FUTURE OF COMPUTER SCIENCE TASK FORCE

PROPOSAL FOR A SCHOOL OF COMPUTING

DATE: FEBRUARY 5, 2021

Task Force Members

Marisa Pagnattaro, Chair, Vice Provost for Academic Affairs

Bradley J. Barnes, Senior Lecturer of Computer Science, Department of Computer Science, Franklin College of Arts and Sciences

Suchendra M. Bhandarkar, Professor, Department of Computer Science, Franklin College of Arts and Sciences

Mable Fok, Associate Professor, Director of the Lightwave and Microwave Photonics Laboratory, School of Electrical and Electronics Engineering, College of Engineering

Kyle J. Johnsen, Associate Professor, School of Electrical and Computer Engineering, College of Engineering

Krzysztof J. Kochut, Professor and Associate Department Head, Department of Computer Science, Franklin College of Arts and Sciences

Thomas L. Mote, Associate Dean and Distinguished Research Professor, Department of Geography, Franklin College of Arts and Sciences

Roberto Perdisci, Associate Professor, Patty and D.R. Grimes Distinguished Professor in Computer Science, Director of the UGA Institute for Cybersecurity and Privacy, Department of Computer Science, Franklin College of Arts and Sciences

Ramaraja Ramasamy, Professor and Associate Dean, Academic Affairs & Assessment School of Chemical, Materials, and Biomedical Engineering, College of Engineering

Lakshmish Ramaswamy, Professor, Associate Director, Georgia Informatics Institutes for Research and Education, Department of Computer Science, Franklin College of Arts and Sciences

Khaled Rasheed, Professor and Director of the Institute for Artificial Intelligence, Department of Computer Science, Franklin College of Arts and Sciences

WenZhan Song, Georgia Power Mickey A. Brown Professor, Director of the Center for Cyber-Physical Systems, School of Electrical and Computer Engineering, College of Engineering

T.N. Sriram, Professor and Head, Department of Statistics, Franklin College of Arts and Sciences

UNIVERSITY OF GEORGIA

Department of Computer Science
415 Boyd Graduate Studies Research Center
200 D.W. Brooks Drive
University of Georgia
Athens, Georgia 30602-7404
TEL 706-542-2911 | FAX 706-542-2966
www.cs.uga.edu

Franklin College of Arts & Sciences
Department of Computer Science

February 22, 2021

Dean Alan Dorsey, Franklin College of Arts and Sciences
Dean Donald Leo, College of Engineering
University of Georgia
CAMPUS

Deans Dorsey and Leo,

I am pleased to convey to you the vote from the faculty of Computer Science on the proposal of February 5, 2021 from the Provost's Task Force on the Future of Computer Science. The eligible faculty voted 27 yes, 4 no, in support of the proposal to transition the Department of Computer Science to a School of Computing jointly administered by the Franklin College of Arts and Sciences and the College of Engineering.

I understand that the Task Force worked diligently for more than a year and consulted with key stakeholders and administrators. You both joined Provost Hu and Vice Provost Pagnattaro in our faculty meeting on October 16, 2020 to discuss key elements and seek input on the proposal. Over the three-month period following that meeting, the Task Force made substantial revisions to the proposal in response to input from Computer Science faculty. The Task Force, which included six tenured and non-tenure-track faculty from Computer Science, voted 13 yes, 0 no, in favor of the proposal on February 5th. The Computer Science faculty met on February 12th and 19th to consider the proposal and conducted an electronic vote that closed on February 22nd.

I forward this proposal with our resounding endorsement for consideration by the appropriate governance process in each college. I look forward to working with you both to establish the School of Computing and advance research and instruction in Computer Science and Engineering at the University of Georgia.

Sincerely,

Thiab Taha
Department Head

cc: Jack Hu, Senior Vice President for Academic Affairs and Provost
Marisa Pagnattaro, Vice Provost for Academic Affairs

UNIVERSITY OF
GEORGIA

Terry College of Business
Office of the Dean

Benjamin C. Ayers, Dean
Earl Davis Chair in Taxation

March 4, 2021

Marisa Anne Pagnattaro, J.D., Ph.D.
Vice Provost for Academic Affairs
University of Georgia
Athens, GA 30602
VIA EMAIL

Dear Marisa,

I am pleased to provide this letter of support on behalf of the Terry College of Business for the proposed creation of a School of Computing at UGA. I have reviewed the proposal and agree with the task force that it would create new opportunities in instruction and research that would benefit students and faculty and enhance the reputation of UGA as a whole. I wish you the best with this proposal and hope it receives approval.

Sincerely,

Benjamin C. Ayers

/abg

UNIVERSITY OF GEORGIA

College of Family and Consumer Sciences

Dean's Office
224 Dawson Hall
305 Sanford Drive
Athens, Georgia 30602
TEL 706-542-4860
sworthy@uga.edu
www.fcs.uga.edu

March 11, 2021

Marisa Anne Pagnattaro
Vice Provost for Academic Affairs
University of Georgia
Athens, GA 30602

Dear Marisa:

This letter indicates support for the new academic unit on behalf of the College of Family and Consumer Sciences (FACS). I have reviewed the proposal. The Department of Computer Science will fully transition into the new School of Computing. The Franklin College of Arts and Sciences and the College of Engineering will jointly fund, house, and administer the new SoC administered in the Franklin College of Arts and Sciences and the College of Engineering. We can find no issue with the proposed structure. This new school will benefit UGA students and faculty from across campus in their research and educational pursuits.

Regarding physical location, the majority of the Computer Science space and part of the College of Engineering is currently located in Boyd GSRC in close proximity to the College of Family and Consumer Sciences in Dawson and Barrow Halls. Preparation of a joint request for space in Barrow Hall for FACS and Computer Science has been under development with the Associate Dean for the Franklin College. Given the existing positive working relationships between FACS and the colleges of Engineering and Franklin, the proposal for the new School of Computing should not change that Barrow space request going forward this spring for consideration by the space management committee as conceptualized, further benefiting the new SoC as well as FACS.

Please let me know if I can provide anything further.

Sincerely,

Linda Kirk Fox

Linda Kirk Fox, Dean

C:\Users\lkfox\Documents\UGA\2021\FACS Letter Support School of Computing 03 11 2021.docx

PROPOSAL TO ESTABLISH THE SCHOOL OF COMPUTING AT THE UNIVERSITY OF GEORGIA
2.5.2021

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Appendices

Abstract

This proposal seeks to elevate the Department of Computer Science, which is housed in the Franklin College of Arts and Sciences, to a School of Computing that would reside jointly under the Franklin College of Arts and Sciences and the College of Engineering. The new School would become the fourth school in the College of Engineering and the third school in the Franklin College of Arts and Sciences. The establishment of a School of Computing (SoC) would create new opportunities that benefit students and enhance research activity at the University of Georgia.

I. Background

Department of Computer Science

The Department of Computer Science at UGA was established in 1984, initially with just eight faculty and a single undergraduate degree program. Prof. Robert W. Robinson served as the first Department Head. Shortly thereafter, the Master of Applied Mathematical Sciences (MAMS) degree was added (jointly with Mathematics and Statistics). The Master of Science in Computer Science degree program was created and approved in 1987, and the department grew to 11 faculty. The number of graduate students has been increasing steadily. The Ph.D. program in Computer Science was approved in 1993 and began admitting students in 1995. The number of faculty grew to 14. In 1999, the State of Georgia launched a focused expansion of computing and engineering fields with the Yamacraw Initiative, a state program designed to increase research of broadband technologies, attract broadband companies to Georgia, and foster start-ups. Computer Science at UGA participated in the program, which resulted in a significant growth of the faculty ranks and the funding of research in key areas of computing.

The Department of Computer Science currently has 23 full-time, tenure-track faculty, 8 non-tenure track faculty, and more than 1,300 students—1,134 undergraduates and 190 graduate students (see Appendix A for list of all faculty). It offers several degree and certificate programs, including B.S., M.S., and Ph.D. degrees in Computer Science. An M.S. degree program in Cybersecurity and Privacy enrolled its first students in Fall 2020.

In addition, the Department of Computer Science and Department of Statistics jointly have offered a B.S. degree in Data Science since Fall 2019. The Department of Computer Science offers a Master of Applied Mathematical Sciences (MAMS) degree in conjunction with the Department of Mathematics, and a joint Computer Science/Statistics M.S. degree in Data Science is currently under consideration via faculty governance. Computer Science also offers an Undergraduate Certificate in Applied Data Science, Certificate in Computing, as well as a Graduate Certificate in Cybersecurity (see Appendix B for list of courses).

College of Engineering

Founded in 2012, the College of Engineering builds upon a long history of Engineering programs at UGA, which awarded its first Engineering degrees in 1868 and established the Faculty of Engineering in 2001.

The College of Engineering consists of three schools: The School of Electrical and Computer Engineering; the School of Environmental, Civil, Agricultural, and Mechanical Engineering; and

the School of Chemical, Materials, and Biomedical Engineering. The College of Engineering currently has 61 full-time tenure-track faculty, 23 non-tenure-track faculty, and nearly 2,500 engineering majors—2,309 undergraduate students and 168 graduate students. The College offers eight undergraduate degree programs, five master's degree programs, and two doctoral programs. One of its degree programs—a B.S. in Computer Systems Engineering—already has strong ties to the Department of Computer Science in the form of joint classes, and several faculty members in both programs have courtesy appointments.

II. Rationale for Creating a School of Computing

A joint School of Computing (SoC) between the College of Engineering and the Franklin College of Arts and Sciences will create new opportunities in instruction and research while enhancing the reputation of computer science and engineering programs at the University, as well as the reputation of the University as a whole.

Instructional Benefits

A recent white paper from the Computing Resources Association[1] notes that computing and data science have become relevant to almost every area and domain outside the sciences and also within every domain of engineering. Enrollment in STEM related occupations is projected by the Bureau of Labor Statistics to grow 8% through 2029, more than the double the 3.4% growth for non-STEM occupations.[2] Within STEM, both computer science and engineering are among the fields with the highest growth.[3]

In response to trends such as these, enrollment in computer science and engineering programs at UGA has experienced rapid growth in recent years. Fall 2020 enrollment in computer science totaled 1,321 students, 1,146 undergraduates, and 175 graduate students.[4] This represents an 49% increase since fall 2015, when total enrollment was 889 students.

The growth of the Department of Computer Science has recently been constrained by the high student-to-faculty ratio and limited availability of space. Despite recent hiring in the department, the relatively low number of the CS faculty and the high enrollments in computer science programs translate to a very high student-to-faculty ratio (40:1, as of Fall 2020). Student-to-faculty ratios for computer science and engineering programs at UGA's comparator and aspirational peers that incorporate computer science are significantly lower.[5]

With resources from both the Franklin College and the College of Engineering, strategic hiring of new faculty into the SoC can better support undergraduate and graduate instruction in key areas of specialization, especially those in high demand among students, as well as strategic research goals.

Research Synergies

[1] https://cra.org/resources/creating-institutional-homes-for-computing/
[2] https://www.bls.gov/emp/tables/stem-employment.htm
[3] https://www.bls.gov/k12/students/careers/stem-table.htm
[4] https://oir.uga.edu/data/facts/enrlmj/ataglance/
[5] Aspirational: Penn State 14:1, Illinois 24:1, Virginia 27:1 UT Austin 38:1; Comparator: NC State 30:1, Michigan State 36:1, Purdue 36:1, Kentucky 22:1.

The importance of computing and computational systems is especially true in the various disciplines of engineering where sensors, machines, and systems are connected via the internet and volumes of data are generated through such connections. Computational systems (machines and algorithms) make use of such data to infer the state of the systems and support optimal decision-making. In fact, many engineering systems are considered cyber-physical systems today. Computer science and computing are essential to the teaching and research mission of the College of Engineering. Robotics and artificial intelligence are emerging areas of teaching and research that require close collaboration between the disciplines of computer science and engineering.

Moreover, Computer Science plays an increasingly important role in advancing scholarship across the Arts and Sciences. The new Data Science program involves a successful collaboration between Computer Science and Statistics, while a new emphasis in natural language processing involves an important collaboration with Linguistics. Ongoing efforts to advance Bioinformatics and the Digital Humanities also benefit from their collaboration with Computer Science.

Reputational Benefits
The majority of UGA comparator and aspirational peers administratively connect computer science and engineering programs. An analysis of several rankings methodologies demonstrates that the reputations and rankings of colleges of engineering in the U.S. are closely associated with the reputations of the computer science and engineering programs. In addition, the majority of UGA comparator and aspirational peers incorporate computer science within their engineering college.

The increased visibility of the SoC would also facilitate the recruitment of distinguished faculty, who further enhance the University's reputation.

III. Organization and Administration

Structure and Leadership
The Department of Computer Science will fully transition into the new SoC. The Franklin College of Arts and Sciences and the College of Engineering will jointly fund, house, and administer the new SoC. This transition will retain the current faculty, staff, and the set of current Department of Computer Science guidelines and bylaws governing faculty and staff reviews, faculty promotion, and standing committees. These will be accepted as the initial faculty and staff and the initial set of guidelines and bylaws for the SoC and will apply uniformly to all SoC faculty. The two respective College Deans and a representative of the Provost's Office will form a Governing Council for the SoC (the SoC Governing Council). The Provost's representative will ensure the alignment of policy and guidelines between the two Colleges so that a consistent set of policies and guidelines will apply to the SoC and its faculty.

The SoC will be led by a Director (or an equivalent title to be decided later) recommended by a vote of the SoC faculty to the two Deans on the SoC Governing Council. The Deans will make a joint selection of the Director and submit the recommendation to the Provost for approval. The Director may appoint one or more Associate Directors (or an equivalent title to be decided later) to support the administration of the SoC. The Director of the SoC will meet with the SoC

Governing Council periodically to report on the progress toward strategic goals and will provide an annual report.

The Director will be assisted by an administrative structure extending from the Department of Computer Science, including an Associate Director, an Executive Committee elected by the eligible SoC faculty, other standing committees, and office staff.

Transition Period
For day-to-day management of the SoC, a liaison to the SoC Governing Council will serve as a single point of contact for administrative issues that may not require the direct and immediate involvement of a Dean or the SoC Governing Council. During the transition period, the liaison will be an Associate Dean of the Franklin College. Until the SoC develops a set of approved policies that will replace the existing College-level policies, and to facilitate a smooth transition from the current status as a Department, the SoC will follow College-level policies and guidelines established by the Franklin College. During this transition period, the SoC will develop its own set of policies in place of Franklin College and College of Engineering policies. These policies will be developed by the SoC faculty, with input and approval from the SoC Governing Council, and consistent with University policies. The SoC Director will have the autonomy to implement the policies of the SoC.

The SoC will be reviewed within three years after its formation to identify strengths, weaknesses, and opportunities for improvement. The review will coincide with the end of the transition period. Consistent with other academic units across campus, the SoC will be placed in the regular review cycle within the UGA's Office of Accreditation and Institutional Effectiveness.

Faculty and staff associated with the Department of Computer Science at the time of transition will be associated with the SoC. In addition to the continued support from the Franklin College of Arts and Sciences, the SoC also will receive commensurate staff support from the College of Engineering in matters of budget and finance, human resources, pre-award and post-awards grant management support, and IT support.

Advisory Board
The Department of Computer Science has an existing External Advisory Board that will continue. Upon formation of the SoC, the Director, with input from the SoC, will recommend additional Advisory Board candidates. The final selection of new Advisory Board members will be done through a majority vote by the SoC faculty.

IV. Faculty Affairs
Appointment, Promotion, and Tenure
Faculty in the SoC will be governed by the same set of policies and by-laws, irrespective of the College that funded their position. The SoC will function as a Promotion and Tenure Unit (PTU), and the Director will serve as the PTU head. Current faculty in the College of Engineering may apply to join the faculty of the SoC. Each faculty transitioning to the SoC will require a vote of the eligible SoC faculty and approval by the SoC Governing Council, following the SoC and University policies and guidelines for faculty appointment. If a faculty appointment is approved

by both the SoC faculty and the SoC Governing Council, the SoC will become the faculty's PTU.

The SoC will have a single set of PTU guidelines for appointment, review, and promotion for all of its faculty. There will be no distinction in the policies and guidelines regarding promotion and tenure, or any other faculty affairs, for the new SoC faculty, regardless of which College funded their position. The SoC PTU guidelines will be initially based on the current Computer Science guidelines.

Promotion and tenure of the faculty would be first considered and voted on by the SoC (as the PTU). The next level of review (College-level review) will consist of a joint committee with three members of the Franklin College of Arts and Sciences and three members of the College of Engineering, who are appointed by the respective Deans. Deans of both Colleges will jointly review candidates for promotion and tenure before dossiers advance to the University review committees. Faculty members hired prior to the formation of the SoC will have the option of going through the current promotion and tenure path (to the Franklin College review committees) or through the new promotion path (to the joint committee of Franklin College and Engineering).

Following the School/College review, all promotion cases originating from the SoC will be considered and voted on by the appropriate University Review Committee. Although most faculty may be reviewed by the Physical Sciences committee, depending on the faculty member's expertise, another review committee, such as the Professional and Applied Studies committee or the Life Sciences committee, may be appropriate. A common set of guidelines will be applied to all appointments and promotion of lecturers in the SoC.

The SoC will provide a unified set of teaching, scholarship, and service expectations and make recommendations on how these expectations could be aligned in the School. Within the SoC, all faculty will follow the same set of guidelines and expectations established within the School. These unified expectations will form the basis for annual faculty evaluations and determining merit-based pay raises.

Instruction
Teaching loads in the Department of Computer Science are based on the fact that there are many four-credit-hour courses. This Task Force recommends that the SoC adopt the teaching load currently expected in the Department of Computer Science. New faculty hires in the SoC will assume a similar teaching load as existing SoC faculty commensurate with their track (tenure-track or non-tenure track lecturer) and rank.

Faculty Governance
The faculty of the SoC will be eligible to participate and contribute to faculty governance in both Colleges, including promotion and tenure decisions, faculty affairs, curricular affairs, and other academic functions that require faculty vote.

V. Academic Programs

The SoC will maintain and grow the existing Computer Science-administered undergraduate and graduate programs. The SoC will administer the B.S., M.S., and Ph.D. in Computer Science programs, and the M.S. program in Cybersecurity and Privacy. During the transition period, the SoC will introduce any necessary changes to the degree programs with respect to college-level requirements. Additional programs in emerging areas of computing can also be created by the SoC. New courses and new programs will be approved by the governance structure in both the Franklin College and College of Engineering before moving to University-level review.

The SoC will maintain the current structure of student advising in conjunction with student advisement in the Franklin College of Arts and Sciences. This Task Force recommends that the Franklin College and the College of Engineering put policies in place to accommodate students who wish to transfer between Computer Science and Engineering programs, given that the undergraduate Engineering programs have a secondary admissions process and limits portability for students.

The SoC will maintain and strengthen its association with the Institute for Artificial Intelligence, the Institute for Cybersecurity and Privacy, the Georgia Informatics Institutes, and the Center for Cyber-Physical Systems. The Institute for Artificial Intelligence will remain in the Franklin College. The Institute for Cybersecurity and Privacy (ICSP), which is currently housed in the Department of Computer Science, will be housed in the SoC and will retain its current ICSP faculty and institute-specific bylaws. The SoC will continue participating in the Data Science program currently administered jointly by Computer Science and Statistics.

The SoC also will be involved in providing the necessary courses of general interest to University students. The SoC has the potential to explore the creation of University-wide educational initiatives in the general areas of Computing and Data Literacy. The EECS 101, "Thriving in a Digital World," course at the University of Michigan, UGA's aspirational peer institution, is a notable example. This course explores computational technologies and how they impact society and our everyday lives.

This Task Force envisions opportunities for many innovative collaborative programs between the SoC and other UGA units. The SoC may consider allowing courtesy faculty appointments (if approved by the SoC faculty) from those units to fund SoC graduate students and serve as their major advisor. These enhanced collaborations have the potential to become a game-changer for growing the graduate programs of Computing at UGA.

VI. Computer Science Trends and Comparisons

In North America, computer science departments have been traditionally housed within a college of sciences or engineering. With the rapid advances in computing and storage capacity in the big data era, the entire discipline of computer science has grown tremendously, pushing its boundaries into broader areas, such as artificial intelligence, robotics, human-computer interaction, machine learning, natural language processing, cognitive psychology, security and privacy, and data science—all of which fall under the encompassing term "computing."

Computing has dramatically increased productivity in business, industry, and management by creating cyberspace—the ubiquitous collection of networks and computers that function as the nervous system of modern society.

Today, computing has become pervasive in nearly every discipline. This has prompted many universities to take an expansive view of computer science and to explore the possibility of creating institutional homes for computing by either transforming a computer science department into a school of computing and placing it within an existing college or housing a computer science department in a standalone college of computing along with other broader areas. Here, the term "college" refers to an academic organization headed by a dean. The 2019 white paper titled "Creating Institutional Homes for Computing: Transforming a Department into a School or College" published by the Computing Research Association (CRA) is a comprehensive report on the growing trend of transforming a department of computer science into a school or housing it within a college of computing. The report discusses strategies for such a transformation and provides a list of 25 current schools or colleges of computing in North America and notes that more are likely to be created. In each of these instances, the primary motivation for transforming a computer science department into a school or creating a college of computing is to allow the discipline to embrace the broader role of being a catalyst for interdisciplinary research and education across the university, and thereby efficiently manage these needs throughout the campus.

By April 2019, about 25 computer science departments in North America had either transformed into a school of computing housed within an existing college of sciences or engineering or were housed in a standalone college of computing (see Appendix II of the CRA report for a full listing and Appendix C of this proposal for selected examples). More specifically, of the 25 computer science departments, four (Arizona State University School of Computing Informatics, and Decision Systems Engineering; Clemson School of Computing; Montana State University Gianforte School of Computing; and University of Washington Paul G. Allen School of Computer Science and Engineering) transformed into a school of computing but remained within the college of engineering; about 18 computer science departments were housed within a standalone college of computing along with other computing-related areas; and the remaining three either transformed into a standalone school of computing or elevated their status to a school but remained in the college of sciences. In some of these instances, large donors to the universities facilitated the transformation to schools/colleges of computing. There are also three other universities not mentioned in the CRA report where the department of computer science has been elevated to a school level but housed in either the college of sciences or the college of engineering along with related disciplines (School of Computer Science at Brandeis University, School of Computer Science and Management at University of Nebraska–Lincoln, School of Electrical Engineering and Computer Science at LSU).

The creation of an intercollegiate School of Computing that would be jointly administered by both the Franklin College of Arts and Sciences and the College of Engineering builds on the University's history of promoting interdisciplinary programs such as the joint MPA/JD degree, administered by the School of Public and International Affairs and the School of Law[6], several

[6] https://spia.uga.edu/degree/mpa-jd-joint-degree/

Double Dawgs[7] programs, and MBA degrees offered through the Terry College of Business that are linked with JD, Engineering, MPH, PharmD, and MD degrees[8].

As mentioned earlier, the Department of Computer Science has already embraced interdisciplinary research and education across units within Franklin College of Arts and Sciences. Given the notion that computing incorporates three main research paradigms—theory, rooted in mathematics; abstraction (modeling), rooted in science; and design, rooted in engineering—it is a natural next step to transform the Department of Computer Science into a School of Computing. Forming this new school would not only strengthen existing collaborations, but also facilitate new formal collaborations with units on campus.

VII. Facilities

Regarding physical location, the majority of the Computer Science space and part of the College of Engineering is currently located in Boyd GSRC (see Appendix D for details on facilities and equipment). It is anticipated that this proximity will facilitate further, more expansive collaboration between the SoC and the College of Engineering on joint programs and research. As future potential space may be considered for the SoC, consideration should be given to space that will bring all SoC faculty offices and lab spaces to physical proximity to foster more effective collaboration.

VIII. Funding

The SoC will be established with funds available to the existing Department of Computer Science, as currently placed within the Franklin College of Arts and Sciences. FY22 program funding, which includes operating funds and supplemental instructional funding, will be provided by the Franklin College.

Graduate teaching assistants are funded centrally in the College of Engineering, but the Department of Computer Science currently receives a supplemental instructional budget from the Franklin College to use at the discretion of the Department Head for graduate teaching assistants and part-time or limited-term faculty. This Task Force recommends that the SoC continue to receive instructional budget at least at the current level. This Task Force recommends that instructional funds for graduate teaching assistants be shared by both colleges proportionally to the number of faculty funded by each college. These funds will be used at the discretion of the SoC director for graduate teaching assistants and part-time or limited-term faculty.

IX. Implementation

An implementation committee will be established to provide faculty input into the implementation of the SoC. This committee will have representatives from the current Computer Science Department, Franklin College, and the College of Engineering. The representatives from the current Department of Computer Science will be elected by the faculty of the Department. The implementation committee will advise the SoC in formulating a vision and a strategic plan during the transition period, as well as the College-level policies for the SoC. In addition, the implementation committee will provide input into resource needs from the two Colleges. An interim director will be appointed through the same process discussed in section III.

[7] http://doubledawgs.uga.edu/ProgramList
[8] https://www.terry.uga.edu/mba/fulltime/dual-degrees/index.php

APPENDICES

A. Computer Science Faculty

COMPUTER SCIENCE FULL TIME FACULTY

Ismailcem Budak Arpinar, Associate Professor
Brad Barnes, Senior Lecturer and Undergraduate Coordinator
Suchendra M. Bhandarkar, Professor
Liming Cai, Professor
Michael Cotterell, Lecturer
Prashant Doshi, Professor
Shelby H. Funk, Associate Professor
Le Guan, Assistant Professor
Bill Hollingsworth, Senior Lecturer
Maria Hybinette, Associate Professor
Mustakimur R. Khandaker, Assistant Professor
Manijeh Keshtgari, Lecturer
In Kee Kim, Assistant Professor
Krzysztof J. Kochut, Professor and Associate Department Head
Salvatore Lamarca, Lecturer
Jaewoo Lee, Assistant Professor
Kyu Hyung Lee, Assistant Professor
Sheng Li, Assistant Professor
Tianming Liu, Distinguished Research Professor
Sachin Meena, Lecturer
Chenglin Miao, Assistant Professor
John A. Miller, Professor and Graduate Coordinator
Ramviyas Nattanmai Parasuraman, Assistant Professor
Hao Peng, Lecturer
Roberto Perdisci, Patty and D.R. Grimes Distinguished Professor/ Director of the ICSP
Shannon Quinn, Assistant Professor
Lakshmish Ramaswamy, Professor
Khaled Rasheed, Professor
Eman Saleh, Lecturer
Thiab Taha, Professor and Department Head
Wenwen Wang, Assistant Professor

COURTESY AND ADJUNCT FACULTY

Kyle J. Johnsen, Associate Professor of Engineering
Jessica Kissinger, Professor of Genetics
Changying Li, Professor of Engineering
Kang Li, Professor
Ping Ma, Professor of Statistics
Fred Maier, Assistant Research Scientist
Hanchuan Peng, Associate Professor
Amit P. Sheth, LexisNexis Professor of Computer Science, University of South Carolina
Wenzhan Song, Georgia Power Mickey A. Brown Professor of Engineering
Ying Xu, Professor and Eminent Scholar of Biochemistry and Molecular Biology
William York, Associate Professor of Biochemistry and Molecular Biology

EMERITUS FACULTY

Hamid Arabnia, Professor Emeritus
E. Rodney Canfield, Professor Emeritus
Walter Potter, Professor Emeritus
Robert W. Robinson, Professor Emeritus
Jeffrey W. Smith, Associate Professor Emeritus

B. List of Undergraduate and Graduate Computer Science Courses

Computer Science Courses (125)

CSCI 1100 / L	Topics in Computing
CSCI 1210	Computer Modeling and Science
CSCI 1300	Introduction to Programming with Python
CSCI 1301 / L	Introduction to Computing and Programming
CSCI 1302	Software Development
CSCI 1360	Foundations for Informatics and Data Analytics
CSCI 1730	Systems Programming
CSCI 1900	Computer Science Special Topic
CSCI 2150 / L	Introduction to Computational Science
CSCI 2610	Discrete Mathematics for Computer Science
CSCI 2611	Discrete Mathematics for Engineers
CSCI 2670	Introduction to Theory of Computing
CSCI 2720	Data Structures
CSCI 2725	Data Structures for Data Science
CSCI 3030	Computing, Ethics, and Society
CSCI 3030H	Computing, Ethics, and Society (Honors)
CSCI 3360	Data Science I
CSCI 4050/6050	Software Engineering
CSCI 4060/6060	Mobile Software Development
CSCI 4070/6070	Introduction to Game Programming
CSCI 4080/6080	Intermediate Game Programming
CSCI 4130/6130	CUDA C Programming on GPUs for High Performance Computing
CSCI 4140/6140	Numerical Methods and Computing
CSCI 4150/6150	Numerical Simulations in Science and Engineering
CSCI 4170/6170	Introduction to Computational Investing
CSCI 4210/4210	Simulation and Modeling
CSCI 4250/6250	Cyber Security
CSCI 4260/6260	Data Security and Privacy
CSCI 4270/6270	Introduction to Computer Forensics
CSCI 4300	Web programming
CSCI 4330/6330	Artificial Intelligence and the Web
CSCI 4350/6350	Global Information Systems
CSCI 4360/6360	Data Science II
CSCI 4370/6370	Database Management
CSCI 4380/6380	Data Mining
CSCI 4470/6470	Algorithms
CSCI 4490/6490	Algorithms for Computational Biology
CSCI 4500/6500	Programming Languages
CSCI 4520/6520	Functional Programming
CSCI 4530/6530	Robotics
CSCI(ARTI) 4540/6540	Symbolic Programming
CSCI(ARTI) 4550/6550	Artificial Intelligence
CSCI 4560/6560	Evolutionary Computation and Its Applications
CSCI 4570/6570	Compilers

CSCI(MATH)(PHYS) 4612/6612	Introduction to Quantum Computation
MATH(CSCI) 4670/6670	Combinatorics
CSCI 4690/6690	Graph Theory
CSCI 4720	Computer Architecture and Organization
CSCI 4730/6730	Operating Systems
CSCI 4740/6740	Real-Time Scheduling for Internet of Things
CSCI 4760/6760	Computer Systems Architecture
CSCI 4770/6770	Ubiquitous Computing
CSCI 4780/6780	Distributed Computing Systems
CSCI 4795/6795	Cloud Computing
CSCI 4800/6800	Human-Computer Interaction
CSCI 4810/6810	Computer Graphics
CSCI 4830/6830	Virtual Reality
CBIO(CSCI) 4835/6835	Introduction to Computational Biology
CSCI 4840/6840	Signal Processing
CSCI 4850/6850	Biomedical Image Analysis
CSCI 4900/6900	Special Topics in Computer Science
ENGR(CSCI) 4922	Computer Systems Engineering Design Project
CSCI 4950/6950	Directed Study in Computer Science
CSCI 4960	Faculty Mentored Research in Computer Science
CSCI 4960R	Faculty-Mentored Undergraduate Research I
CSCI 4970R	Faculty-Mentored Undergraduate Research II
CSCI 4980R	Faculty-Mentored Undergraduate Research III
CSCI 4990R	Undergraduate Research Thesis (or Final Project)
STAT(CSCI) 4990	Data Science Capstone Course
CSCI 5007/7007	Internship in Computer Science Business/Industry
CSCI 5310/7310	Web Composing and Scripting
CSCI(STAT) 6375	Foundations of Data Science
CSCI 6480	Approximation Algorithms
CSCI 6610	Automata and Formal Languages
CSCI 6720	Architecture
CSEE(CSCI) 6922	Computer Systems Engineering Design Project
CSCI 7000	Master's Research
CSCI 7005	Graduate Student Seminar
CSCI 7010	Computer Programming
CSCI 7100	Technical Report
CSCI 7200	Master's Project
CSCI 7300	Master's Thesis
CSCI 8000	Advanced Special Topics
CSCI 8050	Knowledge-Based Systems
CSCI 8060	Advanced Software Engineering
CSCI 8140	Parallel Processing and Computational Science
CSCI 8150	Advanced Numerical Methods and Scientific Computing
CSCI 8220	Parallel and Distributed Simulation Systems
CSCI 8240	Software Security and Cyber Forensics
CSCI 8245	Secure Programming
CSCI 8250	Advanced Cyber Security

CSCI 8260	Computer Network Attacks and Defenses
CSCI 8265	Trustworthy Machine Learning
CSCI 8350	Enterprise Integration
CSCI 8360	Data Science Practicum
CSCI 8370	Advanced Database Systems
CSCI 8380	Advanced Topics Information Systems
CSCI 8470	Advanced Algorithms
CSCI 8530	Advanced Topics in Robotics
CSCI 8535	Multi-Robot Systems
CSCI(LING) 8570	Natural Language Processing Techniques
CSCI 8610	Topics in Theoretical Computer Science
CSCI(MATH)(PHYS) 8612	Topics in Quantum Computation
PHYS(MATH)(CSCI) 8615	Quantum Information Science Seminar
CSCI 8650	Logic and Logic Programming
CSCI 8720	Advanced Computer Architecture
CSCI 8730	Advanced Topics in Operating Systems
CSCI 8740	Advanced Topics in Real-Time Scheduling
CSCI 8780	Advanced Topics in Distributed Systems
CSCI 8790	Advanced Topics in Data Intensive Computing
CSCI 8795	Advanced Topics in Cloud Computing
CSCI 8810	Image Processing and Computer Graphics
CSCI 8820	Computer Vision and Pattern Recognition
CSEE(CSCI) 8840	Advanced Image Analysis
CSCI 8850	Advanced Biomedical Image Analysis
CSCI 8860	Biomedical Informatics
CSCI 8920	Decision Making Under Uncertainty
CSCI(ENGR) 8940	Computational Intelligence
CSCI 8945	Advanced Representation Learning
CSCI(ARTI) 8950	Machine Learning
CSCI 8951	Large-Scale Optimization for Machine Learning
CSCI 8955	Advanced Data Analytics: Statistical Learning and Optimization
CSCI 8960	Privacy-Preserving Data Analysis
CSCI 8965	Internet of Things Security
CSCI 8990	Research Seminar
CSCI 9000	Doctoral Research
CSCI 9005	Doctoral Graduate Student Seminar
CSCI 9300	Doctoral Dissertation

C. Examples of Schools or Colleges of Computing

- School of Computer Science at Carnegie Mellon University (CMU): The CMU Computer Science department, which was housed within the science college, made the transition to the School of Computer Science (CMU SCS) in 1988. CMU SCS is a standalone academic organization led by a Dean, and it includes 7 departments ranging from Computational Biology and Computer Science to Machine Learning and Robotics.
- The Paul G. Allen School of Computer Science & Engineering at the University of Washington: In 2017, the University of Washington Board of Regents voted to create the Allen School, elevating the status of Computer Science and Engineering within the university and linking them in perpetuity with the internationally renowned investor, philanthropist, and computing pioneer. This school is part of the College of Engineering at UW. The school has roughly 80 full-time faculty and 100 technical and administrative staff members.
- Computing and Information Science at Cornell University: Cornell's Computer Science department is one of the first of its kind, founded in 1965. Today, more than a half-century later, Computer Science is part of Computing and Information Science (CIS), which was established as an academic unit in 1999. CIS is a standalone academic organization that has its own Dean. Currently, CIS comprises of three distinct but interconnected departments: Computer Science (CS), Information Science (IS), and Statistics and Data Science (DSDS).
- School of Computer Science, College of Computing at the Georgia Institute of Technology: The College of Computing at Georgia Tech is a standalone college, led by a Dean. It was formally established in 1990. In 2007, the College of Computing elevated two divisions to become the School of Computer Science and the School of Interactive Computing. In 2010, the College added the School of Computational Science and Engineering. The College of Computing now has three schools.
- School of Computer, Data & Information Sciences at the University of Wisconsin–Madison: The School of Computer, Data & Information Sciences (CDIS) is part of the College of Letters and Science at UW Madison. It brings together top-ranked departments of Computer Sciences, Statistics, and the Information School. CDIS was launched in late 2019 to serve the computing, data, and information needs of the UW-Madison campus, region, and society. The College of Letters & Science is home to the humanities, the natural, physical, and biological sciences, and the social sciences at UW-Madison.
- UC Irvine School of Information and Computer Sciences (ICS): ICS began as a department in 1968. More than 35 years later, it was formally recognized as a school. In June 2004, the School adopted benefactor Donald Bren's name in recognition of his generous contribution and visionary leadership. The school is led by a Dean and now includes three departments—Computer Science, Informatics, and Statistics.
- School of Computing at the University of Utah: The School of Computing (until 2000 the Computer Science Department) at the University of Utah belongs to the College of Engineering, which has several other engineering units such as Biomedical, Chemical, Civil and Environmental, Electrical & Computer, Material Science & Engineering, Mechanical, and other degree programs.
- School of Computing and Information at the University of Pittsburgh: The school was renamed the School of Computing and Information in 2017. It combines the School of Information Science with the Department of Computer Science and the Intelligent Systems Program (both from the Kenneth P. Dietrich School of Arts and Sciences).

- Indiana University School of Informatics, Computing, and Engineering: The Luddy School of Informatics, Computing and Engineering at Indiana University Bloomington includes the Department of Computer Science and four others, including the Department of Statistics. It is a standalone school led by a Dean. In 2005, the Department of Computer Science at IU Bloomington moved to the School of Informatics from the College of Arts and Sciences.
- School of Computing at Clemson University: The College of Engineering, Computing and Applied Sciences (CECAS) at Clemson is made up of 12 schools and departments. The School of Computing is within CECAS, and its faculty reside in one of four divisions—Computer Science, Visual Computing, Human-Centered Computing, and Faculty of Instruction. In 2007, the Department of Computer Science evolved to form the School of Computing.

D. Facilities and Equipment

Engineering Facilities

- The College of Engineering's physical infrastructure is spread across six different facilities across the Athens campus: the Driftmier Engineering Center, Boyd Graduate Studies Research Center (Boyd GSRC), Riverbend North, Riverbend South, the Whitehall facility, and the Interdisciplinary STEM Research Building 1. Future expansion in Boyd and I-STEM-2 are anticipated.
- The 110,000-square-foot Driftmier Engineering Center building is the primary instructional facility in the College, which is currently undergoing a three-phase renovation over a period of three years. Phases 1 and 2 have been completed, and Phase-3 renovation will begin in Summer 2021. Driftmier houses most of Engineering's classrooms, instructional labs including computer labs, fabrication facilities, auditorium, student success center, as well as some faculty and staff offices. Boyd primarily houses the School of Electrical and Computer Engineering's faculty offices, research laboratories, and some classrooms on the first and 7th floor. The Riverbend North and South buildings house the School of Chemical, Materials, and Biomedical Engineering's faculty office and research laboratories. The Whitehall Engineering Education and Research facility features large-scale research and testing facilities for all Engineering disciplines. The I-STEM building will provide research and collaborative space for Engineering faculty.

Classrooms and Instructional Labs

- The Driftmier building currently has over 24 classrooms and laboratories dedicated for instructional activities in the College of Engineering. The smallest of the classrooms has a seating capacity of 20, and the largest classroom has a seating capacity of 85. The building also houses two conference rooms (10 and 18 seats) as well as a large auditorium with a seating capacity of 125, which is used as for large-section courses. Additionally, there are four small student conference spaces also known as huddle rooms for promoting student collaborations and group study. Following is the list of instructional labs inside the Driftmier building:
  - Material Testing and Heat Transfer Laboratory
  - Systems Simulation Laboratory
  - Systems Design Laboratory
  - Mechanical, Thermal, and Fluid Systems Laboratory
  - Environmental and Biological Systems Laboratory
  - Tissue Culture Laboratory
  - Design and Discover Laboratory
  - Process Automation Laboratory
  - Measurement Systems Laboratory
  - Biochemical Processes Laboratory
  - Strengths Analysis Laboratory

Additionally, there are dedicated collaborative facilities and spaces for students to work together on group projects such as Capstone Design. A list of these facilities include:

- Design and Discovery Lab
- Student Fabrication Center
- Design Workshop
- Digital Prototyping Lab

- Fabrication (Machine) Shop

Computer Labs

- There are two sets of computer labs in the Driftmier building. The instructional computer labs, which are used for classes, are located in rooms 209, 219, 310, 312, 314, and 316. The general-use computer labs are not used as classrooms and are located in room 601 for graduate students and rooms 208 and 607 for undergraduate students.
- Undergraduate students receive 150 pages of free printing per semester for every Engineering class they are enrolled in. Students can also print 3' x 4' posters free of charge if it is related to their course project.

Research Labs

- The College of Engineering has over 50 research laboratory spaces directed by individual principal investigators as well as jointly administered by the College and the Centers or Institutes.
- The research institutes affiliated with the College of Engineering include the Engineering Education Transformations Institute, Institute for Resilient Infrastructure Systems, New Materials Institute, and the Georgia Informatics Institutes. The research centers housed in the college include the Center for Cyber-Physical Systems and Phenomics and Plant Robotics Center.

Computer Science Facilities

Faculty in the Department of Computer Science have offices in one of two buildings: Boyd Graduate Studies Research Center (Boyd GSRC) and Hardman Hall. Both buildings are located in close proximity to each other, and Department of Computer Science is housed in Boyd GSRC.

The Department of Computer Science administrative support staff consists of a Business Manager, two Administrative Specialists, a Grants Coordinator, and a Student Affairs Professional II. Each staff member has a dedicated office complete with desktop computer, printer, and filing cabinet. These offices are located in close proximity to each other, allowing for interaction between the employees.

The information technology (IT) support staff for the department consists of two members and has their own dedicated office area that is home to the departmental servers.

Graduate Teaching Assistants (GTAs) are assigned a desk, chair, and computer workstation in shared office space. Two primary GTA offices reside in the common area of the 2nd floor of Boyd GSRC, in close proximity to one of the departmental classrooms.

Classrooms and Instructional Labs

The Department of Computer Science has two dedicated lecture classrooms in Boyd GSRC: 208 and 306. Each classroom is approximately 700 square feet and holds up to 48 students. Also, in Boyd GSRC, a classroom in room 222 and a larger classroom in 328 are shared between Computer Science and Mathematics.

The Department of Computer Science has three dedicated teaching computer labs, also housed in Boyd GSRC: Boyd 201, Boyd 202, and Boyd 307A. These labs are equipped with modern workstation-type computers.

Computer Labs
The Department of Computer Science has multiple computer labs mainly used for instruction. All labs are housed in the Boyd building in rooms 201, 202, 307, and 307A. Boyd 307 is a general-purpose computer lab used by students for classwork, programming projects, and personal projects. A breakdown of the hardware in each lab can be found in the table below.

201 Boyd	30 Dell OptiPlex 7050 Towers with 22" monitors
202 Boyd	32 Dell OptiPlex 7450 AIO
307 Boyd	23 Dell 22" All-in-one OptiPlex 5260
307A Boyd	23 Dell 22" All-in-one OptiPlex 5260

Computing Equipment
The Department of Computer Science has several server-type computer systems housed in the Computer Science Data Center (206 Boyd) and some in the EITS Data Center. The computer servers support undergraduate and graduate instruction as well as research efforts. All of the department's teaching is done on Puma. Zeus and Artemis serve the labs. The virtualization servers handle instructional virtual machines for students. A complete list of the department's servers is below:

- **Puma** – Dell PowerEdge 740xd Main Instructional server hosting VMs ST: JNBN9N2
- **Cosmo** – Dell PowerEdge R730xd Virtualization host ST: 9S0HD42
- **Nova** – Dell PowerEdge R815 Virtualization host ST: C24B7Y1
- **Cscuda** – Dell PowerEdge T640 Cuda teaching server for graduate students ST: FMTHBZ2
- **Zeus** – Dell PowerEdge R730HD Windows Server ST: 9065d42
- **Wopr** – Dell PowerEdge R815 Virtualization Host ST: 620PTQ1
- **Kirk** – Dell PowerEdge R430 Cloud service server ST: 1GS1HB2
- **Artemis** – Dell PowerEdge R610 Windows Server ST: 8R1BHS1
- **Nike** – Dell PowerEdge R910 Legacy Instructional Server ST: FMTHBZ2
- **Ajax** – Dell PowerEdge R810 Faculty fileserver ST: 3RLM6Q1

Research Labs
In addition to facilities for instructional computing, the Department of Computer Science maintains a number of research laboratories. These laboratories are a mix of faculty-administered and Department-administered labs.

- *Cortical Architecture Imaging and Discovery (CAID) Lab:* The CAID lab's research mainly focuses on the discovery of structural and functional architectures of the cerebral cortex via brain imaging and computational modeling.
- *CUDA Research and Teaching Centers:* The Center offers researchers a dedicated lab with 24 Nvidia GeForce GTX 480 GPUs, a website with access to tutorials and learning resources, and hands-on training including but not limited to invitational seminars since 2012.
- *Data Intensive Pervasive Systems (DIPS) Lab:* Research in the DIPS lab focuses on Big Data, Mobile and Sensor Systems, Cloud Computing, Online Social Media, and the applications of the above technologies to various application domains.

- *Evolutionary Computing and Machine Learning (ECML) Lab:* Research in the Evolutionary Computation & Machine Learning (ECML) Lab is centered around Genetic and Evolutionary Algorithms, Machine Learning, and the intersection/cross-fertilization of the two fields.
- *Heterogeneous Robotics (HeRo) Lab:* HeRo lab conducts experimental and application-oriented research in heterogeneous robotics systems of varying functionalities and mobility capabilities. Specifically, the current research focus is on multi-robot systems, wireless networks, intelligent and intuitive teleoperation, human-robot interfaces, robotics applied in nuclear, radioactive, rescue, disaster, and challenging environments, and machine learning applications to multi-agent systems.
- *Intelligent Thought and Action Lab (THINC) Lab:* Research conducted in the lab has been funded by grants from the Air Force and Army Research Offices, National Science Foundation, National Institutes of Health, and industry.
- *Large Scale Distributed Information Systems Lab (LSDIS):* Over the years, LSDIS has been actively involved in research projects in the areas of Databases, Workflows, Information Integration, Web Services, and the Semantic Web initiative.
- *Network Systems and Security (NSS) Lab:* NSS research lab is focused on security problems present on the network or system level. The lab conducts research in each case hoping to mitigate/eliminate any problem, vulnerability, or attack.
- *RNA Informatics Group:* The RNA Informatics Research Lab at UGA is focused on developing computational tools and online servers for the prediction and annotation of non-coding RNA (ncRNA) genes and the prediction of protein tertiary structures.
- *Visual and Parallel Computing Lab (VPCL):* The goals of the VPCL are to undertake projects that advance the state of the art in the theory and applications of Visual Computing and Parallel Computing.

Engineering Research Labs and Facilities in Boyd GSRC

- *Computational Drug Discovery Lab:* Identifies drug candidates with existing computational tools, creates new computational drug discovery methods, and improves existing methodologies; builds models to simulate biological systems.
- *Design Informatics and Computational Intelligence Lab:* Works on projects related to quantitative analysis through lung models, computational simulations, and imaging data correlating to inflammation, disease, and aging.
- *Virtual Experiences Lab*: Develops novel virtual and augmented reality interfaces and experiences applied to problems in education, health, and the environment.
- *Sensorweb Research Lab:* Develops sensor web systems and applies this technology to critical scientific and engineering applications.
- *Complex Systems Control Lab:* Develops analytical tools for data-driven modeling of complex nonlinear systems, distributed model predictive control design methods for spatially interconnected systems, distributed coverage control algorithms for heterogeneous multi-agent systems, fog computing-based algorithms for distributed monitoring and control in cyber-physical systems, and new countermeasures based on statistical graph-theoretic methods.
- *Intelligent Power Electronics and Electric Machine Lab:* Develops efficient, secure, and resilient power electronics and electric machines for the next generation of smart grids and electrified transportation.

- *Lightwave and Microwave Photonics Lab*: Interdisciplinary photonics lab focusing on microwave and neuromorphic photonics, as well as fiber optic sensing for soft robotics and biomedical applications.
- *Bio-Sensing and Instrumentation Lab:* Develops innovative sensing and automation technologies for biological and food systems, contributing to providing safe and quality food in an efficient and sustainable way
- *Biophotonics/Bioimaging Lab:* Investigates novel applications of spectroscopic and laser-optical imaging techniques with a focus on fluorescent sensing.
- *Cardiorenal Systems Pharmacology Lab:* Develops and applies mathematical models of physiological systems to understand complex mechanisms of renal and cardiovascular control, disease progression, and pharmacology.
- *Boyd Research Makerspace:* Dedicated space for the manufacturing and assembly of research equipment.