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 Professor[7], Mathematics & Computer Science Department, School of Arts & Sciences, Coppin State University (CSU), Baltimore, Maryland

2019 Visiting Scientist[8], Army Research Laboratory (ARL), Edgewood, Maryland

2021-2025 Visiting Faculty[9], 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 Assistantship[10], 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 Workshop[11], 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. Cowell[13], R. Carter[14], $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 Center[15] (NCSC), *Experiments for Rational Polynomial Interpolation Problems: Tangential Nevanlinna-Pick and Matrix Nehari*, Allocation: 200 hours - SGI Origin, 2000 hours - IBM SP, February 2002

2004 ACM/IEEE Supercomputing Conference 2004, Technical Program20 *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

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[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 / Capybara 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. Jones[16], 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 SouthEastCon, 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. Pan[17], *Structured Matrices and Polynomials: Unified Super-fast Algorithms*, ISBN: 0-8176-4240-4, Birkhäuser, Springer, 2001 [two papers referenced]

Manuscripts

1986 Richard Isaac[18], *Introduction to Real Analysis*, twelve chapters with exercises, hand-written & drawn

1989 Charles R. Giardina[19], *Multidimensional Parallel Digital Signal Processing: A Unified Signal Algebra Approach*, 555 pages, seven chapters with exercises, hand-written & drawn

1991 Charles R. Giardina[20], *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 LaTeX2$_\varepsilon$ & Xy-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, ADMI, 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., *Undegraduate 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 89^{th} 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 41^{st} 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 MPI*[21], Virginia Academy of Science 85^{th} Annual Meeting, James Madison University, Harrisonburg, VA

2008 S.V. Providence, *A Sparse Linear Solver*, Virginia Academy of Science 86^{th} 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 Computing*[22], 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 90^{th} 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 91^{th} 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 ITD[23] Teaching and Learning Conference, Coppin State University, May 25, 2017

Selected Teaching

Undergraduate

2000-2006 Computer Architecture and Organization[24] - COMP 370 (now 375), NCA& TSU

2006-2014 Computer Architecture, Systems and Organization[25] I - CSC 204, HU

2006-2014 Computer Architecture, Systems and Organization[26] II - CSC 205, HU

2007-2008 Data Structures II[27] - 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 Structures[28] - COSC 302

2016-2021 Artificial Intelligence[29] - COSC 307, CSU

2016-2021 Assembly Language & Machine Organization[30] - COSC 316, CSU

2016-2021 Data Communications Systems[31] - COSC 406, CSU

2018-2021 Web Programming[32] - COSC 314, CSU

2017-2021 Software Engineering[33] - COSC 409, CSU

2018-2019 Special Topics: Computer Architecture[34] - COSC 420, CSU

2018-2019 Special Topics: Data Science in R[35] - COSC 420, CSU

2020-2021 Computer Science Senior Seminar: Theory of Computation[36] - 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 Processing[37] - 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 Programming[38] - 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 application 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 Studio / 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 Center[39], 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