016, Nashville, Tennessee.
An Introduction to Analytics. Annual Conference,
    SD Department of Education Career and Technical Education Annual Conference, July 31, 2016

Working Papers

Huckabee, Gregory, David Carr and Thomas Tiahrt. *NCAA Inter-divisional Games:*
    Are There More Injuries When David Plays Goliath?.
Tiahrt, Thomas and Daniel Chang. *What Do Analytics Programs Teach?*
Tiahrt, Thomas, Raleigh M. Tiahrt, and Michael Allgrunn. *Characteristics of Successful*
    University Presidents

Patents

US Patent **6,741,979**; *System and method for flexible indexing of document content*, May 25, 2004.
    Inventor: **Tiahrt; Thomas W.**

    Patents Referencing US Patent **6,741,979** as prior art for their patents:
    US Patent 9,864,767 *Storing term substitution information in an index* Jan. 9, 2018.
    Assignee: Google Inc. (Mountain View, CA),
    US Patent 9,286,405 *Index-side synonym generation* Mar. 15, 2016.
    Assignee: Google Inc. (Mountain View, CA),
    US Patent 8,171,002 *Matching engine with signature generation* May 1, 2012.
    Assignee: Trend Micro Incorporated (Tokyo, JP)
    US Patent 8,117,205 *Technique for enhancing a set of website bookmarks by finding*
    related bookmarks based on a latent similarity metric Feb. 14, 2012
    Assignee: International Business Machines Corporation (Armonk, NY)
    US Patent 7,685,112 *Method and apparatus for retrieving and indexing hidden pages*
    Mar. 23, 2010
    Assignee: The Regents of the University of California (Oakland, CA)

US Patent 7,146,409; *System and method for efficient control and capture of dynamic database content*,
    December 5, 2006. Inventors: Bushee; William J., **Tiahrt; Thomas W.**, Bergman; Michael K.
US Patent 7,249,122; *Method and system for automatic harvesting and qualification of dynamic database*
    content, July 24, 2007. Inventors: Bushee; William J., **Tiahrt; Thomas W.**, Bergman; Michael K.
US Patent 7,676,555; *System and method for efficient control and capture of dynamic database content*,
    March 9, 2010. Inventors: Bushee; William J., **Tiahrt; Thomas W.**, Bergman; Michael K.
US Patent 8,380,735; *System and method for efficient control and capture of dynamic database content*,
    February 19, 2013. Inventors: Bushee; William J., **Tiahrt; Thomas W.**, Bergman; Michael K.

Consulting

University Enrollment Services – admissions and enrollment analysis, prospect personae 2022; analysis of employee perspective on process improvement 2021

University Libraries – resource-usage analytics consulting

University Information Technology Services – software and statistics consulting

Beacom School of Business Director, Graduate Business & Executive Education Programs – database schema architecture

Paulsen Ag – marketing analytics consulting

Committees

Beacom School of Business

Standing
  Chair - Curriculum and Instruction Committee 2019-present
  Member - Curriculum and Instruction Committee 2017-2019
  Chair - MSBA Admissions Committee 2018-2022
  Chair - MSBA Assessment Committee Chair 2018-2021
  Member - Beacom Opportunity Fund Committee 2016-2020
  MBA Admissions Committee - Alternate 2015-2017

Ad Hoc Member - School of Business Dean Search Committee 2022-2023
  Chair - Business Analytics Professor Search Committee 2018-2019
  Chair - Information Systems Professor Search Committee 2016-2017
  Chair - Business Analytics Professors Search Committee (two positions) 2015-2016
  Member - Faculty Excellence in Research Committee 2016-2018
  Member - Director of Graduate and Executive Education Search Committee 2015

University

Standing
  University Parking Committee 2023-present
  Intellectual Property Committee 2015-2021
  University Libraries Committee 2015-2019

Media Contributions

Radio

Kelo 1320 AM – Bill Zortman – It's Your Business, April 30, 2019
South Dakota Public Radio – Lori Walsh – In the Moment, November 6, 2018

TV

Keloland TV – News – Whitney Fowkes – Graduation Summaries, April 27, 2019

Internet

USD Credit Hour Podcast #136 – April 25, 2019

Magazine

Vital – The Essential Perspective – BryAnn Becker Knecht, June 20, 2018
BizNOW – Why Does Business Analytics Matter?' December 10, 2015

New Course Development

The University of South Dakota

BADM 501 *Business Essentials I* – The course provides a background in business essentials such as economics, operations management, statistics, and calculus.
DSCI 724 *Data Mining for Managers* –
    data mining survey including supervised and unsupervised machine learning
DSCI 725 *Data Mining for Competitive Advantage* –
    time-series forecasting, dimension reduction, neural nets and discriminant analysis all using data mining
DSCI 726 *Operational Analytics* –
    explores the full cycle of descriptive, predictive, and prescriptive analytics to optimize business processes
DSCI 784 *Project Capstone* –
    experiential course where students complete an analytics project using industry data

Existing Course Redevelopment

BADM 520 *Foundations of Calculus and Statistics for Business* –
    Replaced a 80% calculus / 20% statistics topic split with a 30% calculus / 70% statistics division.
BADM 323 *Information Systems for Data Analytics* –
    (formerly Information Systems for Business Professionals) reoriented a systems-focused course
    to a data-centric course.

Northwestern College
    CSC 210 *Accounting Information Systems* – accounting systems implemented in information technology
    CSC 280 *Enterprise Architecture* – planning, designing, and implementing infrastructure solutions
    CSC 482 *Introduction to Text Analytics* – descriptive and predictive text analytics
    CSC 492 *Advanced Text Analytics* – statistical natural language processing

Curriculum Development - Northwestern College

Online Analytics Certificate 18 credit hour course of study preparing students to succeed as data scientists

Teaching - The University of South Dakota

BADM 501 *Business Essentials I* – Summer 2022, 2023, Fall 2022, Spring 2023
BADM 720 *Quantitative Analysis* – Summer 2014, 2015, Fall 2015
DSCI 724 *Data Mining for Managers* – Fall 2014, Summer 2016, 2017, Fall 2020, 2021, 2022
DSCI 725 *Data Mining for Competitive Advantage* – Spring 2015, Fall 2016, 2017, 2018, 2019,
    Spring 2021, 2022, 2023
DSCI 726 *Operational Analytics* – Spring 2015, 2016, 2017, 2018, 2019, 2020, 2021
DSCI 784 *Project Capstone* – Spring 2019, 2020, 2021, Fall 2021, 2022
BADM 520 *Foundations of Calculus & Statistics for Business* – Spring 2015, 2016, 2017, 2018, 2019,
    2020, 2021, 2022
BADM 220 *Business Statistics I* – Fall 2014, Spring 2015, Fall 2015, 2018, Fall 2022
BADM 321 *Business Statistics II* – Spring 2016, 2018, 2021
BADM 323 *Information Systems for Business Professionals* – Fall 2016, Spring 2017, Fall 2017

Teaching - Northwestern College

COM 315 *Writing and Design for the Web* – concepts and techniques for writing and design for the Internet
CSC 102 *Business Computing* – relational database management in business applications
CSC 105 *Introduction to Spreadsheets* – Microsoft Excel fundamental skills
CSC 151 *Office Application Programming* – macros, scripts and short programs manipulating data
CSC 200 *Principles of Computer Information Systems* – IS development, integration and management
CSC 210 *Accounting Information Systems* – verifying, analyzing and reporting accounting information
CSC 270 *Computer Organization* – computer architecture, components and assembly language programming
CSC 280 *Enterprise Architecture* – planning, designing, and implementing infrastructure solutions
CSC 291 *Database Management* – relational database concepts, theory, design and management
CSC 321 *Human Computer Interaction and Interface Programming* – user interface theory and practice
CSC 361 *Networking* – principles and implementation of computer networks
CSC 371 *Operating Systems* – analysis, design, structure and implementation of operating systems
CSC 420 *Special Topics* – computer security, cryptography
CSC 450 *Values Issues in Computing* – ethics and issues of values in computer and information technology
CSC 482 *Introduction to Text Analytics* – descriptive and predictive text analytics
CSC 492 *Advanced Text Analytics* – statistical natural language processing

Professional Memberships

DSI - The Decision Sciences Institute

Grants

NSF EPSCoR Student Summer Research Grant $2,850
Beacom School of Business Faculty Summer Research Grants, 2021 – $2,000, 2022 – $3,500, 2023 – $3,500
John W. Carlson Research Grant $1,000

Teaching Philosophy

I find that I learn best by acquiring knowledge incrementally, in the strata above the trivial and below the inaccessible. I aspire to find the stratum for each student that is challenging, but also provides a path for success.

Teaching Objectives

Perhaps the single greatest contributor to the remarkable improvements in humanity's standard of living in the last two centuries is the ability of people to use information to transcend the physical world. Those abilities are amplified through statistics and mathematics expressed in computing and communication implementations. Those resources provided the means to produce achievements scarcely imagined even two decades ago. We have designated the current era the 'information age' for good reason. But it is neither the theoretical foundations underlying these advances, nor their expression as information and communication technology that is the most important component of this latest information revolution. It is the businesses, organizations, institutions and finally the people themselves that constitute the critical factors in realizing life-enhancing breakthroughs. There are no educational tasks more important than transmitting the knowledge, skills and understanding of the key role of business and organizational acumen in the interplay of the constituents of the information age. I find that my quarter-century of industry experience in augmenting

human capabilities through technology is invaluable in conveying the importance of information in the success of all organizations. Students gain an appreciation for data numeracy and literacy in solving a wide array of business problems through real-world examples applicable to scenarios they are likely to encounter.

My foremost teaching objectives are to equip students to think creatively, systematically and consistently, and to leverage the instruments of the information age to exploit opportunities and solve problems. The ability to learn in order to manage informational, human and organizational resources efficaciously is the *sine qua non* of a satisfying career. Success in learning and applying these principles means success not only professionally, but in other aspects of life as well.

Graduate Student Mentoring

Five of my students, Asli Dag, Shamly Mackey, Daniel Chang, Cody Reed and Andrew Keithley, are working on their doctorates. Asli and Shamly have graduated from the MSBA program, and I worked with them on research that we plan to publish. Daniel Chang is an accounting Ph.D. student at the University of North Texas. Cody is pursuing a sociology Ph.D. at the University of Michigan, and Andrew is working toward an economics Ph.D. at the University of Texas, San Antonio. Cody took Business Statistics I and II from me, then through my encouragement completed the Business Analytics minor to improve his quantitative skills. Andrew has completed a Master's in Economics, but before he began the program, he wrote, *"this fall I plan to attend the University of Texas - San Antonio to pursue a Masters in Economics with a concentration in Data Analysis and Forecasting. My interest in this concentration is largely due to the classes I took with you at USD."* Andrew has matriculated in the Finance doctoral program at UTSA.

Note that theses are optional for our Master of Business Administration students, and there is no thesis track for the Master of Science in Business Analytics. Consequently, opportunities to sit on theses committees are limited to undergraduate committees.

Nonclassroom Teaching

I also teach during office hours when students drop in for help. In some cases, I have students that I have taught in a prior semester come in for help on problems in Business Statistics II or consultation on a project they have in one of their courses. I have even had a number of occasions to help students that I have not taught before.

In addition to in-class time, I have offered help sessions for Business Statistics I courses beginning in Fall 2014. There is a widespread misconception that high schools teach students Microsoft Office applications, including Microsoft Excel. I shared that misconception when I arrived at USD. What I have found is that students know next to nothing about Excel. However, when I developed the first course, I assumed that they were competent in using Excel. I did not have time to revise the course, so I offered two one-hour evening sessions each week so that I could provide students extended instruction in Excel use. Once I flipped Business Statistics I, I did not need separate sessions because I cover Excel in class.

Last fall (Fall 2018) I invited all nine MSBA students for free pizza to meet them, and a chance to socialize with their cohort. My purpose was to help them develop a sense of community, to get to know them better myself, and to discover if they were encountering problems that I could fix. The students revealed that they did not feel like they were getting enough practice writing code. As a consequence, I started weekly sessions where I had explained coding principles and had them write code to implement those principles. Most students attended the sessions and reported that the sessions were helpful to them.

Employment

2018–present POET Professor of Business Analytics

2020–present Associate Professor of Decision Sciences

2018–2022 Master of Science in Business Analytics Program Coordinator

2016–2021 Operational Analytics Program Coordinator

2014–2020 Assistant Professor of Decision Sciences

2012–2014 Analytics Program Director, Northwestern College

2011–2014 Assistant Professor of Computer Science, Northwestern College

2010–2011 Instructor in Computer Science, Northwestern College

2008–2010 Computational Science Research Assistant, University of South Dakota

2006–2008 Chief Scientist, BrightPlanet Corporation

2003–2006 Principal Software Engineer, BrightPlanet Corporation

1996–2003 Principal Software Engineer, VisualMetrics Corporation

1995–1996 Senior Software Engineer, Gateway

1993–1995 Senior Software Engineer and Manager of Human Resources, Parallel Software, Inc.

1991–1993 Senior Design Engineer, Mycro-Tek, Inc.

1988–1991 Graduate Teaching Assistant, University of South Dakota

1986–1988 Director of Software Development, CMC Information Systems, Inc.

1984–1986 Manager of Software Development, CMC Information Systems, Inc.

1983–1986 Software Engineer, CMC Information Systems, Inc.

Selected Software Development Experience

Chief Scientist, BrightPlanet Corporation.

Researched, developed and had overall responsibility for the Information Retrieval (IR) software that comprises BrightPlanet's indexing subsystem. Designed and wrote the SQSTR (Semantic Query, Storage, Transformation, and Reporting) subsystem, adding XML processing to existing IR capabilities. Also rewrote the performance bottleneck portions of the distributed processing middleware, including results consolidation and the native interface.

Principal Software Engineer, BrightPlanet Corporation.

Researched, analyzed, developed, tested and deployed the document-centric BrightPlanet Text Engine. The Text Engine is an inverted index IR system that employs a trie-based dictionary, full-text postings with positions, and two-phase document compression. Reduced document size through token-to-integer conversion, and Huffman encoding of converted integers. The Text Engine also implemented index-only query processing using standard Boolean operations, positional/proximity operators, phrases, wild cards and regular expressions. Together with filter lists, the text engine's query processing subsystem provides on-demand dynamic results for the hierarchical categorization system, without the need for manual document tagging.

Principal Software Engineer, VisualMetrics Corporation.

Researched, analyzed, developed, tested and deployed the Mata Hari/Lexibot meta-search tool's inverted index text processing subsystem. This index was used initially in a desktop application to search multiple search engines simultaneously. Later, the same underlying technology was adapted to a query and rule-based static categorization system. The categorization system used inheritance-derived inclusion and exclusion lists in conjunction with queries to place documents in a hierarchical node structure.

Senior Software Engineer, Gateway.

Created an order suspension and release subsystem supporting multiple departments and incorporated into two separately developed applications with any interface or underlying code changes.

Senior Software Engineer, Parallel Software.

Worked under contract to Loral Medical Imaging Systems. Conducted requirements analysis, coded, tested the Picture Archive Communication System's (PACS) Removable Media subsystem. This module allowed physicians to record images and annotations on local media that could be carried with them between offices and hospitals.

Senior Software Engineer, Parallel Software.

Contracted with to Siemens Gammasonics for software development. Identified, described and documented the image loss potential during PACS network or server failure. Coded and tested the Failover Image Recovery system, which stored images locally during failover. This saved images until they could be uploaded once PACS was restored to a fully-operational status.

Director of Software Development, CMC Information Systems

Managed the software development staff, estimated and managed projects, constructed budgets, tracked expenses, hired and fired staff.

Software Engineer, CMC Information Systems

As a software engineer, met with customers to develop requirements; designed, constructed, installed and modified accounting and database applications for small to medium sized businesses. Replaced hard-coded procedures necessary to install basic software packages with a parameter-based installer, and implemented code-reuse procedures, libraries and tools that simplified the customization of common financial packages.

Notable Software Development Achievements

BrightPlanet Corporation

Rewrote the query-results consolidation routines for the distributed processing aggregator. Replaced the sort among all results of all nodes ($O(n \log n)$) with a linked list by score. This reduced processing time to $O(n)$, which was both faster and simpler than the so-called Ideal Merge ($O(n \log m)$). Used one singly-linked list for each score, and round-robin processing to place results into output for optimal distribution.

Developed a document summary construction system using query phrases combined with exponential amplification and decay of the term-by-term score. Used that score as a metric to rank term runs. The summary consisted of the highest ranking passages in the document.

Constructed a regular expression processor by implementing a deterministic finite automaton (DFA) built from a parse tree. The DFA was evaluated against the index, not the original document, reducing run times.

UTF-8 Case Folding – wrote a code generation module to convert a UTF specification into in a C code case-folding routine. Compiled and linked the output to produce a DFA. This included validity enforcement, as well as handling UTF-8 multiple byte codes as a single unit.

Eliminated the sort of triples during index construction process (cf. *Managing Gigabytes*, Witten, Moffat, Bell) through the use of direct addressing, Virtual Memory and a singly linked list. This reduced build time for our largest dataset from 14 hrs 35 minutes to 1 hr 45 minutes.

Replaced individual terms with stem ordinal sets in query processing. All higher level query processing remained the same, only the lowest-level code required modification. Regular expression sets, including wildcards, were able to behave in exactly the same way as single terms.

Substituted a permutation of document ordinals and document positions from multiple terms or stem ordinal sets (which are already in ascending order), with a priority queue. The change eliminated 90% of the run time in the test set for query evaluation and scoring.

Improved query evaluation execution times by identifying and processing the smallest component of a Boolean expression to either include or exclude documents.

Implemented a document similarity operation allowing a new document to be used to retrieve the most similar documents from the collection. This supports identification of similar funding requests to prevent duplication and to ensured relevant preexisting work was included in further research.

Constructed a document compare routine based on integer-valued word ordinals instead of text terms, which eliminated 85% of the comparison execution time.

Produced categorization run-time reductions by substituting bit vectors for Boolean queries. The categorization taxonomy was hierarchical with inheritance. Because the operations were Boolean OR, and Boolean AND NOT, inclusion of documents with terms and exclusion of documents with terms could be performed using bit vectors. This reduced a 24 hour categorization run time to 30 minutes.

In replacing the internal paging system with one based on memory-mapped files and virtual memory I reduced index retrieval time by 30%.

Sped free list access by maintaining 16 free lists for each 4 GB segment, and accessing free list requests by promoting requests to the next higher free list. Requests therefore were guaranteed to be met on the first free-list probe instead of traversing the list to locate a suitable block.

Precomputed the square roots from 1-10000 to speed Extended Boolean Information Retrieval computation. Compared to the Standard C Library floating point routine this reduced the computation time to one-third of the original.

Gateway

Created a three-tier order suspension and release subsystem using Microsoft Foundation Classes (MFC), C++ and Sybase. This subsystem supported order suspension for the international, tax, finance, sales, personnel and accounts receivable departments. Its user-interface was developed with MFC, and incorporated a decision object layer as well as a database interface layer. The latter directly accessed a Sybase database for data storage and retrieval. Once complete, two separate and independently developed applications, one 16-bit, one 32-bit, integrated this subsystem without modification.

Parallel Software, Inc.

Developed software for the Siemens/Loral PACS software suite, a Picture Archiving Communication System. PACS automates all medical image handling for large hospitals, or groups of hospitals.

Enhanced and extended both the Computed Radiography control module for a Fuji plate reader and the Video Acquisition Workstation (VAW) application. Solely created the Failover Image Recovery (FIR) application, which transfers images initially saved on a local Macintosh workstation during network or server failure to the server after failure resolution. Along with writing new code, this required extraction and modularization of large existing code segments from two other applications. Prior to FIR completion, local images could only be viewed on the original acquisition workstation. Developed a removable media application which supported medical image storage on local Macintosh removable media drives.

Honors

Beta Gamma Sigma Business Honor Society
Golden Key International Honour Society
Upsilon Pi Epsilon, International Honor Society for the Computing and Information Disciplines
Omicron Delta Epsilon, the International Honor Society for Economics
University of South Dakota Outstanding Computer Science Graduate Student
University of South Dakota Outstanding Computer Science Teaching Assistant
Mycro-Tek Employee of the Quarter

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