Stephen Winters-Hilt Curriculum Vitae

Background

Education:

University of California -- Santa Cruz, Ph.D., Computer and Information Science, Sept. 1997 – Mar. 2003

University of Wisconsin -- Milwaukee, Ph.D., Theoretical Physics, Sept. 1990 – June 1997

Wadham College, Oxford, Visiting Student in Mathematics, Aug. 1994 – Aug. 1995

California Institute of Technology, M.S., Applied Physics, Sept. 1987 – June 1990

California Institute of Technology, B.S., Electrical Engineering and Physics, Sept. 1984 – June 1987

Experience:

A. Academic:

Assistant Professor in Computer Science, University of New Orleans, 8/03–present

Principal Investigator, the Research Institute for Children, New Orleans, 5/03-present

Instructor in Physics, University of Wisconsin – Milwaukee, 6/97 – 8/97

B. Other Professional

Sole Proprietor; Meta-Logos Systems; Santa Cruz, CA; Aug. 1997– Mar. 2003

Bioinformatics Programmer/Analyst; Neomorphic, Berkeley, CA; Jan. 1999 – June 1999

Senior Technical Writer; Network Alchemy; Santa Cruz, CA; Aug. 1998 – Dec. 1998

Tech. Writer/Web Page Consultant; Tip Technologies; Milwaukee, WI; June 1997 – Aug. 1998

Scholarly and Creative Productivity

1. Publications

A. Books:

Winters-Hilt S. Machine Learning based computational science. Draft in preparation for submission to John Wiley & Sons.

B. Refereed/Invited Publications:

a. Book chapters

Winters-Hilt S. Nanopore Cheminformatics based Studies of Individual Molecular Interactions. Ch. 13 in Yanqing Zhang and Jagath C. Rajapakse, editors, Machine Learning in Bioinformatics, John Wiley & Sons, 2007.

b. Journal articles

Publications in Biophysics/Cheminformatics:

1. Churbanov A and Winters-Hilt S. Clustering ionic flow blockade toggles with a Mixture of HMMs. BMC Bioinf. 9 Suppl. 9, S13 (2008).

2. Winters-Hilt S. Nanopore Cheminformatics based Studies of Individual Molecular Interactions. Ch. 13 in Yanqing Zhang and Jagath C. Rajapakse, editors, Machine Learning in Bioinformatics, John Wiley & Sons, 2007.

3. Winters-Hilt S. The alpha-Hemolysin Nanopore Transduction Detector -- single-molecule binding studies and immunological screening of antibodies and aptamers. BMC Bioinf. 8 Suppl. 7, S12 (2007). [16 pages]

4. Thomson K, Amin I, Morales E, and Winters-Hilt S. Preliminary Nanopore Cheminformatics Analysis of Aptamer-Target Binding Strength. BMC Bioinf. 8 Suppl. 7, S14 (2007). [15 pages]

5. Winters-Hilt S., Davis, A, Amin, I, and Morales E. The Nanopore Cheminformatics of Individual Transcription Factor Binding Site Interactions. BMC Bioinf. 8 Suppl. 7, S10 (2007). [12 pages]

6. Winters-Hilt S, Morales E, Amin, I., and Stoyanov, A. Nanopore Cheminformatics Analysis of Single Antibody-Channel Interactions and Antibody-Antigen Binding. BMC Bioinf. 8 Suppl. 7, S20 (2007). [17 pages]

7. Winters-Hilt, S., Landry M, Akeson M, Tanase M, Amin I, Coombs A, Morales E, Millet J, Baribault C, and Sendamangalam S. Cheminformatics Methods for Novel Nanopore analysis of HIV DNA termini. BMC Bioinformatics 2006, Sept. 26, 7 Suppl 2: S22. [18 pages]

8. Winters-Hilt, S: Nanopore Detector based analysis of single-molecule conformational kinetics and binding interactions. BMC Bioinformatics 2006, Sept. 26, 7 Suppl 2: S21. [27 pages]

9. Deamer, David W. and S. Winters-Hilt, “Nanopore analysis of DNA.” Encyclopedia of Nanoscience and Nanotechnology, Ed. H. S. Nalwa. 2005. Vol. 7, pgs 229-235.

10. Winters-Hilt, S. and M. Akeson, "Nanopore cheminformatics," *DNA and Cell Biology, Vol. 23 (10), Oct. 2004*.

11. S. Winters-Hilt, W. Vercoutere, V. S. DeGuzman, D. Deamer, M. Akeson, and D. Haussler, "Highly Accurate Classification of Watson-Crick Base-Pairs on Termini of Single DNA Molecules," *Biophys. J.* Vol. 84, pg 967, 2003.

12. W. Vercoutere, S. Winters-Hilt, V. S. DeGuzman, D. Deamer, S. Ridino, J. T. Rogers, H. E. Olsen, A. Marziali, and M. Akeson, "Discrimination Among Individual Watson-Crick Base-Pairs at the Termini of Single DNA Hairpin Molecules," *Nucl. Acids Res. Vol.31, 1311-1318*, 2003.

13. W. Vercoutere, S. Winters-Hilt, H. Olsen, D. Deamer, D. Haussler, and M. Akeson, "Rapid Discrimination Among Individual DNA Molecules at Single Nucleotide Resolution Using an Ion Channel," *Nature Biotechnology*, Vol. 19, pg 248, 2001.

Publications in Machine Learning:

14. Alexander Churbanov, Stephen Winters-Hilt, Eugene V Koonin and Igor B Rogozin. Accumulation of GC donor splice signals in mammals. Biology Direct 2008, 3:30.

15. Churbanov, Alexander and S. Winters-Hilt. Implementing EM and Viterbi algorithms for Hidden Markov Model in linear memory. BMC Bioinformatics 2008, 9:228.

16. Roux B and Winters-Hilt S. Hybrid SVM/MM Structural Sensors for Stochastic Sequential Data. BMC Bioinf. 9 Suppl. 9, S12 (2008).

17. Winters-Hilt S and Merat S. SVM Clustering. BMC Bioinf. 8 Suppl. 7, S18 (2007). [12 pages]

18. Churbanov A, Baribault C, Winters-Hilt S. Duration learning for nanopore ionic flow blockade analysis. BMC Bioinf. 8 Suppl. 7, S14 (2007). [15 pages]

19. Landry M, Winters-Hilt S. Analysis of nanopore detector measurements using machine learning methods, with application to single-molecule kinetic analysis. BMC Bioinf. 8 Suppl. 7, S12 (2007). [16 pages]

20. Winters-Hilt, S and C Baribault. A novel, fast, HMM-with-Duration implementation – for application with a new, pattern recognition informed, nanopore detector. BMC Bioinf. 8 Suppl. 7, S19 (2007). [17 pages]

21. Winters-Hilt S, Yelundur A, McChesney C, Landry M: Support Vector Machine Implementations for Classification & Clustering. BMC Bioinformatics 2006, Sept. 26, 7 Suppl 2: S4. [18 pages]

22. Iqbal R, Landry M, Winters-Hilt S: DNA Molecule Classification Using Feature Primitives. BMC Bioinformatics 2006, Sept. 26, 7 Suppl 2: S15. [8 pages]

23. Winters-Hilt S: Hidden Markov Model Variants and their Application. BMC Bioinformatics 2006, 7 Suppl 2: S14.

24. Winters-Hilt, S., "Single-molecule Biochemical Analysis Using Channel Current Cheminformatics," *Fourth International Conference on Unsolved Problems of Noise and Fluctuations, June 6–10, 2005*. [6 pages]

25. Winters-Hilt, S., "Nanopore detection using channel current cheminformatics," *SPIE Second International Symposium on Fluctuations and Noise,* 25-28 May, 2004. [13 pages]

26. Winters-Hilt S, "Highly Accurate Real-Time Classification of Channel-Captured DNA Termini," *Third International Conference on Unsolved Problems of Noise and Fluctuations,* 2003. [14 pages]

<u>*Publications in Theoretical Physics:*</u>

27. Winters-Hilt S, I. H. Redmount, and L. Parker, "Physical distinction among alternative vacuum states in flat spacetime geometries," *Phys. Rev. D* 60, 124017 (1999). [7 pages]

28. Friedman J. L., J. Louko, and S. Winters-Hilt, "Reduced Phase space formalism for spherically symmetric geometry with a massive dust shell," *Phys. Rev. D* 56, 7674-7691 (1997). [18 pages]

29. Louko J, J. Z. Simon, and S. Winters-Hilt, "Hamiltonian thermodynamics of a Lovelock black hole," *Phys. Rev. D* 55, 3525-3535 (1997). [11 pages]

30. Louko J and S. Winters-Hilt, "Hamiltonian thermodynamics of the Reissner-Nordstrom-anti de Sitter black hole," *Phys. Rev. D* 54, 2647-2663 (1996). [27 pages]

c. Refereed monographs

N/A

d. Refereed proceedings

N/A

C. Other Publications:

a. Non-refereed academic journal articles:
N/A

b. Others (working papers):

Submissions made in August 2008 (these 6 recent journal submissions are also listed in submitted manuscripts section):

1. Winters-Hilt, S. Nanopore transduction analysis of biotin-streptavidin binding. Submitted to BMC Biotechnology, Aug. 2008.

2. Stoyanov A and Winters–Hilt S. Non-covalent interactions studied using Nanopore and Electrophoretic Techniques. Submitted to BMC Biotechnology, Aug. 2008.

3. Eren AM, Amin I, Alba A, Morales E, Stoyanov A, and Winters-Hilt S. Pattern Recognition Informed Feedback for Nanopore Detector Cheminformatics. Submitted to BMC Biotechnology, Aug. 2008.

4. Winters-Hilt S and Armond Jr. K. Distributed SVM Learning and Support Vector Reduction. Submitted to BMC Bioinformatics, Aug. 2008.

5. Winters-Hilt S and Merat S. Unsupervised clustering using supervised support vector machines. Submitted to BMC Bioinformatics, Aug. 2008.

6. Winters-Hilt S and Jiang Z. An implementation for HMM-with-Duration. Submitted to BMC Bioinformatics, Aug. 2008.

Submissions planned for Fall/Winter 2008:

Biophysics

7. Morales E and S Winters–Hilt. "Nanopore Cheminformatics Analysis of Single Antibody-Channel Interactions and Antibody-Antigen Binding". Paper in preparation for submission to BMC Biology.

8. Amin I and S Winters–Hilt. "Analysis of HIV integrase binding to viral DNA using Nanopore-based Channel Current". Paper in preparation for submission to BMC Biology.

9. Alba A and S Winters–Hilt. "Nanopore cheminformatics analysis of DNA aptamer interactions". Paper in preparation for submission to BMC Biology.

10. Winters-Hilt, S. Nanopore transduction analysis of biotin-streptavidin bound complexes. Work in progress.

11. Winters-Hilt S. "Biotin binding with monoclonal antibody studied using a nanopore transduction detector". Work in progress.

12. Winters-Hilt S and A Stoyanov. "Chemical Equilibria in multi-component systems studied using a nanopore detector". Work in progress.

Machine Learning and Bioinformatics

13. Murat A, I Amin, and S Winters-Hilt. "The CCC, SVM, and GeneTools Web Interfaces". Paper in preparation for submission to BMC Bioinf.

14. Baribault C and S Winters-Hilt. "Meta-state generalized HMMs for eukaryotic gene structure identification". Paper in preparation for submission to BMC Bioinf.

15. Winters-Hilt S and A. Lu. "Boot-strap prokaryotic gene structure identification". Paper in preparation for submission to BMC Bioinf.

16. Winters-Hilt S and H. Zhang. "Mercer satisfiability of the Occam's Razor kernels". Work in progress.

17. Winters-Hilt S and Z. Jiang. Alternative-Splice Gene Prediction by use of Generalized Hidden Markov Models and Support Vector Machines. Work in progress.

18. Roux B and S Winters-Hilt. SVM Kernel selection and tuning using genetic algorithms. Work in progress.

19. Winters-Hilt S and J. Morrison. MM methods for feature extraction, motif discovery, and structure identification in computational genomics. Work in progress.

2. *Items Accepted for Publication but Not Yet Published:*
N/A

3. *Artistic or Other Creative Contributions:*

A. Software Development and Implementation:

1. Structure identification in stochastic sequential data using hidden Markov models – bioinformatics applications include gene prediction in DNA and pattern recognition in power signals.

2. Noise tolerant pattern recognition using support vector machines implemented with novel kernels and algorithmic implementations (including distributed implementations).

3. Development of software suites for general signal analysis with HMMs and SVMs (with web interfaces), and development of specialized software suite for channel current cheminformatics, with applications of HMMs and SVMs and numerous other Machine Learning tools. The web interfaces for the CCC software suite include sample data from experiment that the user can upload and analyze to test the software or to calibrate.

B. Patents:

1. Winters-Hilt, S., NTD-based methods for: (I) electrophoresis-separation based on nanopore acquisition rate and nanopore-based classification; (II) multi-channel sensitivity gain and affinity gain, and related architectural refinements; and (III) multicomponent and nanomanipulation refinements. Provisional PATENT, UNO filing, August 2008.

2. Stoyanov A and Winters-Hilt S. Method of electrophoresis for biopolymer separation in gel media with immobilized charges according to molecular size or asymptotic

electrophoretic mobility and its multi-dimensional applications. Provisional PATENT, UNO filing, August 2008.

3. Winters-Hilt, S., Pattern Recognition Informed (PRI) Nanopore Detection for Sample Boosting, Nanomanipulation, and Device Stabilization; and PRI Device Stabilization Methods in General. Provisional PATENT, UNO filing, August 2008.

4. Winters-Hilt S and Zhang J. An efficient implementation for HMM with duration. Provisional PATENT, UNO filing, August 2008.

5. Winters-Hilt, S., Channel current cheminformatics and bioengineering methods for immunological screening, single-molecule analysis, and single molecular-interaction analysis. PATENT, UNO filing, 2005.

6. Winters-Hilt, S., and Pincus, S. Nanopore-based biosensing. Provisional PATENT, UNO filing, 2004.

7. Winters-Hilt, S., and Pincus, S. Nanopore-based antibody characterization and antibody-antigen efficacy screening. Provisional PATENT, UNO filing, 2004.

8. Winters-Hilt, S. Channel current cheminformatics based immunological screening of pore inhibiting agents. Provisional PATENT, UNO filing, 2004.

9. Winters-Hilt, S. Channel current cheminformatics based assayer of cytosolic antigen delivery. Provisional PATENT, UNO, 2004.

10. Akeson, M. and Winters-Hilt, S. Methods and devices for manipulating single biomolecules. PATENT, UCSC, 2003.

11. Akeson, M., Winters-Hilt, S., Vercoutere, W., Deamer, D., and Haussler, D. Methods and devices for characterizing duplex DNA molecules. PATENT, UCSC filing, 2000.

4. Participation at Professional Meetings:

1. Winters-Hilt S. "The alpha-Hemolysin Nanopore Transduction Detector - single-molecule binding studies". International Conference on Biosensing with Channels, Vannes, France, Aug. 26-30, 2007 [INVITED SPEAKER].

2. Stoyanov A, E Morales, I Amin, A Alba, and S Winters–Hilt. "Individual Protein-protein And Protein-DNA Channel Current Blockades Are Studied In The Presence Of Chaotropic Agents And High Salt Concentration". Biophysical Society Annual Meeting, Long Beach, Feb 2-5, 2008.

3. Alba A and S Winters–Hilt. "Nanopore cheminformatics analysis of DNA aptamer interactions". Biophysical Society Annual Meeting, Long Beach, Feb 2-5, 2008.

4. Morales E and S Winters–Hilt. "Nanopore Cheminformatics Analysis of Single Antibody-Channel Interactions and Antibody-Antigen Binding". Biophysical Society Annual Meeting, Long Beach, Feb 2-5, 2008.

5. Amin I and S Winters–Hilt. "Analysis of HIV integrase binding to viral DNA using Nanopore-based Channel Current". Biophysical Society Annual Meeting, Long Beach, Feb 2-5, 2008.

6. Eren A and S Winters–Hilt. "Pattern Recognition Informed Feedback for Channel Current Cheminformatics". Biophysical Society Annual Meeting, Long Beach, Feb 2-5, 2008.

7. Baribault C and S Winters-Hilt. "Meta-state generalized HMMs for eukaryotic gene structure identification". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

8. Roux B, S Merat, and S Winters-Hilt. "Hybrid SVM/HMM structural sensors for stochastic sequential data". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

9. Lu A and S Winters-Hilt. "Boot-strap prokaryotic gene structure identification". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

10. Jiang Z and S Winters-Hilt. "HMM-with-Duration Implementations". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

11. Tchourbanov A, Jiang Z, and S Winters-Hilt. "Mixture HMM Modeling". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

12. Armond K and S Winters-Hilt. "Distributed SVM Learning". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

13. Merat S and S Winters-Hilt. "Mercer satisfiability of the Occam's Razor kernels". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

14. Merat S and S Winters-Hilt. "SVM clustering in Decision Space". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

15. Murat A, I Amin, and S Winters-Hilt. "The CCC, SVM, and GeneTools Web Interfaces". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

16. Murat A, I Amin, and S Winters-Hilt. "Pattern recognition-informed sampling for channel current data acquisition". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008.

17. Winters-Hilt S. "Single-molecule event transduction via nanopore cheminformatics analysis". MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Oklahoma City, OK, Feb. 23-24, 2008 [INVITED SPEAKER].

18. Stoyanov A and S Winters-Hilt. "Method of electrophoresis for protein separation according to molecular weight in absence of ionic detergent". 32nd International Symposium on High Performance Liquid Phase Separations and Related Techniques. Baltimore, MD. May 10 - 16, 2008.

19. Stephen Winters-Hilt, "Nanopore Detector based Single-Molecule Binding Studies", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007. [Keynote Speaker]

20. Alexander Tchourbanov and Stephen Winters-Hilt, "Using HMM-with-Duration to predict genes better", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

21. Alexander Stoyanov, Eric Morales, Iftekhar Amin, and Stephen Winters–Hilt, "Antibody-antigen binding in presence of chaotropic agents and in high salt conditions: a nanopore detector study", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

22. Eric Morales, I. Amin, K. Tellio, and S. Winters-Hilt, "Nanopore Cheminformatics Analysis of Single Antibody-Channel Interactions and Antibody-Antigen Binding", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

23. Iftekhar Amin, Karen Thomson, Eric Morales, Stephen Winters–Hilt, "Nanopore Cheminformatics: Analysis of Aptamer-Target Binding Strength", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

24. Matthew Landry and Stephen Winters-Hilt, "Novel HMM Feature Generation and Adaboost Feature Selection for Nanopore Cheminformatics", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

25. Zuliang Jiang and Stephen Winters-Hilt, "Distributed HMM Processing", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

26. Amin, I., Landry, M., S. Winters-Hilt, "Characterization of the Binding and Conformational Kinetics of DNA-hairpin Termini Captured in a Nanopore Detector ", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

27. Matthew Landry and Stephen Winters-Hilt, "HMM-Based Kinetic Feature Extraction from Channel Current Measurements", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

28. Carl Baribault, Eddie Branch, Eric Morales, and Stephen Winters-Hilt, "Real-time sampling control of a nanopore detector with HMM/SVM Pattern Recognition", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

29. Sam Merat and Stephen Winters-Hilt, "SVM-based clustering, hybrids, and resolution beyond the Parametric Limit", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

30. Amanda Davis , Iftekar Amin, Eric Morales, Karen Thomson, Alex Stoyanov, Stephen Winters-Hilt, "The Nanopore Cheminformatics of Individual TF/TFBS Interactions", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

31. A. Murat Eren and Stephen Winters-Hilt, "Web Interface to HMM-based Channel Current Cheminformatics Tools and SVM-based Classification and Clustering Tools", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

32. Stephen Winters-Hilt and Carl Baribault, "A Novel, Fast, HMM-with-Duration Implementation, with Application to Pattern Recognition Informed Sampling Control of a Nanopore Detector", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), University of New Orleans, Feb. 1-3, 2007.

33. Winters-Hilt, S., "Nanopore Detector based single-molecule binding studies", International Conference on Nanopore Biosensing, Liege, Belgium, Sept.7-9, 2006.

34. Winters-Hilt, S., "Single-Molecule Biochemical Analysis Using A Nanopore Detector", Biosensing with Channels, smaller, faster, smarter, International University Bremen, July 28 – Aug. 4. [Invited Speaker]

35. Winters-Hilt, S., "Single-molecule biochemical analysis using channel current cheminformatics", UPoN 2005: Fourth International Conference on Unsolved Problems of Noise and Fluctuations in Physics, Biology, and High Technology, Gallipoli, Lecce, Italy June 6-10 , 2005. [Invited Speaker]

36. Winters-Hilt, S., "Nanopore-based detection for kinetic analysis of individual biomolecular interaction histories in solution," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006. [Invited Speaker]

37. Winters-Hilt, S., "Novel HMM and SVM generalizations for analysis of single-channel current blockade data," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006. [Invited Speaker]

38. Sendamangalam, S., C. Baribault, and S. Winters-Hilt, "Nanopore Detector Feedback Control using Cheminformatics Methods Integrated with LabView/LabWindows Tools," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

39. Winters-Hilt, S., E. Morales, I. Amin, and A. Ortiz, "Nanopore Cheminformatics Analysis of Single Antibody Motions, Antibody-Effector Binding, and Antibody-Antigen Binding," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

40. Winters-Hilt, S., E. Morales, I. Amin, T. Banh, and A. Ortiz, "Nanopore Cheminformatics Analysis of DNA-Aptamer/Target Binding Efficacy," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

41. Winters-Hilt, S., M. Tanase, T. Banh, and E. Morales, "The Nanopore Cheminformatics of Individual Transcription-Factor/Transcription-Factor-Binding-Site Interactions," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

42. Tanase, M., S. Sendamangalam, S. Winters-Hilt, and M. Akeson, "Nanopore Cheminformatics Analysis of the "sticky" DNA-intercalating behavior of HIV DNA termini," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

43. McChesney, C., S. Sendamangalam, and S. Winters-Hilt, "SVM-based Clustering", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

44. Baribault, C., C. McChesney, and S. Winters-Hilt, "Web Interface to Channel Current Cheminformatics Software", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

45. Millet, J. and S. Winters-Hilt, "Overview of Channel Current Cheminformatics Architecture", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

46. A. Yelundur, M. Landry, and S. Winters-Hilt, "Multiclass SVMs: External vs. Internal", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

47. Winters-Hilt, S., A. Yelundur, and J. Millet, "Novel HMM-with-Duration and Generalized HMM Implementations", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

48. Prabhakaran, A., S. Sendamangalam, M. Landry, and S. Winters-Hilt, "Channel Current based Kinetic Feature Extraction", MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Baton Rouge, Mar. 1-4, 2006.

49. Winters-Hilt, S., "Single-molecule Biochemical Analysis Using Channel Current Cheminformatics," *Fourth International Conference on Unsolved Problems of Noise and Fluctuations*, June 6–10, 2005

50. Winters-Hilt, S., "Machine-based Learning: Nanopore Characterization of Antibody-Antigen Binding," *American Society of Hypertension, Sixth Annual Winter/Laragh Conference*, Jan. 13-15, 2005

51. Winters-Hilt, S., "Immunoinformatics, Cheminformatics, Bioinformatics – new opportunities using Nanopore Detection with Machine Learning Signal Analysis," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Little Rock, Nov. 13-15, 2004.

52. Romero, P. and Winters-Hilt, S., "Nanopore Detector Variants and Modulations for Biosensing & Biomedical Informatics," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Little Rock, Nov. 13-15, 2004.

53. Winters-Hilt, S. and Du, L., "Bootstrap Prokaryotic Gene Prediction using smORF, gIMM, and HMMs/SVMs," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Little Rock, Nov. 13-15, 2004.

54. Winters-Hilt, S., and Prabhakaran, A., "Channel Current Kinetic Analysis using FSAs and HMMs," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Little Rock, Nov. 13-15, 2004.

55. Winters-Hilt, S. and Landry, M., "Divergence- vs. Distance-regularized SVM Kernels in multiclass Channel Current Cheminformatics Applications," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Little Rock, Nov. 13-15, 2004.

56. Amin, I. and Winters-Hilt, S., "The unoSVM Web interface and the unoCCC Web-tools interface," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Little Rock, Nov. 13-15, 2004.

57. Sendamangalam, S., Amin, I. and Winters-Hilt, S., "Single molecule manipulation and nano-manufacturing using the alpha-Hemolysin Nanopore Detector," MidSouth Computational Biology and Bioinformatics Society (MCBIOS), Little Rock, Nov. 13-15, 2004.

58. Winters-Hilt, S., "Nanopore detection using channel current cheminformatics," *Fluctuations and Noise in Biological, Biophysical, and Biomedical Systems, Masopalomas, Spain*, May, 2004.

59. Winters-Hilt, S., "Forcing DNA through nanostructures," *Oklahoma NSF EPSCoR Annual State Conference*, May, 2004. [KEYNOTE SPEAKER]

60. Winters-Hilt, S., Veronica S. DeGuzman, and Mark Akeson, "Nanopore Cheminformatics: A new method for single molecule biophysics", *Biophysical Society, Annual Meeting in Baltimore, MD*, Feb., 2004.

61. Winters-Hilt, S., Andrew Duda, Clarence C. Lee, and Mark Akeson, "Nanopore Cheminformatics based on channel current blockades: Machine learning methods for classification and analysis of single-molecule blockade events", *Biophysical Society, Annual Meeting in Baltimore, MD*, Feb., 2004.

62. Lee, C. C., Wenonah A. Vercoutere, Veronica S. DeGuzman, Wesley Shugrue, Stephen Winters-Hilt, David W. Deamer, and Mark Akeson, "A Model for Sequence-Dependent Gating of an Ion Channel by DNA Hairpins", *Biophysical Society, Annual Meeting in Baltimore, MD*, Feb., 2004.

63. Solbrig, A., Veronica S. DeGuzman, Stephen Winters-Hilt, Wesley Shugrue, David W. Deamer, and Mark Akeson, "DNA Processing by Lambda-Exonuclease Observed in Real Time Using a Single-Ion Channel", *Biophysical Society, Annual Meeting in Baltimore, MD*, Feb., 2004.

64. Solbrig, A., Veronica S. DeGuzman, Stephen Winters-Hilt, David W. Deamer, David Haussler , and Mark Akeson, "Use of a Single Ion Channel to Analyze the Structure and Dynamics of Individual DNA Molecules", *Biophysical Society, Annual Meeting in Baltimore, MD*, Feb., 2004.

65. Andrews, J. C., and Stephen Winters-Hilt, "Utilization of cell profiling to evaluate bovine spermatozoa in normal and simulated microgravity", *Annual Thereogenology Conference*, Jan., 2004.

66. Andrews, J. C., and Stephen Winters-Hilt, "Real time cell profiling to evaluate membranes of living cells in simulated microgravity", *NASA Cell Science Conference*, Feb., 2004.

67. Winters-Hilt, S., “Nanopore Cheminformatics,” MCBIOS, Little Rock, AR, Nov., 2003.

68. Winters-Hilt, S., "Highly Accurate Real-time Classification of Watson-Crick Termini on Single DNA Molecules," Unsolved Problems of Noise 2002, NIH, Bethesda MD, Sept., 2002

69. Winters-Hilt, S., "Classification of Watson-Crick Termini on Single DNA Molecules," Biophysical Society, annual meeting in San Francisco, CA, Feb., 2002.

70. Winters-Hilt, S., "Rapid Discrimination Among Individual DNA Molecules at Single Nucleotide Resolution," Nanopore Conference, NIH, Bethesda MD, Apr., 2001.

71. Winters-Hilt, S., "Channel Current Analysis using Generative Feature Extraction and Support Vector Machine Discrimination enables Single Nucleotide Resolution in an Alpha-Hemolysin Nanopore Detector," Biophysical Society, annual meeting in Boston, MA, Jan., 2001.

72. Winters-Hilt, S., "Massive dust shell collapse,"Midwest Relativity Conference, UWM (organizer), Jan. 1996.

73. Winters-Hilt, S., "Alternative vacuum states in flat spacetime geometries," Midwest Relativity Conference, Univ. Chicago, Mar. 1994.

5. Other Scholarly or Creative Activities

A. Service (Journal Article Reviewer)

Journal of Molecular Biology

Bioinformatics

IEEE Transactions on Systems, Man and Cybernetics, Part B: Cybernetics

Physical Review D

(and many others)

B. Service (Officer/Organizer)

Chair of Planning Committee for MCBIOS 2007 (New Orleans)

Co-Chair of Planning Committee for MCBIOS 2006 (Baton Rouge)

President MCBIOS Bioinformatics Society, 2006 – 2007

Re-elected Board Member for the MCBIOS Bioinformatics Society, 2003 –2008

Conference Organizer for the Midwest Relativity Conference, UWM, 1996.

C. General editorship

Co-editor of BMC Bioinformatics MCBIOS Proceedings, Co-author of Proceedings synopsis paper: BMC Bioinformatics 2006, 7 Suppl 2: S1.

Co-editor of BMC Bioinformatics MCBIOS Proceedings, Co-author of Proceedings synopsis paper: BMC Bioinformatics 2007, 8 Suppl 7: S1.

Co-editor of BMC Bioinformatics MCBIOS Proceedings, Co-author of Proceedings synopsis paper: BMC Bioinformatics 2008, 9 Suppl 9: S1.

D. Professional society membership

American Physical Society

Biophysical Society

IEEE Computer Society

Mid-South Computational Biology and Bioinformatics Society (MCBIOS)

International Society of Computational Biologists (ISCB)

6. Awards, Lectureships, or Prizes
N/A

7. Grants and Contracts

A. Grants and contracts received

a. Principal Investigator

Agency/Grant No.: NIH K-22 (PI)
Title: *Nanopore study of single antibody-antigen interactions*
Amount: $486,000 (Direct Costs)
Period: 09/01/05-08/31/09
Effort: 75% academic
Location: UNO

Agency/Grant No.: LEQSF (2006-07)-ENH-TR-88
Title: *An Interdisciplinary Center for Bioinformatics*
Amount: $364,398 (Direct Costs: 229,000 Support Fund; 135,398 Match from RIC)
Period: 06/01/07-05/31/08
Location: UNO

Agency/Grant No.: LaSPACE REA (PI)
Title: *Single Molecule Cheminformatics Analysis using a Nanopore Detector*
Amount: $22,500 (Direct Costs)
Period: 04/01/06-03/31/08 (1yr no-cost extension)
Effort: 5% academic
Location: UNO

Agency/Grant No.: LEQSF (2004-07)-RD-A-39 (PI)
Title: *Knowledge Discovery and Pattern Recognition in Bioinformatics and Cheminformatics using Machine Learning Methods*
Amount: $109,827
Period: 06/01/04-05/31/08
Effort: 10% academic
Location: UNO

Agency/Grant No.: NSF(2005)-LSII-Planning-22 (PI)
Title: *A UNO-LSUHSC Bioinformatics Initiative*
Amount: $20,000
Period: 06/01/05-05/31/07
Effort: 5% academic
Location: UNO

Agency/Grant No.: LEQSF (2005-06)-ENH-TR-104 (PI)
Title: *A Biophysics/Cheminformatics Laboratory*
Amount: $100,000

Period: 06/01/05-05/31/07
Effort: 5% academic
Location: UNO

Agency/Grant No.: LEQSF (2004-05)-ENH-TR-108 (PI)
Title: *An Informatics Laboratory*
Amount: $71,585
Period: 06/01/04-05/31/06
Effort: 5% academic
Location: UNO

Agency/Grant No.: LEQSF (2004-05)-LaSPACE (PI)
Title: *Nanopore-based Cheminformatics Analysis of Biomolecules, Membranes, and Protein Channels*
Amount: $26,216
Period: 3/15/04-3/15/06
Effort: 20% academic
Location: UNO

b. Not principal investigator

Agency/Grant No.: LEQSF (2007-08)-ENH-TR- (co-PI)
Title: Developing a Multidisciplinary Program in Molecular Simulation, Visualization, and Engineering
Amount: $287,652 (Direct Costs: 177,000 Support Fund; 110,652 Match from RIC)
Period: 06/01/08-05/31/09

Agency/Grant No.: NSF MRI Proposal (co-PI)
Title: *MRI: Development of PetaShare: A Distributed Data Archival, Analysis and Visualization System for Data Intensive Collaborative Research*
Amount: $96,144 (Portions of Direct Costs to co-PI for 40TB disk)
Period: 08/15/06-08/14/10
Location: Louisiana Tech University (PI is Tevfik Kosar, full award: $957,678)

Agency/Grant No.: NSF CRI Proposal (co-PI)
Title: *CRI: Planning for Heterogeneous Data Repository for Computing Research*
Amount: $100,000 (Portions of Direct Costs to co-PI)
Period: 06/01/06-05/31/09
Location: Louisiana Tech University (PI is Sumeet Dua)

Agency/Grant No.: LONI PKSFI (co-PI)
Amount: $7,000,000 (with 1-1 Match)
Period: 06/01/07-05/31/12
Location: LSU (PI is Ed Seidel)

Agency/Grant No.: NIH NNBM (co-PI)
Title: *A Comprehensive Structural and Dynamic Map of DNA Duplex Ends*
Amount: $170,066 (subcontract)
Period: 01/01/06-06/30/08
Effort: 5% academic
Location: UNO

Agency/Grant No.: NIH (co-PI)
Title: Sequencing DNA with a Nanopore Detector
Amount: $187,788
Period: 06/01/06-05/31/08
Effort: 5% academic
Location: UNO

B. Grants and contracts applied for

a. Principal Investigator

Agency/Grant No.: NIH DP2 (Young Innovator Award) (Winters-Hilt PI)
Title: *Single-molecule binding kinetics via nanopore event-transduction & cheminformatics*
Amount: $1,375,000 (Direct Costs)
Period: 09/30/2008 – 08/31/2013
Status: **pending**

Agency/Grant No.: NIH R-01 (Winters-Hilt PI)
Title: *Single molecule biosensing and binding characterization using a nanopore detector*
Amount: $1,250,000 (Direct Costs)
Period: 09/01/2008 – 08/31/2013
Status: not awarded

Agency/Grant No.: NIH R-01 (Winters-Hilt PI)
Title: *Machine Learning tools for classification, clustering, and stochastic sequential analysis*
Amount: $1,250,000 (Direct Costs)
Period: 07/01/2008 – 06/30/2013
Status: not awarded

Agency/Grant No.: La BOR Enhancement
Title: *A Distributed-Processing Enhanced Machine Learning Lab*
Amount: $106,840
Period: 06/01/06-05/31/07
Effort: 5% academic
Location: UNO
Status: Not Awarded

Agency/Grant No.: La BOR Enhancement
Title: *A Nanopore Detector Lab for Transcription Factor Biochemistry/Drug Discovery Research & Education*
Amount: $194,772
Period: 06/01/06-05/31/07
Effort: 5% academic
Location: UNO
Status: Not Awarded

Agency/Grant No.: NSF EPSCoR
Title: *A UNO/LSUHSC/Xavier Research & Education Program in Bioinformatics*
Amount: $1,750,000
Period: 07/01/07-06/30/2010
Effort: 15% academic
Location: UNO
Status: Not Awarded

b. Not principal investigator
N/A

8. Thesis/Dissertation Committee Service

A. *Theses Completed as Advisor*

Anand Prabhakaran (UNO; MS in CS, Fall 2005)

Title: POWER SIGNAL ANALYSIS OF CHANNEL CURRENT SIGNAL USING HMM-EM AND TIME DOMAIN FSA

Alex Ortiz (Tulane; MS in Biomedical Engineering, Spring 2006)

Title: DNA Binding Characterization of Pseudo Aptamers using Nanopore Technology

Raja Iqbal (Tulane; PhD in Computer Science, Spring 2006)

Title: Robust Learning Algorithms: Applications in Data Mining, Computer Vision and Bioinformatics

Srikanth Sendamangalam (UNO; MS in CS, Summer 2006)

Title: Nanopore Detector Feedback Control Using Cheminformatics Methods Integrated with LabView/LabWindows Tools

Charlie McChesney (UNO; MS in CS, Summer 2006)

Title: SVM-based Clustering

Matthew Landry (UNO; MS in CS, Spring 2007)

Title: Analysis of Nanopre Detector Measurements using Machine Learning Methods, with application to single-molecule kinetics

Molly Oehmichem (Tulane; BS in Biomedical Engineering, Spring 2008)

Title: DISTINCTION OF SINGLE NUCLEOTIDES FOR THE PURPOSE OF DNA SEQUENCING USING A NANOPORE-BASED DETECTOR

Kenneth Armond Jr. (UNO; MS in CS, Summer 2008)

Title: Distributed Support Vector Machine Learning

Sepehr "Sam" Merat (UNO; MS in CS, Summer 2008)

Title: CLUSTERING VIA SUPERVISED SUPPORT VECTOR MACHINES

Carl Baribault (UNO; PhD General Exam in CS, Summer 2008)

Title: Meta-state generalized HMMs for eukaryotic gene structure identification

B. *Theses under direction as Advisor*

Alex Lu (MS in CS)

Ken Armond (MS in CS)

Hang Zhang (MS in CS)

Sepehr Merat (MS in CS)

Carl Baribault (PhD in CS)

Zuliang Jiang (PhD in CS)

A. Murat Eren (PhD in CS)

C. *Thesis committee membership (for students not under my direction)*

Zhiyu Zhao (UNO; PhD in CS, Summer 2008)

Title: Algorithms for Comparing Protein Structure and Genome Similarities

Zhiyu Zhao (UNO; MS in CS, Fall 2006)

Title: Clustering of Leukemia Patients via Gene Expression Data Analysis

Kenneth Healy (U. College Cork, Ireland, PhD Thesis External Examiner, Sept. 2006)
Title: Nanopore-Based DNA Analysis

Lizhe Xu (UNO; MS in CS, Spring 2004)
Title: Microarray Data Analysis and Mining

9. Major Areas of Creative or Research Interest

Bioinformatics --- gene structure identification, genomics in general, and expression analysis

Cheminformatics --- molecular (DNA) classification using channel current pattern recognition

Machine Learning --- scalable multiclass discrimination and efficient feature extraction

Biophysics --- nanopore-based detection and single-molecule measurement and manipulation

Stochastic Sequential Analysis --- stock market analysis and physics phenomenology

10. Other Professional Accomplishments

A. Manuscripts under submission

1. Winters-Hilt, S. Nanopore transduction analysis of biotin-streptavidin binding. Submitted to BMC Biotechnology, Aug. 2008.

2. Stoyanov A and Winters–Hilt S. Non-covalent interactions studied using Nanopore and Electrophoretic Techniques. Submitted to BMC Biotechnology, Aug. 2008.

3. Eren AM, Amin I, Alba A, Morales E, Stoyanov A, and Winters-Hilt S. Pattern Recognition Informed Feedback for Nanopore Detector Cheminformatics. Submitted to BMC Biotechnology, Aug. 2008.

4. Winters-Hilt S and Armond Jr. K. Distributed SVM Learning and Support Vector Reduction. Submitted to BMC Bioinformatics, Aug. 2008.

5. Winters-Hilt S and Merat S. Unsupervised clustering using supervised support vector machines. Submitted to BMC Bioinformatics, Aug. 2008.

6. Winters-Hilt S and Jiang Z. An implementation for HMM-with-Duration. Submitted to BMC Bioinformatics, Aug. 2008.

B. Course/Program design and development

The following undergraduate courses were approved by the University Curriculum Committee in 5/08 (along with the associated CS concentration in Bioinformatics). Each course has been taught in the form of a CSCI 4990 course by SWH in previous years.

(1) CSCI 4567 Bioinformatics I, (Grad/UG). A “hands-on” programming and project oriented introduction to the algorithms and theory used in bioinformatics and cheminformatics.

(2) CSCI 4569 Bioinformatics II, (Grad/UG). An interdisciplinary course on informatics methods and medical science applications. A programming-intensive course focusing on HMM-based project efforts in bioinformatics and cheminformatics.
(3) CSCI 4589 Machine-Learning Methods in Bioinformatics I, (Grad/UG). A programming-intensive course focusing on HMM-based project efforts in bioinformatics and cheminformatics.
(4) CSCI 4590 Machine-Learning Methods in Bioinformatics II, (Grad/UG). A programming-intensive course focusing on SVM-based machine learning methods and applications (particularly for classification in cheminformatics and bioinformatics).
(5) CSCI 4595 Topics in Bioinformatics, (Grad/UG). Last Topic: *Nanopore Detector Cheminformatics* A programming-intensive course focusing on Finite State Automaton (FSA) methods for signal acquisition, with application to channel current blockade acquisition and signal pre-processing.

The following undergraduate courses were approved at the Departmental level. University approval for addition to the curriculum is pending. Each course has been taught in the form of a CSCI 6990 course by SWH in previous years.

(6) CSCI 6589 Advanced Machine-Learning Methods in Bioinformatics I. An advanced graduate-level programming-intensive course focusing on HMM-based project efforts in bioinformatics and cheminformatics.
(7) CSCI 6590 Advanced Machine-Learning Methods in Bioinformatics II. An advanced graduate-level programming-intensive course focusing on SVM-based machine learning methods and applications
(8) CSCI 6595 Advanced Topics in Bioinformatics. Last Topic: *Nanopore Detector Study of Single-Molecule Interactions.* This course involves grad-level wet-lab and computer-lab coursework in nanopore detection based single molecule biophysics/biochemistry.

The CSCI 4595/6595 Topics courses have introduced interdisciplinary coursework and laboratory work, where the lab work can include biochemistry/biophysics lab work involved in nanopore detection and bioinformatics/cheminformatics research and data analysis. The following grants support/supported the development of the above courses:
(1) Agency/Grant No.: LEQSF (2007-08)-ENH-TR-
Title: Developing a Multidisciplinary Program in Molecular Simulation, Visualization, and Engineering
Amount: $287,652 (Direct Costs: 177,000 Support Fund; 110,652 Match from RIC)
Period: 06/01/08-05/31/09; Location: UNO; PI: C. Summa; Co-PI: S. Winters-Hilt
(2) Agency/Grant No.: LEQSF (2006-07)-ENH-TR-88
Title: *An Interdisciplinary Center for Bioinformatics*
Amount: $364,398 (Direct Costs: 229,000 Support Fund; 135,398 Match from RIC)
Period: 06/01/07-05/31/09; Location: UNO; PI: S. Winters-Hilt
(3) Agency/Grant No.: LEQSF (2005-06)-ENH-TR-104
Title: *A Biophysics/Cheminformatics Laboratory*
Amount: $100,000
Period: 06/01/05-05/31/07; Location: UNO; PI: S. Winters-Hilt
(4) Agency/Grant No.: LEQSF (2004-05)-ENH-TR-108
Title: *An Informatics Laboratory*
Amount: $71,585

Period: 06/01/04-05/31/06; Location: UNO; PI: S. Winters-Hilt

Other courses developed:

Partly Designed and Taught *System Programming Concepts* (UG), a core system programming course in C and PERL.

In Development: *Machine Learning implementations on Distributed Database/Processing platforms* (Grad/UG).

Designed course in "Introductory Physics" (taught at Univ. Wisc. – Milwaukee, Summer 1997)

C. Special recognition for teaching
N/A

D. Academic Service
N/A

E. Other service
N/A