

Dr. David W. Opitz

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Education: Ph.D., Computer Sciences, University of Wisconsin—Madison, 1995 (M.S., 1990)
B.S., Computer Science and Applied Math, Montana Tech, 1988 (Salutatorian)

Research Focus: Machine Learning, Datamining, Data Analytics, Geospatial, Interdisciplinary Research

Employment Highlights:

2009-Present **Entrepreneur**, AstuteWare Technologies, Dearborn Property Management,
Frontier Angel Funds, Canyon River Golf Course and Development
Writer, Fiction series, Technical Writing, Editing.
Service, Volunteer, Help High-Tech Startups; Non-profit and For-profit Boards; Coach.

2001-2009 **President**, Visual Learning Systems. Co-founder. (Sold to Textron in 2006)

1997-2005 **Professor**, University of Montana. Computer Science, Tenured. Promoted to Full.

1995-1997 **Assistant Professor**, University of Minnesota—Duluth, Computer Science.

University Highlights:

- Promoted to Full Professor and tenured in Computer Science at the University of Montana
- Interdisciplinary Data Analysis Focus. Collaborated with GIS, Pharmacy, Biology, others
- Part of several research grants (9 totaling about \$4 million). Received NSF CAREER Award
- Published about 65 refereed papers and published several others, such as tech reports, etc.
- Gave over 200 professional talks at conferences and meetings. Reviewed over 250 papers.
- Served as advisor to about 15 theses, six who came to work at VLS. Good teaching evaluations.
- Served on several University and professional committees (e.g., Faculty Senate, chair ASCRC)
- Had to leave University due to his suddenly thriving company, Visual Learning Systems.

Business Highlights:

- Co-founded and ran successful tech-transfer company, Visual Learning Systems, Inc. (VLS)
- Over \$8 million in government funding, including 6 Phase II SBIR contracts in 8 years
- Over 4,000 customers in 400 organizations in 8 years. Expensive software in niche market
- Numerous awards, such as Army quality award, and SBIR Company of the year
- Successful exit event with a sale to Overwatch and later Textron, a Fortune 150 company
- Oversaw technology, strategy, management, accounting, marketing, legal, and sales
- 23 employees when VLS sold; High paying jobs; Mostly University of Montana graduates
- Negotiated powerful partnerships: ESRI, Leica, BAE, Intergraph, and many others
- Software built on applying Machine Learning techniques to image and geospatial analysis

University of Montana Research Funding (1997-2005):

- D. Morton, R. Amin, C. Brewer, L. Churchill, R. Ford, M. Hendrix, D. Opitz, D. Pierce, R. Redmond, A. Ware, “Northern Rockies Center for Applied Computational Science,” NSF EPSCoR, August 2000 – July 2003, \$499,464
- R. Redmond. “Research and Analytical Services for Vegetation and Wildlife Management,” U.S. Forest Service, Northern Region. Aug 17, 2000 - Aug 16, 2001. \$61,875 [Participant].
- R. Nemani, D. Opitz, P. Votava. “Real-time Autonomous Processing and Tracking of Scientific Data,” March 1, 2001 – November 30, 2004, \$325,949.

- D. Opitz. “A Knowledge-Based Ensemble Approach to Real-World Data Analysis,” National Science Foundation (NSF) CAREER award; Aug 1998–July 2004, \$280,000.
- J. Bromenshenk, G. Smith, D Opitz. “Engineered Bee Colonies: A Platform for Bioreporting & Seeking Agents of Harm.” Space and Naval Warfare Systems Center. June 30, 1998–Apr 10, 2000. \$1,406,879.
- C. Wideman, C. Link, T. Ahmed, R. Ford, A. Wright, M. Hendrix, K. Porter, and D. Opitz. “Petroleum Reservoir Characterization”, DOE-EPSCOR Research Cluster. \$605,035.
- S. Basak, D. Hawkins, D. Opitz, and K. Lodge. “Prediction of Health and Environmental Hazards of Chemicals,” U.S. Air Force; July 1997 – June 2001, \$803,802.
- D. Opitz. “Applying Neural Network Ensembles to Digital Image Analysis,” Montana Space Grant Consortium. Apr 1997-Feb 1998. \$14,451
- D. Opitz. “Automated Text Filtering Query Refinement,” Montana’s NSF EPSCor Program (MONTs); April 1997- Feb. 1998. \$25,000

Selected Publications (of approximately 65 refereed)

- Opitz D., and Blundell, S. (2008) “An Automated Feature Extraction Approach for LIDAR and Color Imagery.” American Society for Photogrammetry and Remote Sensing International Conference.
- Brewer, K. Winne, C., Redmond, R, Opitz, D. and Mangrich, M. (2005) “Classifying and Mapping Wildfire Severity: A Comparison of Methods.” Journal of the American Society for Photogrammetry and Remote Sensing. Vol 71. #6 (pp 1311-1320).
- Opitz, D, Morris, M, and Blundell, S. (2004). “A Change Detection System for Natural Resource Applications.” 10th Biennial Forest Service Remote Sensing Applications
- Basak S, Grunwald G, Gute B, Balasubramanian K, Opitz D. (2002) “Use of statistical and neural net approaches in predicting toxicity of chemicals.” Journal of Chemical Info and Computer Sciences.
- Opitz, D., et al. (2001) “Classifying and Mapping Wildfire Severity,” Imaging Notes. Vol 81, (pp. 24-25).
- Opitz D, Maclin R, (1999). “Popular Ensemble Methods” Journal of Artificial Intelligence Research 11 (1), 169-198.
- Opitz D, Shavlik J, (1999). “Actively Searching for an Effective Neural-Network Ensemble.” Springer-Verlag Series on Perspective in Neural Computing, 79-97.
- Opitz D, Shavlik J, (1997). “Connectionist Theory Refinement: Genetically Searching the Space of Network Topologies” Journal of Artificial Intelligence Research 6, 177-209.
- Opitz D, Shavlik J, (1996). “Searching for Effective Neural-Net Ensembles” Connection Science 8, 337-353.
- Opitz D, Shavlik J, (1995). “Dynamically Adding Symbolically Meaningful Nodes to Knowledge-Based Neural Networks.” Journal of Knowledge-Based Systems 8, 301-311.

Patent Applications:

- Opitz D “A Method and Device for Feature Selection for Ensembles.”
- Opitz D. “A Method and Device for Creating a Sequence of Hypotheses.”
- Opitz D. “A Method and Device for Peripheral Vision for Feature Recognition in Digital Images via Inductive Learning.”

Honors and Achievements (selected):

- NSF CAREER award for Faculty Early Career
- Distinguished Alumni Award for outstanding achievement (Montana Tech)
- Recipient of the 2008 Textron Systems Chairman’s Award for Innovation.
- Granted Top Secret (TS/SCI) clearance by the U.S. Government (currently inactive)
- Awarded Tenure, promoted to Full Professor at the University of Montana
- University of Wisconsin-Madison Computer Science Outstanding Student Award; Fellowship

Interdisciplinary Research while at UM (1997-2005):

- GIS and Remote Sensing: Several commercial, government, and UM partners. Funded. Publications.
- Pharmacy: T. Nagel (private sector in Montana). Funded. Company.

- Computational Biology. S. Basak at National Resources Research Institute. Funded. Publications.
- Geology: Hendrix and others at UM. Funded.
- Petroleum: Wideman and others at Montana Tech. Funded.
- Biology: Bromenshank and others at UM. Funded. Publications.
- Chemistry: G. Smith. Funded. Publication.
- Datamining Geospatial Data. R. Nemani, P. Votava, JPL, NASA. Funded.
- Detecting Unexploded Ordnance. Naval Research Lab. Publications.
- Several collaborations within computer science worldwide. Commercial, government, UM. Funded. Publications.

University Committees and Service (selected from 1997-2005):

- Academic Standards and Curriculum Review Committee (ASCRC), (4 years), Chair.
- Faculty Senate (3 years)
- Graduations Appeals Committee (3 years), Chair.
- Director of Technology Transfer hiring committee (2 years)
- University Athletic Committee (6 years), Chair.
- Graduate Admission Committee (yearly)
- Faculty Evaluation Committee (yearly)
- Faculty Search Committees
- Provost's General Education Task Force
- Search Committee for Athletic Director
- Judge for State Science Fair (6 years)

Community Service

- Board Member, *Montana Board of Research & Commercialization*, (Governor Appointee)
- Board Member, *Loyola Sacred Heart Foundation Board* (President 2014-2015)
- Member, *Frontier Angel Funds 1 & 2* (early-stage investing in local companies)
- Board Member, *Montana Academy of Distinguished Entrepreneurs*, University of Montana
- Board Member (former), *Treasure State Bank*, Missoula, MT
- Member (former), *Advising Committee for Technology Transfer*, University of Montana
- Mentor for several local businesses and entrepreneurs
- Completed JustFaith, a ministry for Social Justice
- Business Competition judge at the University of Montana, business school (many years)
- Committee member of about 30 national and international research conferences (former)
- Coach kids in Golf, Soccer, Football, and Basketball

Selected Technology Based Entrepreneurship:

- **Visual Learning Systems (2001-2009)**. Co-Founder and President. Software company focused on using machine learning for automatic digital image interpretation. Became world leader in industry after only 4 years. Sold to Overwatch and Textron. (See below for detailed information)
- **MedIntel (2002-2006)**. Co-founder with Tim Nagel. A computational biology software company focused applying Dr. Opitz' work on predicting the activity of chemicals via purely computational methods (as opposed to wet lab tests). The ownership portion of Dr. Opitz was sold to Nagel as requirement for VLS exit event in 2006. The company had contracts totaling approximately \$400,000 with the Center for Structural and Functional Neurosciences, USDA Phase I SBIR, and Montana Board of Commercialization and Research. Partnerships included the Natural Resources Research Institute (NRRI) in Duluth, MN and Rocky Mountain Labs in Hamilton, MT. Projects included determining blood brain barrier transmission, toxicity of chemicals, and Mad Cow and Chronic Wasting Disease.

Visual Learning Systems

What did VLS do? VLS addressed the problem of *automated feature extraction*, which is finding geospatial features in remotely sensed images. Maps and GIS applications rely on knowing the existence and location of current earth features such as roads, vegetation, or any other geospatial knowledge. The VLS software accelerated the process of obtaining such information from satellite and aerial images. In four years, it became the world leader in this niche space, often called the “Holy Grail of Problems” by many in the GIS and remote sensing industry. Feature extraction software lies between two traditional software spaces: (1) GIS, and (2) image processing. VLS partnered with the leaders in both industries (ESRI, Leica, Intergraph, BAE) to create extensions to their workflow, which in turn kept them from competing, and had them sell the VLS solution to their customers. The result was a company that became the world leader in feature extraction technology, dominating the established feature extraction competitors in a short matter of time.

Pertinent Facts about VLS (during Dave’s time as President, 2001-2009)

- Cofounded the company as a technology transfer of research
- David served as President, leading others in strategy, technology, management, recruitment and hiring, budgets, audits, financials, sales, and marketing.
- Started from SBIR Funding and grew organically. No loans or private capital ever received.
- Hired first employee in 2001. Sold company in 2006 to Overwatch (which then sold to Textron)
- During the tenure of Dr. Opitz (2001 to 2009):
 - Had commercial software sales to over 400 organizations and 4,000 users
 - Successfully completed more than 25 contracts for approximately \$8 million
 - Negotiated and signed over 100 agreements of various kinds with partners
- Developed two commercially successful products:
 - *Feature Analyst*. Became world leader in finding features in all types of images.
 - *LIDAR Analyst*. Became world leader in finding features in LIDAR.
- In a short time period, developed strategic partnerships with key players in the industry, which ultimately played as much of a role in the success for VLS as the base technology.
- Developed Software Development Kit (SDK) to allow third parties to extend the VLS software. Resulted in key partnerships and tools that augmented VLS workflow.
- Had 23 employees when sold in 2006. High paying, high-tech jobs. Still in Missoula.
- Hired mostly U of Montana graduates. Six employees had Dr. Opitz as their graduate thesis advisor
- Several additional software packages were developed but not sold by Textron. These included a geospatial datamining system, a hyperspectral feature extraction extension, and a rule-based modifier.
- As part of sale, Dr. Opitz signed an employment agreement to stay three more years, and resigned in good standing closely after the mandatory period ended to pursue other passions.

Government Grants & Contracts for VLS (Selected):

- Opitz, D. (2008-9) “Automated Target Recognition in Imagery,” National Geospatial-Intelligence Agency (NGA), \$450,000
- Opitz, D., Blundell, S. (2007-9) “Terrestrial LIDAR Toolkit” Army SBIR Phase II, \$730,000
- Opitz, D., Blundell, S. (2007-8) “Use of Target Shape and Size in Classification of UXO in Survey Data” SERDP (subcontract from SAIC). \$170,000
- Opitz, D., Blundell, S. (2006-9) “Feature Analyst Hyperspectral Toolkit” NASA SBIR Phase II, \$500,000
- Opitz, D. (2006-7) “Feature Analyst ATR Toolkit” NGA, \$600,000
- Opitz, D., Blundell, S. (2006-8) “LIDAR Surface Feature Extraction Tool” Navy SBIR Phase II, \$1,000,000
- Opitz, D. (2006-7) “Discovering Anti-TSE Agents” BioPred subcontract. \$181,000

- Opitz, D., Blundell, S. (2005-6) “Terrestrial LIDAR Toolkit” Army SBIR Phase I, \$122,000
- Opitz, D., Blundell, S. (2006) “Feature Analyst Hyperspectral Toolkit” NASA SBIR Phase I, \$70,000
- Opitz, D. (2005-6) “Use of Target Shape and Size in Classification of UXO in Survey Data,” SERDP (Subcontract from AETC), \$95,000
- Opitz, D., Blundell, S. (2004-5) “LIDAR Surface Feature Extraction Tool,” Navy SBIR Phase I, \$100,000
- Opitz, D. (2004-5). “Development of Stereo Capabilities in Feature Analyst” NGA, \$300,000
- Opitz, D., Blundell, S. (2004-5) “Discovery Analyst” NSF SBIR Phase II, \$500,000
- Opitz, D. (2004-5) “Feature Analyst LIDAR Toolkit” ALES Consortium; JSPD, \$349,500
- Opitz, D. (2004). “Development of Stereo Capabilities in Feature Analyst.” NGA, \$500,000
- Opitz, D., Blundell, S. (2004) “Objectionable Image Filtering” NSF SBIR Phase I, \$100,000
- Opitz, D., Blundell, S. (2003-5). “Machine Learning and Rule Based Image Classification,” Army SBIR Phase II, \$730,000
- Opitz, D., Blundell, S. (2003-4) “Proof-of-Concept Study of VLS Machine Learning Techniques Applied to Advanced Volume Sensor Fire Detection” Naval Research Lab \$50,000
- Opitz, D. (2003-4) “Development of Stereo Capabilities in Feature Analyst.” NIMA (NGA), \$350,000.
- Opitz, D., Blundell, S. (2003). “Large Image Datamining: Discovery Analyst” NSF SBIR Phase I, \$500,000
- Opitz, D., Blundell, S. (2002-3). “Machine Learning and Rule Based Image Classification,” Army SBIR Phase I and Option, \$120,000
- Opitz, D. (2001-3) “Extracting Features from Digital Nautical Charts“ NIMA (ESRI Omnibus Subcontract) \$128,000
- Opitz, D., Blundell, S. (2001-2). “A Novel Machine Learning System for Autonomous Classification of High-Resolution Satellite Images.” NASA Phase II SBIR, \$625,000
- Opitz, D. (2001) “Extracting Features from Satellite Imagery,” NIMA (NGA), \$100,000
- Opitz, D., Blundell, S. (2001) “An Assisted Change Detection System.” NASA Phase I SBIR, \$70,000
- Opitz, D., Blundell, S. (2000). “A Novel Machine Learning System for Autonomous Classification of High-Resolution Satellite Images.” NASA Phase I SBIR, \$70,000

Awards

- State of Montana SBIR Company of the Year presented at the Max Baucus Economic Summit (2007)
- Tibbetts Award exemplifying the very best in SBIR achievement (2006)
- Army SBIR and STTR Quality Award (2006)
- *Feature Analyst*, voted ESRI’s Most Innovative Solution of over 1400 business partners (lead designer of software)
- Profiled on CNBC on “Power Lunch.” Visual Learning Systems was chosen as the “small business of the week” to profile for the week of July 27-31, 2005. Show was prime time and broadcast around the world.