

# 2001 ANNUAL REPORT

## Mathematics and Statistics

### Direction of Individual Student Work

#### Theses

[Datta] T. Sylvie Boogie, Estimation of the Selection Parameters and Testing of different Selection Models.

#### Publications

#### Books

*Precalculus Lecture Notes and Activities*. 180 pages of web page images to accompany online course, by Jean Bevis.

#### Articles, Essays, and Chapters

**M. Alexander**, Interactive College Algebra: Standards and Technology Based, *Journal of Computers in Mathematics and Science Teaching* (2001).

**G.T.Chen**, H. Enomoto, K. Kawarabayashi, K. Ota, D. Lou, and A. Saito  
Vertex-disjoint cycles containing specified edges in a bipartite graph, *Australaian Journal of Combinatorics* **23** (2001), 37-48.

**G.T.Chen**, R.J. Faudree and W.E. Shreve, Weak clique-covering cycles and paths, *Ars Combinatoria* **58** (2001), 67-83.

**G.T.Chen**, F.J. Hall, A. E. Kezdy, Z. Li, and H. Zhou, Isomorphisms involving reversing arcs of digraphs, *Journal of Combinatorial Mathematics and Combinatorial Computing* **36** (2001), 155-160.

**G.T.Chen**, J. Hutchinson, W. Piotrowski, W.E. Shreve, B. Wei  
Degree sequences with repeated values, *Ars Combinatoria* **59** (2001), 33-44.

**G.T.Chen**, and M. Jacobson, On a relationship between 2-dominating and 5-dominating sets in graphs, *Journal of Combinatorial Mathematics and Combinatorial Computing* **39** (2001), 139—145.

**G.T.Chen**, B. Wei and X. Zhang, Degree-light-free graphs and Hamiltonian cycles, *Graphs and Combinatorics* **17** (2001), no. 3, 409—434.

R.J. Gould, **G.T.Chen** and H. Li, Partitioning vertices of a tournament into independent cycles, *Journal of Combinatorial Theory Series B* (2001), 213-220.

**S. Datta**, Estimation of selection parameters using multi-generation cytonuclear data, *Biometrical Journal*, **43** (2001), 219-233.

**S. Datta**, Testing neutrality of DNA using multigeneration cytonuclear data, *Selected Proceedings of the Symposium on Inference for Stochastic Processes* (I. V. Basawa, C. C. Heyde, R. L. Taylor, Eds.), IMS Lecture Notes - Monograph Series, 37, 173-184, IMS, Beachwood, OH. (2001).

**S. Datta**, Exploring relationships in gene expressions: a partial least squares approach, *Gene Expression*, **9** (2001), 257-264

**G. Davis**, Kanti V. Mardia, **Vic Patrangenaru** and Gordana Derado, Averaging side view images of almost flat spatial scenes, *Proceedings in Functional and Spatial Data Analysis*, Leeds University Press, (2001), 47-54.

**L. Ding**, Linear systems and linear interpolation I, *Journal of Shanghai Jiaotong University*, **Vol. E-6**, 2001, 72-77.

**F. Hall, Z. Li** and D. Wang, Symmetric sign pattern matrices that require unique inertia, *Linear Algebra and its Application Journal*, **338** (2001), 153-169.

**F. Hall and Z. Li**, Inertia sets of symmetric sign pattern matrices, *Numerical Math. J. of Chinese Universities*, **10** (2001), 226-240

**J.H. Hattingh**, L. Harris and E. Ungerer, The signed and minus k-subdomination number of certain multipartite graphs and their complements, *Utilitas Mathematic*, **59** (2001) 77-95.

**H. He**, Nonvanishing of a certain sesquilinear form in theta correspondence, *AMS Journal of Representation Theory*, **5** (2001), 437-454.

**V. Olshevsky and G.Heinig**, The Schur algorithm for matrices with Hessenberg displacement structure, in *Structured Matrices in Mathematics, Computer Science, and Engineering II, Contemporary Mathematics series*, **281**, 3-16, AMS, 2001.

**V. Olshevsky** and Amin Shokrollahi, A superfast algorithm for confluent rational tangential interpolation problem via matrix-vector multiplication for confluent Cauchy-like matrices, in *Structured Matrices in Mathematics, Computer Science, and Engineering I, Contemporary Mathematics series*, **280**, 32-46, AMS, 2001.

**V. Olshevsky** and D.Fasino, How bad are symmetric pick matrices, in *Structured Matrices in Mathematics, Computer Science, and Engineering I, Contemporary Mathematics series*, **280**, 301-312, AMS, 2001.

**V. Olshevsky**, Unitary Hessenberg matrices and fast generalized Parker-Traub and Bjorck-Pereyra algorithm, invited chapter in the book *Structured Matrices: Recent Developments in Theory and Computation*, 67-78, (D.Bini, E.Tyrtshnikov, P. Yalamov., Eds.), 2001, NOVA Science Publ., USA.

**V. Patrangenaru**, New large sample and bootstrap methods on shape spaces in high level analysis of natural images, *Comm. Statist. Theory Methods*, **30** (8-9) (2001), 675-1693.

**V. Patrangenaru**, Limit theorems for negatively dependent random variables, *Nonlinear Analysis*, **47** (2001), 1283-1295.

**R. Patterson**, Weak laws of large numbers for arrays of rowwise negatively dependent random variables, *Journal of Applied Mathematics and Stochastic Analysis*, **14(3)** (2001), 227-236.

**G.S. Qin**, and B.-Y. Jing, Empirical likelihood for Cox regression model under random censorship, *Commun in Stat Simulation & Computation*, **30**(2001), 79-90.

**G.S. Qin** and B.-Y. Jing, Censored partial linear models and empirical likelihood, *J Multi Anal.*, **78** (2001), 37-61.

**G.S. Qin** and B.-Y. Jing, Empirical likelihood for censored linear regression, *Scand J Statist.*, **28**(2001), 661-673.

A.G.Ramm and **A.B.Smirnova**, On stable numerical differentiation. *Mathematics of computation*, **70**, 1131-1153, (2001).

**M. Stewart and V. Olshevsky**, Stable factorization for Hankel and Hankel-like matrices, *Numerical Linear Algebra and Applications*, **8** (2001), 401-434.

**M. Stewart**, Stability properties of several variants of the unitary Hessenberg QR algorithm, In *Contemporary Mathematics, AMS Contemporary Mathematics Series*, **281**, American Mathematical Society, Providence, RI, 2001.

**D. Vidakovic**, B. Czarnocha, **E. Dubinsky**, S. Loch, and V. Prabhu, Conceptions of area: In students and in history, *The Journal for Collegiate Mathematics* (2001).

**D. Vidakovic, J. Bevis & M. Alexander** (2001). Precalculus with webCT support. *Proceedings of the ICTCM-14*, pp. 282-286. Baltimore, MD.

Czarnocha, B., Loch, S., Prabhu, V., & **D. Vidakovic**. (2001). The concept of the definite integral: Coordination of two schemas. *Proceedings of the 25th Annual Meeting of the International Group for the Psychology of Mathematics Education (PME25)*, V. 2, pp. 297-304, Utrecht: Freudental Institute.

### Presentations at Professional Meetings

[Alexander]

- WAC in Precalculus and English Composition, Fifth National Writing Across the Curriculum Conference, May 2001, Indiana University, Bloomington, IN.
- Precalculus with Web Base Support, Fourteenth Annual Conference on Technology in Collegiate Mathematics, November, 2001, Baltimore Marriott Waterfront Hotel, Baltimore, Maryland.

[Chen]

- Monochromatic Coloring via Total Multicoloring of Trees, Fourteenth Cumberland Conference on Combinatorics, Graph Theory, and Computing, Memphis, TN, May 2001(invited).

- Toughness and Hamiltonicity, The CAS International Conference on Graph Theory and Combinatorics, Kuming, China, June (Plenary Speaker, invited).
- Extremal Graphs for Intersecting Cliques, 2001 Fall AMS Southeastern Section Meeting, Chattanooga, TN, October 2001 (invited).

[Datta]

- IISA-JSM-2000-2001 Conference, January 2001, New Delhi, India, "Microarray data and bioinformatics: a statistical future?"
- International Conference on Statistics, Combinatorics and Related Areas And The Eighth International Conference of the Forum for Interdisciplinary Mathematics, Wollongong University, Australia, "Use of Partial Least Squares in Microarray Data", December 19-21, 2001.

[Ding] On reflexive finite dimensional operator spaces, Conference on Trends in Banach spaces and operator theory, University of Memphis, October 5, 2001.

[Domke]

- Gallai-Type Theorems for Generalized Domination and Degree Parameters, invited presentation at the Sixteenth Clemson Mini-Conference on Discrete Mathematics, Clemson, SC, November 9, 2001.
- A Survey of Gallai-Type Theorems for Domination Parameters, contributed presentation at the South African International Graph Theory Conference, Ithala Game Reserve, KwaZulu-Natal, South Africa, June 19, 2001.
- The Inverse Domination Number of a Graph, contributed presentation at the Thirty-Second Southeastern International Conference on Combinatorics, Graph Theory and Computing, Baton Rouge, LA, February 28, 2001.

[Hall] Irreducible powerful ray pattern matrices, contributed presentation given at the American Mathematical Society Sectional Meeting, Chattanooga, TN, October 6, 2001.

[Hattingh]

- An overview of restrained domination in graph, invited presentation at the South African International Graph Theory Conference, Ithala Game Reserve, South Africa.
- Graphs with small upper line-distinguishing and upper harmonious chromatic numbers, invited presentation at the Regional meeting of the AMS, Chattanooga, USA, 2001.

[Li] Inertia sets of sign pattern matrices, contributed talk at the 2001 American Mathematical Society Southeastern Regional Conference, Chattanooga, Oct. 2001.

[Olshevsky]

- A Plenary lecture at the Meeting of the International Linear Algebra Society, ILAS-2001, Haifa, 25-29 June, 2001.
- An invited talk in the minisymposium at the 2001 SIAM conference on Linear Algebra in Signals, Systems and Control, Boston, August 12-16, 2001.
- A talk at the AMS/IMS/SIAM conference on "Fast Algorithms in Mathematics, Computer Science and Engineering," South Hadley, MA, August 4-9, 2001.

[Patrangenaru]

- V. Patrangenaru and G. Derado, An application of Statistical Methods to 3D Shape Change, at the 15<sup>th</sup> New England Statistics Symposium, April 28, 2001, University of Connecticut, Storrs.
- K.V. Mardia and V. Patrangenaru, On affine and projective shape analysis, Leeds Annual Statistical Research Workshop, University of Leeds, July 9, 2001.
- K.V. Mardia, V. Patrangenaru, G.J. Davis and G. Derado, Averaging side view images of almost flat spatial scenes, University of Leeds, Leeds Annual Statistical Research Workshop, July 9, 2001.

[Qin]

- Censored partial linear models and empirical likelihood, *invited talk* at Central Indiana ASA meeting, Indianapolis, March 2001.
- Refined confidence intervals for the difference of two sensitivities or specificities, *invited talk* at ICSA 2001 Applied Statistics Symposium, Chicago, June 2001.

[Shilnikov]

- SIAM Dynamical Systems, 2001.
- School and Workshop on Dynamical Systems, ICTP, Trieste, Italy, 2001 (Invited lecture).
- International Conference, *Progress in Nonlinear Science*, Nizhny Novgorod, 2001 (Invited lecture).
- MRI Workshop, *Analysis and Continuation of Bifurcations*, Utrecht University, the Netherlands, 2001 (Invited lecture).

[Smirnova]

- Continuous algorithm for solving nonlinear ill-posed problems with simultaneous regularized inversion of the Frechet derivative operator, AMS Special Session on Interaction of Inverse Problems and Image Analysis, AMS Joint Mathematics Meetings, January 12-13, 2001, New Orleans, LA.
- Nonlinear ill-posed problems and dynamical systems, 21st Annual Southeastern-Atlantic Regional Conference on Differential Equations, November 2-3, 2001, Winston-Salem, NC.

[Stewart] Contributed talk, Fast Orthogonalization Algorithms, at 2001 AMS/IMS/SIAM Summer Research Conference on Fast Algorithms in Mathematics, Engineering and Computer Science, South Hadley, MA, August 5-9, 2001.

[Vidakovic]

- The latest trends in education at collegiate level: Focusing on mathematics education. Gave invited talk at the *First International Conference on Science and Education Under Conditions of Transition in Serbia*, Belgrade, YU (2001).
- A **co-organizer** of “*Teaching and learning theories*”, a contributed paper session the MAA regional conference, Spring, 2001, Montgomery, AL
- A **co-organizer** of “*Topics in Teaching, Learning and Exploring Proof*”, a contributed paper session at the Winter 2001 Joint AMS Meeting, New Orleans, LA

### Colloquia and Seminar Presentations

[Chen]

- The circumferences of  $3$ -connected graphs, Huazhong Normal University, Wuhan, China, July (9 hours, three session series talk).
- Hamiltonian Graphs, Nanjing Normal University, Nanjing, China, July (6 hours, two session series talk).
- Longest Cycles in  $3$ -connected Graphs, Clemson University, SC, November.

[Datta]

- Department of Statistics, University of Georgia, Athens, GA, April 2001.
- Department of Biostatistics, University of Alabama, Birmingham, AL, August 2001.

[Ding] Invited talk: Linear systems and linear interpolation, Shanghai Jiaotong University, Shanghai, China, May 28, 2001.

[He]

- Metaplectic Representation and Theta Correspondence I, Department of Mathematics, University of Georgia, April 2, 2001.
- Metaplectic Representation and Theta Correspondence I, Department of Mathematics, University of Georgia, April 9, 2001.
- Unipotent Representation and Theta Correspondence I, Department of Mathematics, University of Georgia, Oct 31, 2001.

- Unipotent Representation and Theta Correspondence II, Department of Mathematics, University of Georgia, November 7, 2001.
- Unipotent Representation and Theta Correspondence III, Department of Mathematics, University of Georgia, November 14, 2001.
- Unipotent Representation and Theta Correspondence IV, Department of Mathematics, University of Georgia, November 28, 2001.

[Hsu] The Role of Statistics in High Tech Disease Diagnoses, presented at the CAPASUS Annual Meeting on June 30, 2001.

[Olshevsky] An invited seminar talk at MIT, November 2001.

[Patrangenaru] Applications of Differential geometry in Image Analysis, Colloquium, Department of Mathematics, University of Haifa, Israel, July 8, 2001.

[Shilnikov]

- Boston University, Department of Mathematics.
- Nonlinear Physics at GaTech.

[Smirnova] Colloquium talk, Iterative regularization and stopping rules for solving nonlinear first-kind unstable operator equations, Montana State University, Bozeman, Montana, July 11, 2001.

[Stewart] Fast Orthogonalization Algorithms, Emory, Department of Mathematics and Computer Science, Computational Mathematics Research Seminar, September 28, 2001.

[Vidakovic & R. Patterson] Statistics and technology: *Workshop for high school teachers*. Curriculum material developed for Dwight Eisenhower program, Georgia State University.

### Internal Grants

[Alexander]

- [Teaching with WebCT: An Alternative Approach (2000/2001). Instructional Technology, Center for Teaching and Learning, Georgia State University, \$5,000.
- Writing Across the Curriculum, \$2000.

[Datta]

P. I., A Pilot Project for Developing Statistical Tools for Bioinformatics. GSU faculty initiation grant, \$5000, 2000-2001.

Co- P. I., Instructional Improvement Grant, GSU Center for Teaching & Learning, \$5000, 2000-2001.

PI (no co-PI), Research Experience for Undergraduates in Fungal Genomics and Computational Biology: GSU VPRSP grant, \$18,666, Summer 2001.

[He] Summer Research Grant, GSU.

[Miller] Writing Across the Curriculum, \$2000.

[Olshevsky] New GSU Equipment matching fund, \$27,155.

[Smirnova] Georgia State University Research Initiation Grant, PI:, \$4,700, 2001.

[Vidakovic (P.I.), Bevis, Datta, Alexander] Technology, Center for Teaching and Learning, Georgia State University, \$5,000

### External Grants

[Alexander] *Developing e-core course*, University System of Georgia (\$10,000.00).

[Bakonyi] Collaboration in Basic Science and Engineering from the National Research Council, \$4,800.

[Chen] Circumferences and Graphic Ramsey Theory, National Science Foundation, 2000-2003.

[Datta]

- P. I., Statistical Analysis of Microarray Gene Expression Data, National Science Foundation, \$127,671, 2000-2002.
- NCI travel award for "Workshops for Junior Biostatisticians, 2001 ENAR, Charlotte, N. Carolina.

[Olshevsky] New NSF grant for 2001-2004. \$285,167.

[Shilnikov] 97-30804 INTAS: *Numerical analysis of local and global bifurcations in ordinary differential equations*, Brussels. Budget 46,000 ECU.

[Smirnova]

- AWM-NSF Mentor Travel Grant to work with Professor Curtis R. Vogel, Montana State University, PI: A.B.Smirnova, Budget: \$2,350, received in 2001.
- NSF support in the amount of \$300 to attend the 21st Annual Southeastern-Atlantic Regional Conference on Differential Equations, November 2-3, 2001, Winston-Salem, NC, received in 2001.
- NSF support in the amount of \$750 to attend NSF/CBMS Regional Research Conference "Using Spectral Data to Solve Inverse Problems", December 14-18, 2001, Edinburg, TX, received in 2001.

[Vidakovic, D. (PI) and R. Patterson] Teaching with Technology: Probability and Statistics for High School Teachers, Principal investigator, Eisenhower Higher Education, awarded \$20,733.00.

[Vidakovic]

- *Developing e-core course*, University System of Georgia (\$10,000.00).
- ExxonMobile support for travel to RUMEC meetings (over \$500.00)