

Stephen V. Providence

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Current Position

Tenured Assistant Professor, Mathematics & Computer Science Department, Coppin State University

Areas of specialization

Computer Science; super-fast and numerically stable classical computer algorithms, quantum computer algorithms & information science, parallel and distributed computing, heterogeneous computer architecture, computational chemistry & genomics, undergraduate & graduate research and education in computer science.

Selected Appointments Held

1986-1993	College Assistant - Academic Computer Center (ACC), Carman Hall, Lehman College, City University of New York (CUNY), Bronx, New York
1993-2000	College Coordinator - Graduate Assistant (A) ¹ , Research Foundation-CUNY, Lehman College, CUNY, Bronx, New York
2000-2006	Assistant Professor ² , Computer Science Department, College of Engineering, North Carolina Agricultural & Technical State University (NCA&TSU), Greensboro, North Carolina
2003	Visiting Faculty ³ , Electrical Engineering Computer Science (EECS) Department, Vanderbilt University, Nashville, Tennessee
2005	NSF Proposal Panelist/Reviewer - Computer Information Science and Engineering
2006-2014	Assistant Professor, Computer Science Department, School of Science, Hampton University (HU), Hampton, Virginia
2012	NSF Proposal Panelist/Reviewer - Computer Information Science and Engineering
2012, 2013	Visiting Scientist ^{4,5} , Broad Institute of Harvard University, Massachusetts Institute of Technology and Massachusetts General Hospital, Boston, Massachusetts
2014-2016	Senior Program Assessment Analyst ⁶ , City Hall, Finance Department, Baltimore, Maryland

¹ Founded / Directed - Science Learning Center (scholarships, faculty meetings, calculus I, II; chemistry, biology, physics, geology) ² assisted in establishment of Computational Science PhD Program ³ Dr. Gabor Karsai Group - Institute of Software Integrated Systems (ISIS), June-August, assisted in development of platform as a service (PaaS) computer architecture education system ⁴ Dr. Jill Mesirov Group - Computational Biology and Bio-informatics Organization, July-August, whole genome sequence (WGS) cancer research using MathWorks MatLab with Parallel Processing toolbox & R language ⁵ Dr. Gad Getz Group - Genome Sequence and Analysis Program, June-September, WGS research using C/C++, Python & R language to find signatures in human DNA ⁶ Former City Economist, Dr. William Voorhees Group - Bureau of the Budget & Management Research (BBMR), program assessments performed using C/C++ & R language workflows with R studio / server & Shiny notebooks for production environment

- 2016-current Assistant Professor⁷, Mathematics & Computer Science Department, School of Arts & Sciences, Coppin State University (CSU), Baltimore, Maryland
- 2019 Visiting Scientist⁸, Army Research Laboratory (ARL), Edgewood, Maryland
- 2021-2025 Visiting Faculty⁹, Department of Energy (DoE), Batavia, Illinois

Education

- 1986 BA, Computer Science, Lehman College, CUNY
- 1988 MS, Computer Science, Lehman College, CUNY
- 1998 PhM Computer Science, Graduate Center, CUNY
- 2000 PhD Computer Science, Graduate Center, CUNY

Selected Grants, Honors & Awards

- 1985-1988 Research Assistantship¹⁰, NIH National Institute of General Medical Sciences (NIGMS), Chemistry Department, Lehman College, CUNY
- 1988-1992 James Bruce Llewellyn Full Doctoral Fellowship, Graduate Center, CUNY
- 1989 Pittsburgh Supercomputing Workshop¹¹, Pittsburgh Supercomputing Center (PSC), Carnegie-Mellon University, NIH NIGMS Fellowship, November 1989
- 1993-2000 NYC Alliance Coordinator, NSF Louis Stokes Alliance for Minority Participation (LSAMP) Fellowship, Lehman College, CUNY
- 1997 NY State Arts Council, *Data Sonification for Live Musical Performance using Kyma*¹², S. Providence, S. Cowell¹³, R. Carter¹⁴, \$75,000
- 1998-1999 Evaluation Coordinator, NSF LSAMP Fellowship, City College of New York, CUNY
- 2001 San Diego Supercomputing Workshop (SDSC), San Diego, California, June, 2001
- 2002 Principle Investigator, North Carolina Supercomputing Center¹⁵ (NCSC), *Experiments for Rational Polynomial Interpolation Problems: Tangential Nevanlinna-Pick and Matrix Nebari*, Allocation: 200 hours - SGI Origin, 2000 hours - IBM SP, February 2002
- 2004 ACM/IEEE Supercomputing Conference 2004, Technical Program *20 years - Unleashing the Power of HPC*, Pittsburgh, Pennsylvania, November 6-12, 2004
- 2005 ACM/IEEE Supercomputing Conference 2005, Technical Program: *20 years - Unleashing the Power of HPC*, Seattle, Washington, November 12-18, 2005
- 2004-2006 Co-Principal Investigator, NSF: Bridge Gaps in IA Education via Collaboration, \$299,896
- 2005-2010 Co-Principal Investigator, NSF: Collaborative Project: Cyber Defender Scholarship, \$650,000
- 2007 University of Southern California (USC) Computational Science Workshop for Underrepresented Groups, Co-laboratory for Advanced Computing and Simulations, Viterbi School of Engineering, USC, Los Angeles, California, January 3-10, 2007
- 2008 ACM/IEEE Supercomputing Conference 2008, Technical Program: *20 years - Unleashing the Power of HPC*, Austin, Texas, November 15-21, 2008

⁷ super-fast $O(n \log^3 n)$ algorithms for computational mathematics & chemistry, computer science education

⁸ Dr. Kelly Basi Group - Combat Capabilities Development Command / Chemical & Biological Center, high-speed mega-base pair analyses using Oxford Nanopore Technologies' MinION ⁹ Dr. Gabriel Purdue Group - Superconducting Quantum Material Science (SQMS) center / Fermi National Accelerator Laboratory, Quantum computing, sensing and communication ¹⁰ development of novel molecular modeling software & creation / implementation of novel x,y-axis stepper-motor & z-axis servo-motor controlled device for automated serial acquisition, measurement and reporting of ion-selective data ¹¹ Thinking Machines Corp. SIMD CM-2, MIMD CM-5 using the C* Programming Language ¹² acquired Symbolic Sound Inc. Kyma / Cpybara 320 nine (9) Digital Signal Processing (DSP) system for live computer / electronic music performance with acoustic musical instruments: grand piano, saxophone, double bass, drum kit ¹³ Professor Emeritus of Music at Rutgers University, formerly Lehman College, CUNY ¹⁴ Professor Emeritus of Music at City College of New York, CUNY ¹⁵ recently defunded by the State

- 2008-2011 Principal Investigator / Researcher, NSF Major Research Instrumentation (MRI): Acquisition of High-Performance Computing Cluster for Research and Education in Computer Science, \$58,400
- 2009 National Center for Supercomputer Applications (NCSA) Parallel Programming Workshop, Kean University, New Jersey, July, 2009
- 2009 Intel Corporation Parallel Computing Workshop, Georgia Tech, Atlanta, Georgia, August, 2009
- 2009-2011 Principal Investigator, NSF Research Experiences for Undergraduates (REU): supplement (to MRI award), \$16,000
- 2010 ACM/IEEE Supercomputing Conference 2010: *The Future of Discovery*, NCSA/Shodor Foundation Student Parallel Programming Contest, HU Team Participants: D. Wiggins, J. Jones¹⁶, B. Blackmon, J. Smothers, G. Spiegniner, Advisor - Dr. Providence, New Orleans, Louisiana, November 13-19, 2010
- 2011 ACM/IEEE Supercomputing Conference 2011, Education Program: *Connecting Communities Through HPC*, Seattle, Washington, November 12-18, 2011
- 2013-2018 Co-Principal Investigator, NSF HBCU Research Infrastructure for Science and Engineering (RISE): Advanced Physical Modeling and Simulation for 21st Century Scientists, \$999,950
- 2017 Coppin State University Certificate of Award for presenting: *Machine Learning & Neural Networks Using Mathematica 11* at 13th Annual Dr. Habtu Btaha Information Technology in Teaching and Learning Conference on Thursday, May 25, 2017
- 2017 S.V. Providence, Hack-a-thon: Society for Advancement of Computer Science (Sponsored by Google), *"Soaring Eagles"* - CSU Team Participants: Anil Yadav, Shamsuddin Khan, Progress Levi, Tyler Bailey: Advisor - Dr. Providence, Won Honorable Mention, Morgan State University, September 30, 2017
- 2018 Certificate of Participation: This Certifies that *Dr. Stephen Providence* was a representative of the Faculty Information Technology Committee (FITC) during the 2017-2018 Academic Year, dated 8/3/2018
- 2018 Certificate of Participation: This Certifies that *Dr. Stephen Providence* was a *Faculty Senator* during the 2017-2018 Academic Year, Presented by; Dr. Charlotte M. Wood, dated 8/3/2018
- 2019 Certificate of Participation for attending: the 15th Annual Dr. Habtu Btaha Information Technology in Teaching and Learning Conference on Thursday, May 23, 2019
- 2021 IBM HBCU Quantum Center: Founding Member, PI: Dr. Providence, \$16,250
- 2021 DoE Visiting Faculty Program (VFP) Fellowship, *Hybrid Quantum-Classical Density Functional Theory Calculations Using Qudits on a Superconducting Radio Frequency Cavity-Based Quantum Information Processor*, FermiLab SQMS center, Batavia, Illinois

Selected Publications & Talks

PEER-REVIEWED JOURNAL ARTICLES

- 1998 Pan, V.Y., Tabanjeh, M.A., Chen, Z.Q., Providence, S.V., Sadikou, A., *Transformations of Cauchy Matrices, Trummer's Problem and a Cauchy-like Linear Solver*, Proceedings of 5th Annual International Symposium on Solving Irregularly Structured Problems in Parallel (Irregular-98), A. Ferreira, J. Rolim, H. SImon, S.-H. Teng, editors), Lecture Notes in Computer Science, 1457, 275-284, Springer, Berlin, August, 1998, EID: 2 – s2.0 – 84883471787
- 2000 Providence, S.V., A Unified Approach to Structured Matrix Inversion and an Extension to Fast Solution of Trummer's Problem. *PhD dissertation*, Advisor: Distinguished Professor Dr. Victor Y. Pan, remaining as of 2020, a RF-CUNY funded researcher at Lehman College, CUNY
- 2018 Uddin, J., Ghann, W., Oh, J., Kang, H., Nesbitt, F., Providence, S., *Comparison of the Performance of Dye Sensitized Solar Cells Fabricated with Ruthenium Based Dye Sensitizers: Di-tetrabutylammonium cis-bis isothiocyanatobis(2,2'-bipyridyl-4,4'-dicarboxylato)Ruthenium(II)(N719) and Tris(bipyridine)*

¹⁶ now Dr. Jessica Jones, Human Centered Computing

Ruthenium(II) Chloride (Ru-bpy), Inorganica Chimica Acta, Volume 482, 1 October 2018, Pages 943-950

CONFERENCE PROCEEDINGS

- 1999 Pan, V.Y., Tabanjeh, M.A., Chen, Z.Q., Providence, S.V., Zheng, A., *Superfast Computations with Singular Structured Matrices Over Abstract Fields*, Proceedings of Second Workshop on Computer Algebra in Scientific Computing (CASC-99) (V.G. Ganzha, E.E. Mayr and E.V. Vorontsov, editors), 323-338, Springer, Berlin, May 1999
- 2004 Providence, S.V., *Utilization of Cellular Automata in the Signal Search Problem*, IEEE SouthEast-Con, Greensboro, NC, Pages 325-329, March 26-29, 2004, EID: 2-s2-2442526438
- 2006 Yuan, X., Vega, P., Xu, J., Yu, H., Providence, S.V., *An Animated Simulator for Packet Sniffer*, WECS7, 2006
- 2007 Yu, H., Yuan, X., Xu, J., Providence, S.V., Chu, B., Gu, D., *Bridge Information Assurance Education Gap Between the Majority and Minority Universities Through Collaboration*, Proceedings - 6th IEEE / ACIS International Conference on Computer and Information Science, ICIS 2007; 1st IEEE / ACIS International Workshop on e-Activity, IWEA 2007, DOI: 10.1109/ICIS.2007.70, EID: 2-s2.0-46749151852

CITATIONS

- 2001 Victor Y. Pan¹⁷, *Structured Matrices and Polynomials: Unified Super-fast Algorithms*, ISBN: 0-8176-4240-4, Birkhäuser, Springer, 2001 [two papers referenced]

MANUSCRIPTS

- 1986 Richard Isaac¹⁸, *Introduction to Real Analysis*, twelve chapters with exercises, hand-written & drawn
- 1989 Charles R. Giardina¹⁹, *Multidimensional Parallel Digital Signal Processing: A Unified Signal Algebra Approach*, 555 pages, seven chapters with exercises, hand-written & drawn
- 1991 Charles R. Giardina²⁰, *Parallel Digital Signal Processing: A Unified Signal Algebra Approach*, ISBN: 1-878665-00-6, 305 pages, Regency Publishing Co., Wayne, NJ, 07474, 1991
- 2000-current Stephen Providence, *Advanced Computer Algorithms: volumes I, II*, typeset in L^AT_EX₂_ε & X_Y-pic

THESIS SUPERVISION

- 2001 Kevin L. Mosley, NCA&T, Master's Thesis Committee — February 15, 2001
- 2001 Natalia Vainstein, NCA&T, Master's Thesis Committee
- 2003 Supanon Limthung, NCA&T, Master's Thesis Committee — May 9, 2001
- 2003 Sahdevsinh P. Zala, NCA&T, Master's Thesis Committee — October, 2, 2003
- 2005 Jason Clarke, NCA&T, Master's Thesis Committee — August 26, 2005
- 2006 Nelson Veale, NCA&T, MS project, Advisor: Stephen Providence
- 2006 Yusef Pogue, NCA&T, MS project, Advisor: Stephen Providence
- 2009 Gregory Wilson, *A Promise Theory Model for System Administration*, Hampton University, Successful Defense, MS Thesis Advisor: Stephen Providence
- 2010 Jason Bernier, *Amdahl's Law Speedup Study in High Performance Computing*, Hampton University, Passed Qualifying Exam, MS Thesis Co-Advisor: Stephen Providence
- 2010 Carl Arrington, *Aeronomy of Ice in the Mesosphere Study*, Hampton University, Passed Qualifying Exam, MS Thesis Co-Advisor: Stephen Providence

¹⁷ Department of Mathematics & Computer Science, Lehman College, CUNY ¹⁸ Professor Emeritus Mathematics, Department of Mathematics & Computer Science, Lehman College, CUNY ¹⁹ Professor Emeritus Computer Science, Department of Computer Science, Graduate Center, CUNY ²⁰ Professor Emeritus Computer Science, Department of Computer Science, Staten Island College, CUNY

POSTERS

- 2009 Providence, S.V., Bernier, J. *Gustofson-Barsis, Karp-Flatt & Amdahl's Law Study of a High Performance Computing Cluster*, Presentation, ADAMI, Virginia Beach, Virginia, May, 2009
- 2010 Providence, S.V., Johnson, B., Buchanan, G., *Undergraduate Research into Parallel Computational Methods Applied to Data Generated by Experiments of Measuring Water in Supersonic Combusting Flows*, Virginia Space Grant Consortium, 2010
- 2010 Providence, S.V., Wiggins, D., *Undergraduate Research in Parallel Computing*, NSF ARTSI, Spelman College, Georgia, August 2010
- 2011 Providence, S.V., Farhat, T., *A Trummer's Problems Solver Using MPI*, National Center for Supercomputing Applications (NCSA), University of Illinois at Urbana-Champaign, 2011
- 2011 Providence, S.V., Alexander, A., *Power Aware Parallel and Distributed Computing on Heterogeneous Systems*, Virginia Academy of Science 89th Annual Meeting, University of Richmond, Virginia, May 25 to 27, 2011
- 2019 Providence, S., Arevalo, M., Liem, A., Roth, P., *A Unified Method for Blind Source Separation of Genomic Data Reads*, Army Research Laboratory, DEVCOM, Edgewood, MD, August, 2019

ORAL PRESENTATIONS

- 1991 S. Providence, M. Phillipp, *Automation of pH and Ion-selective Electrode Measurements*, NIH-NIGMS Minority Programs Symposium, Washington, DC, November 3-6, 1991
- 1992 S. Providence, E. Robertson, C. Dougherty, M. Phillipp, *Molecular Modeling in the Design of HIV-Protease Inhibitors*, Northeast Regional Minority Bio-medical Research Support / Minority Access to Research Careers (MBRS / MARC) Meeting, New York, September 26, 1992
- 1993 E. Robertson, R. Pironkova, P. Warikam, R. Wilson, S. Providence, C. Dougherty, M. Phillipp, *Molecular Modeling and Inhibition Kinetics for the HIV-1 Protease*, New York Chemistry Students Association 41st Annual Undergraduate Research Symposium, Fordham University, Bronx, NY, May 1, 1993
- 2004 S.V. Providence, *Parallelizing Algorithms*, High Performance Computing Workshop, Appalachian State University, Boone, North Carolina, July 2004
- 2007 S.V. Providence, *Dense Linear Solver Templates for Distributed Memory Architectures Using MPI²¹*, Virginia Academy of Science 85th Annual Meeting, James Madison University, Harrisonburg, VA
- 2008 S.V. Providence, *A Sparse Linear Solver*, Virginia Academy of Science 86th Annual Meeting, Hampton University, Hampton, VA
- 2011 Howard Hughes Medical Institute (HHMI) GCAT Synthetic Biology Workshop, Oral Presentation: *Synthetic Biology Research at Hampton University*, Missouri Western State University, St. Joseph, Missouri, May 2011
- 2011 S.V. Providence, *Parallel Computing: Keys to a Future in Computing²²*, First NSF / TCPP Workshop on Parallel & Distributed Computing Education (EduPar-11), Anchorage, Alaska
- 2012 S.V. Providence, *Dense Unstructured Matrix Computations Using MPI*, Virginia Academy of Science 90th Annual Meeting, Norfolk State University, Norfolk, VA
- 2013 S.V. Providence, *Open Questions Regarding Upper Bounds on Matrix Multiplication of $O(n^\omega)$ for $\omega < 2.374$* , Virginia Academy of Science 91th Annual Meeting, Virginia Polytechnic Institute and State University, Blacksburg, VA

²¹ Message Passing Interface bound to the C language, used in high-performance computing (HPC)

²² URL:<http://techtalks.tv/talks/parallel-computing-keys-to-a-future-in-computing/5308/>

- 2016 S.V. Providence, *Coppin State Professor Chimes in on NASA Launch*, Channel 13 (WJZ), front of: Science and Technology Center, aired at 11:00 PM EST, Monday, October 17, 2016
- 2017 S.V. Providence, *Interdisciplinary Education & Research In STEM Education*, 2017 Capital PKAL Regional Network Conference, American Association of Colleges & Universities, Morgan State University, April 14, 2017
- 2017 S.V. Providence, *Machine Learning and Neural Networks Using Mathematica* 11, Dr. Habtu Braha 13th Annual ITD²³ Teaching and Learning Conference, Coppin State University, May 25, 2017

Selected Teaching

UNDERGRADUATE

- 2000-2006 Computer Architecture and Organization²⁴ - COMP 370 (now 375), NCA& TSU
- 2006-2014 Computer Architecture, Systems and Organization²⁵ I - CSC 204, HU
- 2006-2014 Computer Architecture, Systems and Organization²⁶ II - CSC 205, HU
- 2007-2008 Data Structures II²⁷ - CSC 252, HU
- 2009 Special Topics: Parallel Thinking - CSC 395-04, HU
- 2010 Special Topics: Supercomputing - CSC 395-02, HU
- 2011 Special Topics: Embedded Software - CSC 395-03, HU
- 2010-2011 Discrete Structures - CSC 215, HU
- 2011 Introduction to Research: Computational Biology - BIO 191, HU
- 2012-2013 Organization of Programming Languages - CSC 308, HU
- 2016-2021 Advanced Data Structures²⁸ - COSC 302
- 2016-2021 Artificial Intelligence²⁹ - COSC 307, CSU
- 2016-2021 Assembly Language & Machine Organization³⁰ - COSC 316, CSU
- 2016-2021 Data Communications Systems³¹ - COSC 406, CSU
- 2018-2021 Web Programming³² - COSC 314, CSU
- 2017-2021 Software Engineering³³ - COSC 409, CSU
- 2018-2019 Special Topics: Computer Architecture³⁴ - COSC 420, CSU
- 2018-2019 Special Topics: Data Science in R³⁵ - COSC 420, CSU
- 2020-2021 Computer Science Senior Seminar: Theory of Computation³⁶ - COSC 417, CSU

GRADUATE

- 2000-2005 Advanced Analysis of Algorithms - COMP 685 (now 785), NCA& TSU
- 2004-2005 Computer Organization and Programming for Scientific Computing - COMP 770, NCA& TSU
- 2005-2006 Parallel Computing Applications - COMP 733, NCA&TSU
- 2007-2008 Parallel Processing³⁷ - CSC 622
- 2007-2008 Algorithms and Complexity - CSC 651, HU
- 2008-2010 Research Seminar I / II / Thesis Research / Thesis - CSC 681 / 683 / 684 / 689, HU
- 2009-2012 Mathematical Foundations - CSC 510, HU
- 2010, 2013 Special Topics: Parallel Programming³⁸ - CSC 529, HU

²³ CSU Information Technology Department ²⁴ x86 ²⁵ x86, MIPS ²⁶ Logisim Digital Logic Simulator
²⁷ Unified Modeling Language (UML) ²⁸ Eclipse Java, CentOS & C++/C ²⁹ Python3 ³⁰ Pep/9 & Logisim
Combinational and Sequential Logic Simulator ³¹ MS Azure VM, Ubuntu 14.08 LTS Linux, GNU C++/C ³² MS
Azure VM, MS Windows Subsystem for Linux (WSL), Ubuntu 14.08 LTS Linux, Ruby on Rails for MVC web appli-
cation development & programming ³³ UML, Eclipse Java, Agile, Extreme Programming & Dev Ops development
³⁴ ASICs, CPUs, GPUs, FPGAs, RISC, CISC architecture, RAM / ROM, cache, computer organization ³⁵ R Stu-
dio / Server ³⁶ MS Azure VM, Java Formal Languages and Automata Package (JFLAP) ³⁷ Red Hat Enterprise
Linux (RHEL), OpenMP ³⁸ RHEL, MPI

Service to the Profession

FACILITIES

- 1993-2000 Founder / Director, Science Learning Center³⁹, Gillet Hall, Lehman College, CUNY
2004-2006 Co-Director, Network of Workstations Cluster (8 processing nodes), NCA& TSU
2009-2014 Project Director / Principal Investigator. Zeus HPC Lab (9 processing nodes)⁴⁰, HU
2014-2018 Co-Principal Investigator, Advanced Physical Modeling & Simulation Heterogeneous Cluster Computer System (500+ processing nodes), located at National Institute of Aerospace (NIA)
2017-current Project Director, HPC Lab (6 processing nodes)⁴¹, located in STC123, CSU

MEMBERSHIPS

- 1992-current Sigma Xi: Scientific Research Honor Society - Lehman College Chapter Full Member
2000-2005 Society of Industrial and Applied Mathematics (SIAM) - Subscriber: Journal of Matrix Analysis & Applications, Journal of Mathematical Analysis
2000-current Association for Computing Machinery (ACM) - Professional Member: Special Interest Group on Algorithms and Computation Theory (SIGACT)
2000-current Institute of Electronic & Electrical Engineers (IEEE) - Region 3 Member: Signal Processing Society, Computer Society
2006-2013 Virginia Academy of Science - Computer Science Section Editor
2006-current ResearchGate.net - URL: https://www.researchgate.net/profile/Stephen_Providence/

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³⁹ Graduate & Undergraduate Scholarships, Faculty meetings, Calculus I & II, General Chemistry, Physics, Biology, Geology instruction ⁴⁰ MatLab, RHEL, C/C⁺⁺, CUDA, OpenCL ⁴¹ CentOS7, C/C⁺⁺, Swift3, Metal2, Jupyter Notebooks