

Contact Information

Juan B. Gutierrez, Ph.D.

Associate Professor, Department of Mathematics, Institute of Bioinformatics

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Interim Director (Jan-Jun, 2018), Latin American and Caribbean Studies Institute

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Online version of this CV with links to publications: <http://euler.math.uga.edu/>

Education and Training

- **9/2010 - 7/2012.** Postdoctoral Fellow, Mathematical Biosciences Institute, Ohio State University, Columbus, OH.
- **9/2009 - 8/2010.** Postdoctoral Associate, Institute for Theoretical and Mathematical Ecology, University of Miami, Coral Gables, FL.
- **12/2009.** Ph.D. in Mathematics. Dissertation: *Mathematical Analysis of the Use of Trojan Y Chromosomes as Means of Eradication of Invasive Species*. Advisor: Dr. Monica K. Hurdal. Department of Mathematics, Florida State University, Tallahassee, Florida.
- **05/2005.** M.Sc. in Biomedical Mathematics. Department of Mathematics, Florida State University, Tallahassee, Florida.
- **05/1996.** B.Sc., Civil Engineering, Meritorious Thesis. National Prize of Excellence in B.Sc. Thesis, National University of Colombia.

Research

My current **research** efforts in **quantitative biology** focus on **multi-scale analysis of infectious disease** and other ecological problems: (i) the characterization of malaria, from the within-host dynamics to the epidemiology of this infectious disease, and (ii) modeling dispersal and population dynamics of genetically modified organisms. In my lab we produce mathematical, computational, and statistical models ranging from molecular interactions to spatial distribution and interaction of populations.

My current efforts in **education** focus on **adaptive learning**. We have created in my lab an Adaptive Learning System for Interdisciplinary Collaborative Environments (ALICE). This system offers competency-centered adaptivity (a syllabus is created for each student based on what they do not know), and interest-based adaptivity (examples respond to students' interests). The multi-lingual web-based pilot has shown improvements in student performance with strong statistical significance.

My lab hosts postdoctoral scholars, undergraduate students, and graduate students from mathematics, bioinformatics, biology, computer science, and engineering. As of 2017, I have graduated two Ph.D students: Dr. Yi Heng Yan (bioinformatics), and Dr. Karen Aguar (computer science).

My currently funded research projects are:

1. (PI Gutierrez) ALICE (Adaptive Learning for Interdisciplinary Learning Environments, 2016-2018, \$299K), NSF award #1645325: ALICE is a Web-based information system that generates individualized development plans, according to previous experiences and current challenges. Furthermore, ALICE is designed to connect lexias from multiple subject matters, thus bypassing disciplinary barriers that in many cases are artificial. The principles behind ALICE are generalizable, and hence it has the potential to be used in K-16, graduate, and continuing education. ALICE is based upon the Literatronica engine I designed and implemented between 1996 and 2005.

2. (Co-PI Gutierrez, PI Galinski) Technologies for Host Resilience (2016-2019, \$1.9M UGA out of \$6.5M) - Host Acute Models of Malaria to study Experimental Resilience (THoR's HAMMER), DARPA contract #W911NF-16-C-0008, 2016-2019. This project explores the molecular mechanisms of resilience, susceptibility and resistance of non-human primate hosts when challenged with a malaria infection. I direct the computational biology team in charge of building mathematical models of resilience.
3. (Co-PI Gutierrez, PI Barbour) Collaborative Research: NSF INCLUDES: An Integrated Approach to Retain Underrepresented Minority Students in STEM Disciplines (2016-2018, \$117K). NSF award 1649226. The University of Georgia, Florida International University, Savannah State University, Clark Atlanta University and Fort Valley State University will lead this Design and Development Launch Pilot to address enhancing recruitment, retention, productivity and satisfaction of historically underrepresented minority (URM) undergraduate students who enroll in STEM graduate programs at primarily white (PWI) and research intensive (RI) universities.

I participated as a co-investigator in the following past research projects:

1. (Co-I Gutierrez, PI Galinski) Malaria Host-Pathogen Interaction Center (MaHPIC - 2012-2017, \$19.5M) NIH's NIAID contract HHSN272201200031C. PI Mary Galinski. MaHPIC involves the multidisciplinary study of malaria infections, immunity and pathogenesis of *P. falciparum*, *P. vivax* and *P. knowlesi* in the context of host-pathogen interactions, in humans and nonhuman primates, using a systems biology approach. Three nonhuman primate malaria species will be studied: *P. coatneyi* to model *P. falciparum*, *P. cynomolgi* to model *P. vivax*, and *P. knowlesi*, a monkey malaria species that has been causing illness and cases of death in humans in Southeast Asia. My role in MaHPIC: mathematical modeling based on 'omics data (functional genomics, lipidomics, proteomics, metabolomics).
2. (Co-I Gutierrez, PI Herrera) International Centers for Excellence in Malaria Research - Center for non-Amazonian regions of Latin America (2012-2017, \$159K for UGA out of \$5.5M) - CLAIM, NIAID cooperative agreement U19AI089702-01, 2010-2017. PI Socrates Herrera. CLAIM is divided into three projects: Project 1 is evaluating the diversity of the ecology and parasite populations related to the epidemiology and clinical findings to establish a scientific framework that supports the development of new intervention strategies for malaria elimination in non-Amazonian areas of Latin America. Project 2 is addressing major gaps in understanding of the ecology, behavior, vector potential, and control of Anopheles malaria vectors to guide the development and implementation of more effective integrated vector management (IVM) strategies of National Malaria Control Programs (NMCPs). Project 3 aims to determine the clinical outcomes and their association with parasite and host features of malaria-infected individuals living in non-Amazon regions of LA with different intensities of malaria transmission. My role in CLAIM: Data manager and mathematical modeler.

Publications

Publications in the arXiv

- 2017 Karen Aguar, Charles C. Sanchez, Diego Boada Beltran, Saeid Safaei, Mehdi Asefi, Jonathan Arnold, Pedro Portes, Hamid R. Arabnia, [Juan B Gutierrez](#). Considerations on Interdisciplinary Instruction and Design Influenced by Adaptive Learning. A Case Study Involving Biology, Computer Science, Mathematics, and Statistics. [arXiv:1703.06010](#) [physics.ed-ph]
- 2017 Mehdi Allahyari, Seyedamin Pouriyeh, Mehdi Assefi, Saied Safaei, Elizabeth D. Trippe, [Juan B Gutierrez](#), Krys Kochut. A Brief Survey of Text Mining: Classification, Clustering and Extraction Techniques. [arXiv:1707.02919](#) [cs.CL] Mehdi Allahyari, Seyedamin Pouriyeh, Mehdi Assefi, Saied Safaei, Elizabeth D. Trippe, [Juan B. Gutierrez](#), Krys Kochut. Text Summarization Techniques: A Brief Survey. [arXiv:1707.02268](#) [cs.CL]

- 2017 Elizabeth D. Trippe, Jacob B. Aguilar, Yi H. Yan, Mustafa V. Nural, Jessica A. Brady, Mehdi Assefi, Saeid Safaei, Mehdi Allahyari, Seyedamin Pouriyeh, Mary R. Galinski, Jessica C. Kissinger, Juan B Gutierrez. A Vision for Health Informatics: Introducing the SKED Framework. An Extensible Architecture for Scientific Knowledge Extraction from Data. [arXiv:1706.07992](https://arxiv.org/abs/1706.07992) [q-bio.QM].
- 2017 Yi H. Yan, Diego M. Moncada, Elizabeth D. Trippe, Juan B Gutierrez. Correlates of severity of disease in *Macaca mulatta* infected with *Plasmodium cynomolgi*. [arXiv:1706.08836](https://arxiv.org/abs/1706.08836) [q-bio.TO].
- 2017 Derek Onken, Eric Marty, Roberto Palomares, Rui Xie, Leyao Zhang, Jonathan Arnold, Juan B Gutierrez. The lunar cycle's influence on sex determination at conception in humans. [arXiv:1706.08151](https://arxiv.org/abs/1706.08151) [q-bio.OT].
- 2017 Yi H. Yan, Jacob B. Aguilar, Elizabeth D. Trippe, Juan B Gutierrez. Quantification of Healthy Red Blood Cell Removal and Preferential Invasion of Reticulocytes in *Macaca mulatta* during *Plasmodium cynomolgi* Infection. [arXiv:1706.08139](https://arxiv.org/abs/1706.08139) [q-bio.CB].
- 2017 Elizabeth D. Trippe, Jacob B. Aguilar, Yi H. Yan, Mustafa V. Nural, Jessica A. Brady, Juan B Gutierrez. Introducing Data Primitives: Data Formats for the SKED Framework. [arXiv:1706.08131](https://arxiv.org/abs/1706.08131) [q-bio.QM].
- 2016 Yi H. Yan, Elizabeth D. Trippe, Juan B Gutierrez. A Method for Massively Parallel Analysis of Time Series. [arXiv:1612.08759](https://arxiv.org/abs/1612.08759) [q-bio.QM].
- 2016 Jacob B. Aguilar, Juan B Gutierrez. An Epidemiological Model of Malaria Accounting for Asymptomatic Carriers. [arXiv:1611.04668](https://arxiv.org/abs/1611.04668) [q-bio.PE].
- 2016 Amanda N. Cameron, Matthew T. Houston, Juan B Gutierrez. A Review of Mathematical Models for Muscular Dystrophy: A Systems Biology Approach. [arXiv:1610.03521](https://arxiv.org/abs/1610.03521) [q-bio.QM].

Published peer-reviewed articles:

- 2017 Senz, Fabian E., Andrea Arvalo-Corts, Gabriela Valenzuela, Andrs F. Vallejo, Anglica Castellanos, Andrea C. Poveda-Loayza, Juan B Gutierrez, et al. Malaria epidemiology in low-endemicity areas of the northern coast of Ecuador: high prevalence of asymptomatic infections. *Malaria journal* 16, no. 1 (2017): 300.
- 2017 PROCEEDINGS. Pouriyeh, Seyedamin, Sara Vahid, Giovanna Sannino, Giuseppe De Pietro, Hamid Arabnia, and Juan Gutierrez. A comprehensive investigation and comparison of Machine Learning Techniques in the domain of heart disease. In *Computers and Communications (ISCC), 2017 IEEE Symposium on*, pp. 204-207. IEEE, 2017. DOI: [doi:10.1109/ISCC.2017.8024530](https://doi.org/10.1109/ISCC.2017.8024530)
- 2016 CHAPTER. Tseng, Wei-Chia, Mumingjiang Munisha, Juan B. Gutierrez, and Scott T. Dougan. Establishment of the Vertebrate Germ Layers. In *Vertebrate Development*, pp. 307-381. Springer International Publishing, 2017. [doi:10.1007/978-3-319-46095-6_7](https://doi.org/10.1007/978-3-319-46095-6_7)
- 2016 PROCEEDINGS. Aguar, Karen, Hamid R. Arabnia, Juan B Gutierrez, Walter D. Potter, and Thiab R. Taha. Making cs inclusive: An overview of efforts to expand and diversify cs education. In *Computational Science and Computational Intelligence (CSCI), 2016 International Conference on*, pp. 321-326. IEEE, 2016. DOI: [10.1109/CSCI.2016.0067](https://doi.org/10.1109/CSCI.2016.0067)
- 2015 Yi Yan, Brian Adam, Alberto Moreno, Mary Galinski, Jessica Kissinger, Juan B Gutierrez. Mathematical model of susceptibility, resistance, and resilience in the within-host dynamics between a *Plasmodium* parasite and the immune system. *Mathematical Biosciences*. Volume 270, Part B, December 2015, Pages 213223. DOI: [10.1016/j.mbs.2015.10.003](https://doi.org/10.1016/j.mbs.2015.10.003)
- 2015 Myriam Arevalo-Herrera, Mary Lopez-Perez, Luz Medina, Alberto Moreno, Juan B Gutierrez, Socrates Herrera Clinical profile of *Plasmodium falciparum* and *Plasmodium vivax* infections in low and unstable malaria transmission settings of Colombia. *Malaria Journal* 2015, 14:154. DOI: [10.1186/s12936-015-0678-3](https://doi.org/10.1186/s12936-015-0678-3)

- 2015 Juan B Gutierrez, Ming-Jun Lai, George Slavov. Bivariate Spline Solution of Time Dependent Non-linear PDE for a Population Density over Irregular Domains. *Mathematical Biosciences*. Volume 270, Part B, December 2015, Pages 263277. DOI: [10.1016/j.mbs.2015.08.013](https://doi.org/10.1016/j.mbs.2015.08.013)
- 2015 Juan B Gutierrez, Mary R. Galinski, Stephen Cantrell, Eberhard O. Voit. From Within Host Dynamics to the Epidemiology of Infectious Disease: Scientific Overview and Challenges. *Mathematical Biosciences*. Volume 270, Part B, December 2015, Pages 143155. DOI: [10.1016/j.mbs.2015.10.002](https://doi.org/10.1016/j.mbs.2015.10.002)
- 2015 Juan B Gutierrez, Omar S. Harb, Jie Zheng, Daniel J. Tisch, Edwin Charlebois, Christian J. Stoeckert Jr., and Deirdre A. Joy. A Framework for Global Collaborative Data Management in Malaria Research. *Am J Trop Med Hyg*. 2015 Sep 2; 93(3 Suppl): 124132. DOI: [10.4269/ajtmh.15-0003](https://doi.org/10.4269/ajtmh.15-0003)
- 2015 M Lopez-Perez, A Alvarez, JB Gutierrez, A Moreno, S Herrera and M Arevalo-Herrera. Malaria-Related anemia in patients from unstable transmission areas in Colombia. *Am J Trop Med Hyg*. 2015 Feb 4;92(2):294-301. DOI: [10.4269/ajtmh.14-0345](https://doi.org/10.4269/ajtmh.14-0345).
- 2014 DA Forero-Pena, P Chaparro, A Vallejo, Y Benavides, JB Gutierrez, M Arevalo-Herrera, and S Herrera. Knowledge attitudes and practices on malaria in Colombia. *Malaria Journal* 2014, 13:165 DOI: [10.1186/1475-2875-13-165](https://doi.org/10.1186/1475-2875-13-165).
- 2013 JB Gutierrez, S Kouachi, RD Parshad. Global existence and asymptotic behavior of a model for biological control of invasive species via supermale introduction. *Communications in Mathematical Sciences*. 11(4):971-992. DOI: [10.4310/CMS.2013.v11.n4.a4](https://doi.org/10.4310/CMS.2013.v11.n4.a4)
- 2013 JL Teem, JB Gutierrez. Combining the Trojan Y Chromosome and Daughterless Carp Eradication Strategies. *Biological Invasions*, May 2013. DOI: [10.1007/s10530-013-0476-1](https://doi.org/10.1007/s10530-013-0476-1).
- 2013 JL Teem, JB Gutierrez, RD Parshad. A Comparison of the Trojan Y Chromosome and Daughterless Carp Eradication Strategies. *Biological Invasions*, May 2013. DOI: [10.1007/s10530-013-0475-2](https://doi.org/10.1007/s10530-013-0475-2)
- 2012 S Herrera, ML Quinones, JP Quintero, V Corredor, DO Fuller, JC Mateus, JE Calzada, JB Gutierrez, A Llanos, E Soto, C Menendez, Y Wu, P Alonso, G Carrasquilla, M Galinski, J Beier, M Arevalo-Herrera. Prospects for malaria elimination in non-Amazonian regions of Latin America. *Acta Tropica*. Volume 121, issue 3 (March, 2012), p. 315-323. DOI: [10.1016/j.actatropica.2011.06.018](https://doi.org/10.1016/j.actatropica.2011.06.018)
- 2012 JB Gutierrez, MK Hurdal, RD Parshad, JL Teem. Analysis of the Trojan Y Chromosome Model for Eradication of Invasive Species in a Riverine System. *Journal of Mathematical Biology*. Volume 64, Numbers 1-2 (2012), 319-340. DOI: [10.1007/s00285-011-0413-9](https://doi.org/10.1007/s00285-011-0413-9).
- 2011 CHAPTER. John Teem and Juan B. Gutierrez. A theoretical strategy for eradication of Asian carps using a Trojan Y chromosome to shift the sex ratio of the population. In Duane C. Chapman, editor, *Bigheaded Carps in North America*. Published by the American Fisheries Society, AFS Symposium 74, Bethesda, MD, 2011. ISBN: 978-1-934874-23-3.
- 2010 RD Parshad, JB Gutierrez. On the Well Posedness of the Trojan Y Chromosome Model. *Boundary Value Problems*, vol. 2010, Article ID 405816, Nov. 2010. [10.1155/2010/405816](https://doi.org/10.1155/2010/405816)
- 2010 RD Parshad, JB Gutierrez. On the Global Attractor of the Trojan Y Chromosome Model. *Communications in Pure and Applied Analysis*, 10(10):339-359, January 2010. [10.3934/cpaa.2011.10.339](https://doi.org/10.3934/cpaa.2011.10.339)
- 2008 MK Hurdal, JB Gutierrez, C Laing, and DA Smith. Shape analysis for automated sulcal classification and parcellation of MRI data. *Journal of Combinatorial Optimization*, 15(3):257-275, 2008. DOI: [10.1007/s10878-007-9096-y](https://doi.org/10.1007/s10878-007-9096-y).
- 2008 PROCEEDINGS. Monica K. Hurdal, Juan B. Gutierrez, Christian Laing, Aaron D. Kline, and Deborah A. Smith. Geometric invariants for classification of cortical sulci. In *IEEE International Conference on Image Processing*. IEEE, pages 1156-1159, San Diego, CA, October 2008. DOI: [10.1109/ICIP.2008.4711965](https://doi.org/10.1109/ICIP.2008.4711965)

- 2008 PROCEEDINGS. Juan B Gutierrez and Mark C Marino. Literatronica. Adaptive Digital Narrative. In ACM's Hypertext'08. Creating '08: Proceedings of the hypertext 2008 workshop on Creating out of the machine: hypertext, hypermedia, and web artists explore the craft, pages 5-8, New York, NY, USA. DOI: [10.1145/1379153.1379156](https://doi.org/10.1145/1379153.1379156)
- 2006 PROCEEDINGS. Juan B. Gutierrez. Literatronic: Use of Hamiltonian cycles to produce adaptivity in literary hypertext. In *The Bridges Conference 2006: Mathematical Connections in Art, Music, and Science*, pages 215–224, London, UK, August 2006. The Bridges Organization. <http://archive.bridgesmathart.org/2006/bridges2006-215.html>.
- 2006 JB Gutierrez and JL Teem. A model describing the effect of sex-reversed YY fish in an established wild population: the use of a Trojan Y chromosome to cause extinction of an introduced exotic species. *Journal of Theoretical Biology*, 241(22):333–341, July 2006. DOI: [10.1016/j.jtbi.2005.11.032](https://doi.org/10.1016/j.jtbi.2005.11.032).
- Featured in Nature News. Louis Buckley. Sex change wipes out invasive species. *Nature*, July 2007. London, UK. <http://dx.doi.org/10.1038/news070723-9> [Online; accessed 25-Feb-2015].
 - Featured in Trends in Ecology & Evolution. Samuel Cotton and Claus Wedekind (Switzerland). Control of introduced species using Trojan sex chromosomes. *Trends in Ecology & Evolution* 22(9), pp. 441-3, 09-2007. DOI: [10.1016/j.tree.2007.06.010](https://doi.org/10.1016/j.tree.2007.06.010).
 - Featured in ScienceLine. Rachel Mahan. Supermales to the rescue. *Scienceline*, Jan 2008. New York, NY. <http://scienceline.org/2008/01/11/env-mahan-invasives/> [Online; accessed 25-Feb-2015].
 - Featured in NCR Handelsblad. Sander Voormolen. Vrouwtjes verdrijven (Females away). NCR Handelsblad, 2007. Rotterdam, Netherlands. http://www.nrc.nl/wetenschap/article1828576.ece/Vrouwtjes_verdrijven [Online; accessed 25-Feb-2015].
 - Featured in Conservation Magazine. Cynthia Mills (WA, USA). Operation Sex Change. *Conservation Magazine*, a publication of the Society for Conservation Biology, Sep 2009. <http://conservationmagazine.org/2009/07/operation-sex-change/> [Online; accessed 25-Feb-2015]

Teaching Experience

At the University of Georgia:

- 2018 BINF8950 (3h). Spring - Systems Biology.
- 2018 LACS1000 (3h). Spring - Introduction to Latin American and Caribbean Studies.
- 2017 MATH4500/6500 (3h). Fall - Numerical Analysis.
- 2017 FYOS1001 (1h). Fall - Modes of Knowledge.
- 2017 STAT4510/6510 (3h). Summer - Mathematical Statistics.
- 2017 MATH4780/6780 (3h). Spring - Mathematical Biology.
- 2016 FYOS1001 (1h). Fall - History of Science.
- 2016 GRSC8015 (1h). Fall - Data Management.
- 2016 BINF8950 (3h). Spring - Mathematical Biology.
- 2015 GRSC8015 (1h). Fall - Data Management.
- 2015 MATH2700 (3h). Fall - Differential Equations.

2015 BINF4005/6005 (3h). Spring - Computational Skills for Biology.

2014 MATH4780/6780 (3h). Fall - Mathematical Biology.

2014 MATH4750/6750 (3h). Spring - Transforms.

2013 MATH4780/6780 (3h). Fall - Computational Skills for Biology.

2013 MATH4780/6780 (3h). Spring - Mathematical Biology.

2012 BINF4005/6005 (3h). Fall - Computational Skills for Biology.

At other institutions:

2011 Instructor of MAT152. Spring - Calculus I, Ohio State University, Columbus, Ohio.

2010 Instructor of MTH300/BIL385. Spring - Mathematical Models in Biology and Medicine, University of Miami, Coral Gables, Florida.

2009 Instructor of MAC-1140.23 Spring - Pre-calculus, Florida State University, Tallahassee, Florida.

2008 Instructor of MAP-2480.02,04 Fall - Biocalculus Computer Laboratory, Florida State University, Tallahassee, Florida.

2008 Online instructor of the Máster de estudios literarios en la era digital (M.A. Literary Studies in the Digital Age, *Universitat Oberta de Catalunya* (UOC), Barcelona, Spain.

Appointments and Professional Experience

- Interim director of the Latin American and Caribbean Studies Institute, University of Georgia, Athens, Georgia. Jan-Jun, 2018.
- Adjunct Professor of Computer Science, University of Georgia, Athens, Georgia. August 2017 to Present.
- Associate Professor of Mathematics and Bioinformatics, University of Georgia, Athens, Georgia. August 2016 to Present. Tenure effective on August, 2017.
- Assistant Professor of Mathematics and Bioinformatics, University of Georgia, Athens, Georgia. August 2012 to July 2016.
- Postdoctoral Fellow, Mathematical Biosciences Institute, Ohio State University, Columbus, OH. Sept 2010 - July 2012.
- Postdoctoral Associate, Institute for Theoretical and Mathematical Ecology, University of Miami, Coral Gables, FL. Sept 2009 - August 2010.
- Research Fellow. President. CAVIAR Inc. Tallahassee, FL. Duties: Build mathematical models and their computational implementation (dynamical systems, partial differential equations, pattern classification, operations research). 2005 - 2010.
- Programmer/Analyst, Information Systems of Florida. Tallahassee, FL. Duties: Architect and programmer for MERLIN, the Communicable Disease Reporting System of the Bureau of Epidemiology, Florida Department of Health. Design enterprise web systems architecture, set development standards, design enterprise relational databases, write specifications for programmers, program according to specifications, design web pages, design and develop GIS applications. 2001 - 2008.
- Independent Engineer. Structural design, hardware, and software design for petroleum industry. 1999 - 2000.

- Author. Fiction writer funded with grants by the Colombian Ministry of Culture and the Bogotan Institute of Culture. Produced two novels and one story book. 1997 - 1998.
- Design Engineer. Inprotekto Ltda. Geographic Information Systems (GIS) and transportation models. 1996
- Engineering Assistant. Inprotekto Ltda and PCA Ltda. Several activities involving GIS data acquisition, structural design, aqueducts. 1992 - 1995

Service

- Member of the Editorial Board of Mathematical Biosciences (Elsevier).
- Member of the Executive Committee of the Latin American and Caribbean Studies Institute, University of Georgia (2014-2017).
- Consultant for the GrantsMART office, charged with coordinating large research grants, Office of the Vice President for Research, University of Georgia.

Information Technology Skills

I have know-how and experience in designing and implementing complex multi-tier information systems that integrate numerical algorithms (microcontrollers to supercomputers), relational databases, data mining, remote sensing & GIS, telecommunication, and user interfaces.

- *Operating Systems*: OS compatibles with the Portable Operating System Interface (POSIX) (UNIX, Linux, MacOS, Windows), DOS.
- *Computer Languages*: C++, C, Fortran, VB.NET, C#, ASP.NET, Java, JSP, JavaScript, SQL (ANSI and vendor variants such as T-SQL and PL-SQL).
- *Mathematics Software*: MATLAB, Maple, Scilab, R.
- *Database Management Systems*: SQL Server, Oracle, MySQL, MS Access.
- *Geographic Information Systems*: Map Windows, ArcGIS, MATLAB Mapping Toolbox.
- *Development Tools and Technologies*: Visual Studio, Eclipse, and productivity tools (MS Project/Office, HTML, XML/XSL, ArcXML).
- *Certifications*: MCSD.NET - Microsoft Certified Solution Developer for .NET.