Welcome to Boston University
Faculty of Computing & Data Sciences

Azer Bestavros

W. F. Warren Distinguished Professor of Computer Science
Associate Provost for Computing & Data Sciences
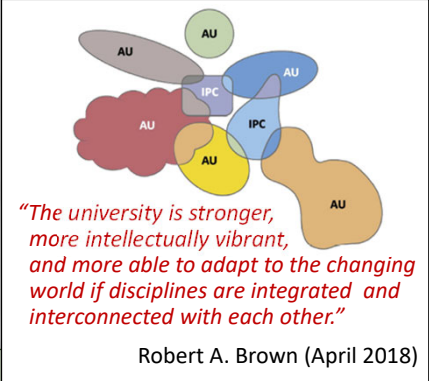
BOSTON UNIVERSITY

May 2023

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Boston University: By the Numbers (circa 2021)

- Institution: 4th largest private University in the US
- Alumni: 1st woman PhD; 1st African-American and 1st Native-American MDs
- Ranked: 27th best US colleges by WSJ/THE & 20th (3rd in MA) for excellence and employability
- Rated: 38th best by U.S. News & World Report for academic excellence and economic value
- Named: 17th best global college in Big Cities by Newsweek
- Member of the AAU elite set of 62 research universities (with Harvard & MIT from Boston Area)
- Size: 33,000 students; 3,850 faculty; 500 postdocs; 250 fields; 17 colleges
- Finances: $5.2B in assets; $1.6B endowment; $1.8B operating revenues
- Students: top 10 most ambitious and 12th most employable graduates in US
- Faculty: 4 Nobel, 2 Pulitzer, 47 Guggenheim, 32 Sloan, 24 AAAS, …
- Research Peaks: 12 BU Institutes, e.g., computing, health, neuroscience, …
- Research Funding: $575M BU and $150M BMC
- Industry: 200+ companies with BU-licensed products
- Urban Campus: Main Campus 135 acres; Medical Campus 80 acres
- Celebrities: Graham Bell; MLK; Geena Davis; Leonard Nimoy aka Spock!
- Fun Fact: Has only US spot where planes fly over cars over trains over boats

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Computing at BU: Decades in the making

Boston University Office of the President

Meet the President   Initiatives   Updates   Contact Us   Menu ☰

CATEGORIES   Columns   **Letters**   Reports   Speeches

Creation of the Faculty of Computing & Data Sciences

June 21, 2019

Dear Friends:

The world around us is becoming ever more interconnected and more engaged with ... and algorithms that are driven by machine learning, and which are based on ... ble activity. Student demand for education ...

"The university is stronger, more intellectually vibrant, and more able to adapt to the changing world if disciplines are integrated and interconnected with each other."

Robert A. Brown (April 2018)

Recent Milestones

2011: **Hariri Institute for Computing** is created as an incubator for data-driven research
2014: Provost launches the **Data Science Initiative** to grow data science faculty
2018: **President & Provost Taskforce** charged with envisioning the future of Data Science at BU
2018: BU announces plans for the new **Center for Computing & Data Sciences**
2019: **Faculty of Computing & Data Sciences** is created in response to DS Taskforce Report

BU COMPUTING & DATA SCIENCES
KEY MILESTONES

1983 Computer Science Degree Programs
1988 Cognitive & Neural Systems Program
1990 Computational Science Research Center
1995 Computer Engineering Degree Programs
2002 Center for Info & Systems Engineering
2005 RISCS Cybersecurity Research Center
2009 Massachusetts Green HPC Consortium
2011 Rafik B. Hariri Institute for Computing
2013 Mass Open Cloud Computing Initiative
2014 Software & Application Innovation Lab
2014 Provost Data Science Hiring Initiative
2015 MS in Statistical Practice Program
2016 Spark! Student Innovation in Computing
2017 Cyber Security, Law, and Society Alliance
2017 Artificial Intelligence Research Initiative
2018 MS in Artificial Intelligence Program
2018 Center for Computing & Data Sciences
2019 Faculty of Computing & Data Sciences

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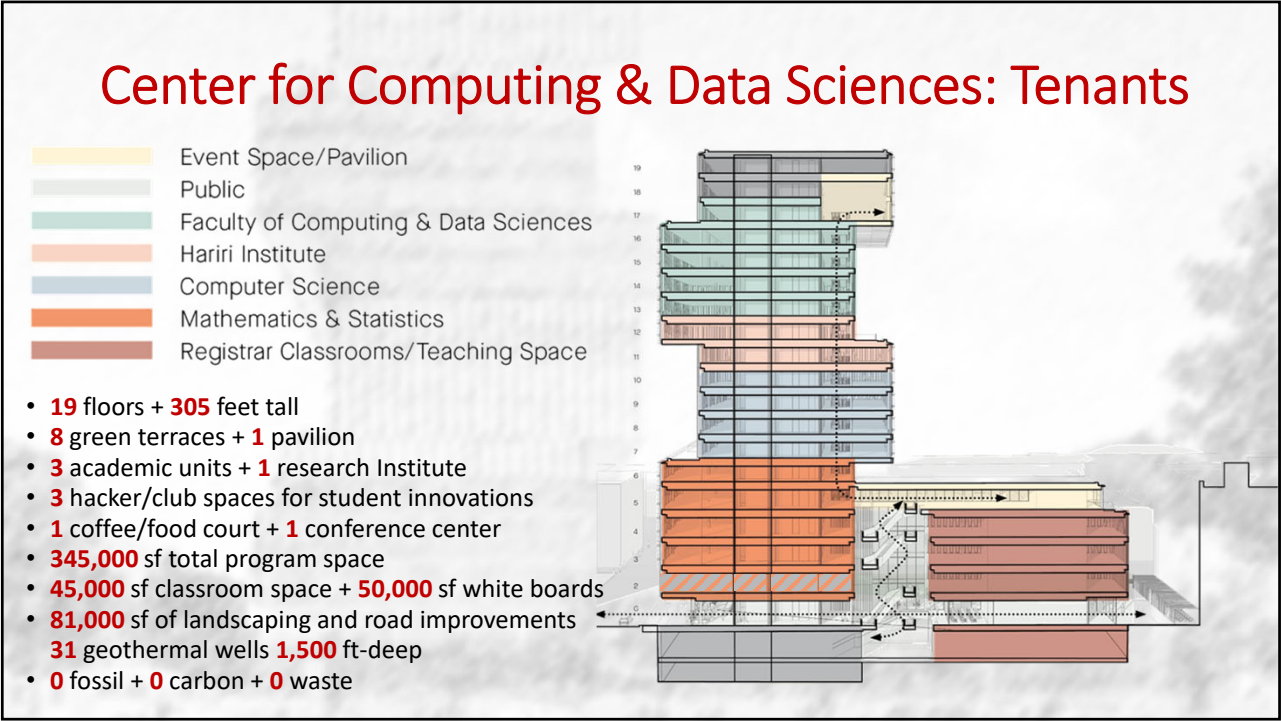## The <u>Center</u> for Computing & Data Sciences
Construction started Fall 2019 and completed Fall 2022

- Iconic 19 stories, 345,000 square feet of state-of-the-art classrooms, labs, and collaboration spaces at the heart of the Charles River Campus

- A major addition of prime campus space at the crossroads of the major corridors connecting key academic and residential centers of mass at BU

- Home for the Departments of Computer Science and Math & Stats, the Hariri Institute, and the Faculty of Computing & Data Sciences

➔ A bold statement about BU's commitment to data-driven discovery & innovation and to the vibrant academic experience for its students

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Center for Computing & Data Sciences: Tenants

Event Space/Pavilion
Public
Faculty of Computing & Data Sciences
Hariri Institute
Computer Science
Mathematics & Statistics
Registrar Classrooms/Teaching Space

- **19** floors + **305** feet tall
- **8** green terraces + **1** pavilion
- **3** academic units + **1** research Institute
- **3** hacker/club spaces for student innovations
- **1** coffee/food court + **1** conference center
- **345,000** sf total program space
- **45,000** sf classroom space + **50,000** sf white boards
- **81,000** sf of landscaping and road improvements
  31 geothermal wells **1,500** ft-deep
- **0** fossil + **0** carbon + **0** waste

5

6

7

8 more reasons to be proud

#1	Resilient Design – first floor 1.25' above University's Elevation for Resilience
#2	Energy Efficient – exterior sun shading + triple glazing + efficient systems
#3	Fossil Free & Carbon Free – no gas line: geothermal + 100% renewable energy
#4	Indoor Environmental Quality – connected spaces + access to daylight and views
#5	Outdoor Environmental Quality – 8 green roofs at terraces
#6	Embodied Carbon – over 13% reduction in emission from construction process
#7	Zero Waste – planned for TRUE Zero Waste Certification
#8	Climate Leadership – tracking LEED Platinum + model for future Boston buildings

BU's Most Sustainable Building

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Faculty of Computing & Data Sciences
Vision, Mission, and Progress

Azer Bestavros

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BOSTON UNIVERSITY

May 2023

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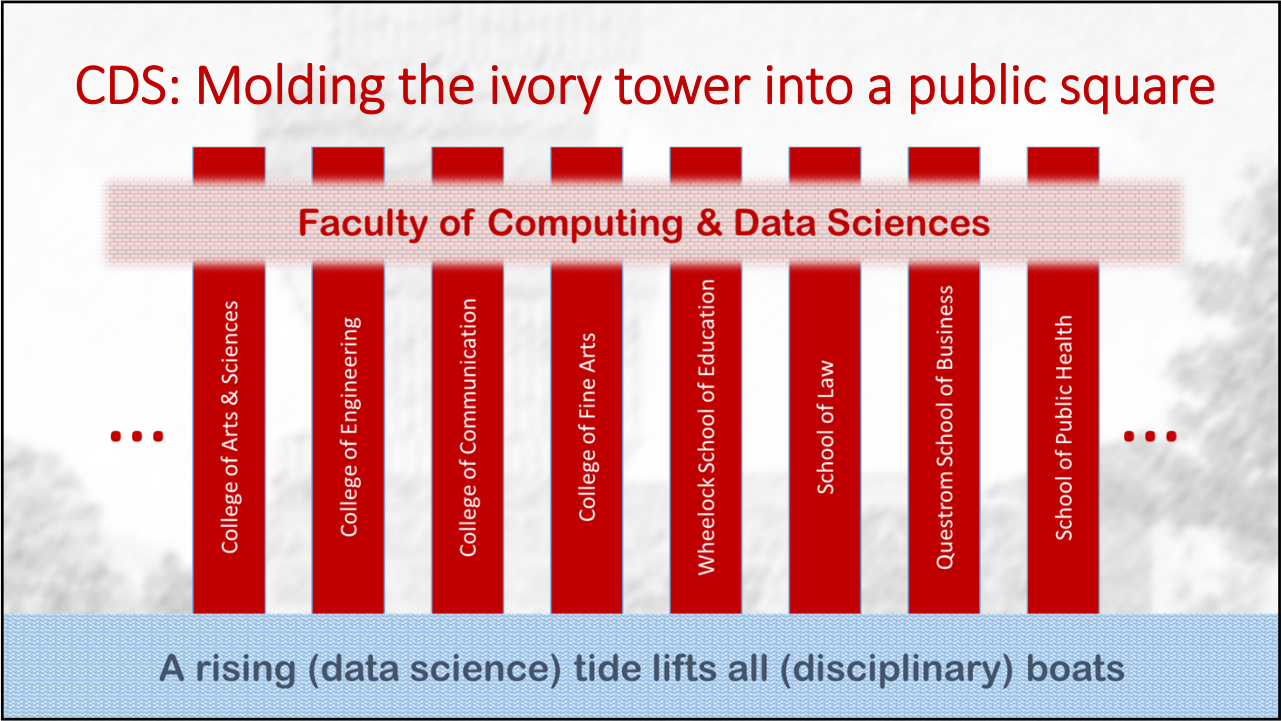# The <u>Faculty</u> of Computing & Data Sciences (CDS)
Launched Fall 2019

… where ivory tower meets public square

- Interdisciplinary, degree-granting academic unit with faculty appointed in CDS and jointly across BU

- Nationally unique organization as a cross-cutting unit under the Provost office -- not a department, not a division, not an institute, and not a school

- Porous organization that augments and connects traditional disciplines of computing & data sciences

➔ To democratize access by students, faculty, and organizations to data-driven innovation in computing & AI

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CDS: Molding the ivory tower into a public square

Faculty of Computing & Data Sciences

College of Arts & Sciences

College of Engineering

College of Communication

College of Fine Arts

Wheelock School of Education

School of Law

Questrom School of Business

School of Public Health

A rising (data science) tide lifts all (disciplinary) boats

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The Faculty of Computing & Data Sciences (CDS)

Vision:
We strive to improve the human condition by bringing computational and data-driven technologies, systems, and processes to bear on the greatest challenges of our world.

Mission:
We conduct cutting-edge research that matters to society; we provide students with rigorous education and vibrant academic experiences that unleash their innovative capacities; and we democratize access by learners, researchers, practitioners, and the public to the transformative power of computation and data.

Values:
We reward creativity and excellence; we recognize collaborative endeavors; we respect and trust each other; we celebrate our diversity of perspectives and lived experiences; and we uphold our moral and ethical responsibilities to the fullest.

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CDS: Academic Programs

Undergraduate Major in Data Science (launched Fall 2021, first matriculates in Fall 2022)
- Spiral approach for coverage of data science foundations (a.k.a. math on demand)
- Two pathways that equalize "methodological" and "in the field" tracks
- Focus on experiential learning and practicums (early and often) through BU Spark!

Graduate PhD in Computing & Data Sciences (launched in 2020, first cohort started in Fall 2021)
- Holistic admission to increase intake from broader (non-CS) backgrounds
- Two-year cohort model + Lab rotations = late-binding to build community and close skills gap
- Bioinformatics program integrated in CDS; degree conferred by CDS; first matriculates in Fall 2023

Undergraduate Minor in Data Science (launched Spring 2022)
- Two pathways: Basics of DS for non-STEM students + Depth in DS for STEM students
- Designed to serve either as a ramp or exit for applied data science disciplines

Graduate Professional MS in Data Sciences (launching Fall 2023)
- MS in Data Science, MS in DS + X, joint programs (e.g., BA/MS, JD/PhD, …), certificate programs
- On-line at scale upskilling and reskilling programs launching in 2024

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Integrative Pedagogy: Spiral DS Curriculum at BU

Algorithms   **Experiential**

Fluency: Design and implementation of DS pipelines → **Major in Data Science**

Competency: Concepts, methods, and tools of DS → **Data Science + X Degrees**

Literacy: Basic programming and data analysis → **Minor in Data Science**

Appreciation: Critical thinking with data → **Ramp to Data Science**

Mathematics   **Programming**

Widening the DS Pipeline
- Motivated by real-world applications
- No presumed exposure to math or CS
- No detached/standalone prerequisites
- Integrated social and ethical considerations

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CDS: Faculty Growth & Areas

1. **Transdisciplinary ML & AI:** Foundational research at the interface of algorithms, info theory, optimization, mathematics, stats, and basic sciences. Examples:
   - Learning Theory: Robust ML, Causal ML, Scientific ML, Info-theoretic ML, Quantum ML, *etc.*
   - Big Data Methods: Streaming/sublinear-time algorithms, Compressive sensing, Federated ML, *etc.*

2. **DS & AI in the Field:** Data mining, machine learning, and AI systems, inspired by concepts from, or addressing unique challenges in specific domains. Examples:
   - Health & Biomedical Sciences: CompBio, Bioinformatics, Precision Medicine, *etc.*
   - Environmental & Sustainability Sciences: Smart Grids, Geospatial ML, Green Computing, *etc.*

3. **Sociotechnical & Human-in-the Loop Systems:** Algorithms, protocols, and platforms that operate within legal, economic, and public policy frameworks. Examples:
   - Civic Tech: Secure/private/verifiable/trusted Computing, Countering mis/disinformation, *etc.*
   - Social Computing & AI: Mech Design, Meta Learning, Explainable/Fair ML, NLP, HCI, AGI, *etc.*

+ Clinical & Of the Practice Teaching Faculty in data science, machine learning, and AI

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CDS: Faculty Members – Tenure Stream **5**

Brian Cleary (PhD'19)
MIT, CompBio
TT Assistant Professor
Computational Biology
(joint with Biology & BME)

Kira Goldner (PhD'19)
U Washington, CS
TT Assistant Professor
Game Theory + Policy

Allison McDonald (PhD'22)
U Michigan, CS
TT Assistant Professor
Human-Centered Computing

Ngozi Okidegbe (LLM'19)
Columbia Law
TT Assistant Professor
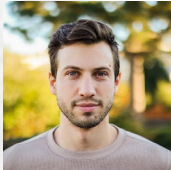**Law & Tech + Racial DS**
(joint with Law School)

Krzysztof Onak (PhD'10)
MIT, EECS
TT Assistant Professor
Big Data Algorithmics

Pawel Przytycki (PhD'18)
Princeton, CS
TT Assistant Professor
Bioinformatics

Mayank Varia (PhD'10)
MIT, Mathematics
Associate Professor
Cryptography + Law

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CDS: Faculty Members – Teaching Stream 2

Tanima Chatterjee (PhD'21)
U Illinois Chicago, CS
Clinical Assistant Prof.
Network Algorithms

A former software engineer and a Yale scientist looking at network anomalies from Biology to Politics, with a passion for undergrad teaching and mentorship

Kevin Gold (PhD'08)
Yale University, CS
Associate Prof. of the Practice
Machine Learning & AI

Former CS faculty at Wellesley and NEU with 15 years of industry experience as software engineer at Google and as a research scientist at MIT Lincoln Lab

Leonidas Kontothanassis (PhD'96)
U Rochester, CS
Professor of the Practice
Content Distribution

Industry veteran with 26 years of experience in the corporate world, most recently as senior engineering director at Facebook/Meta and Google

Langdon White (BS'97)
Siena College, CS
Clinical Assistant Prof.
Software Engineering

A 20+ year veteran of the software industry, the last 10 at Red Hat, having served as CTO, Chief Architect, and VP at companies from startups to Fortune 50

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CDS: Faculty Research "that matters"

Using viral load and epidemic dynamics to optimize pooled testing in resource constrained settings

Brian Cleary, James A. Hay, Brendan Blumenstiel, Maegan Harden, Michelle Cipicchio, Jon Bezney, Brooke Simonton, David Hong, Madikay Senghore, Abdul K. Sesay, Stacey Gabriel, Aviv Regev, Michael J. Mina
doi: https://doi.org/10.1101/2020.05.01.20086801

The Role of Computer Security Customer Support in Helping Survivors of Intimate Partner Violence

Yixin Zou and Allison McDonald, *University of Michigan*; Julia Narakornpichit, Nicola Dell, and Thomas Ristenpart, *Cornell Tech*; Kevin Roundy, *Norton Research Group*; Florian Schaub, *University of Michigan*; Acar Tamersoy, *Norton Research Group*

Reducing Inefficiency in Carbon Auctions with Imperfect Competition

Kira Goldner
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Brendan Lucier
Microsoft Research, Cambridge, MA, USA
https://www.microsoft.com/en-us/research/people/brlucier/
brlucier@microsoft.com

Protecting Cryptography Against Compelled Self-Incrimination

Sarah Scheffler and Mayank Varia, *Boston University*

A transcriptional switch governs fibroblast activation in heart disease

Michael Alexanian, Pawel F. Przytycki, Rudi Micheletti, Arun Padmanabhan, Lin Ye, Joshua G. Travers, Barbara Gonzalez-Teran, Ana Catarina Silva, Qiming Duan, Sanjeev S. Ranade, Franco Felix, Ricardo Linares-Saldana, Li Li, Clara Youngna Lee, Nandhini Sadagopan, Angelo Pelonero, Yu Huang, Gaia Andreoletti, Rajan Jain, Timothy A. McKinsey, Michael G. Rosenfeld, Casey A. Gifford, Katherine S. Pollard, Saptarsi M. Haldar & Deepak Srivastava

Nature 595, 438–443 (2021) | Cite this article

Scalable Fair Clustering

Arturs Backurs, Piotr Indyk, Krzysztof Onak, Baruch Schieber, Ali Vakilian, Tal Wagner *Proceedings of the 36th International Conference on Machine Learning, PMLR 97:405-413, 2019.*

Discredited Data

Cornell Law Review, Vol. 107 (2022 Forthcoming)

Posted: 28 Apr 2021

Ngozi Okidegbe
Yeshiva University - Benjamin N. Cardozo School of Law

The Democratizing Potential Of Algorithms?

Connecticut Law Review, Forthcoming 2021
Cardozo Legal Studies Research Paper No. 655

50 Pages · Posted: 28 Apr 2021 · Last revised: 25 Aug 2021

Ngozi Okidegbe
Yeshiva University - Benjamin N. Cardozo School of Law

Technology and Engineering Emmy® Award Winner

Leonidas Kontothanassis

★★★★★

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Codifying Collaboration & Citizenship

Excerpts from tenure and promotion criteria for CDS

1. **Scholarship = Collaborative Research Impact**
   "Evidence of research impact includes collaboration with researchers and/or practitioners from different disciplines leading to tangible outcomes, exemplified by cross-disciplinary citations to published works, use of software tools or data by researchers or practitioners from different communities, impact on industry standards, public-interest technology platforms, policy frameworks, among others."

2. **Teaching and Service = Citizenship in University and Civic Society**
   "Evidence of excellence in community building and outreach includes a track record of catalyzing broad collaborations among diverse stakeholders from inside the university as well as from the outside, in support of the broader societal impacts of and public interest in computing and data sciences."
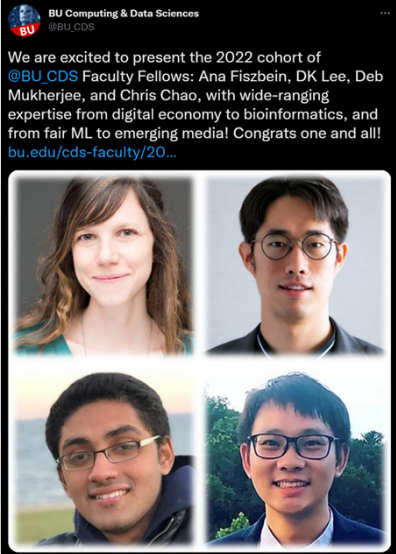
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CDS: Connecting Tissue for BU Faculty

CDS Faculty Fellows Program

"To provide newly recruited faculty in various disciplines at BU with opportunities for connecting with CDS faculty and programs."

CDS CHASS Initiative

"To create a faculty network that promotes the use of computational and data-driven methods in disciplines that have not been traditionally associated with computing and data sciences."

CHASS
Computational Humanities, Arts & Social Sciences

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CDS: Connecting Tissue for BU Curricula

CDS Teaching Rotation Program

"To facilitate collaboration across units aimed at disseminating best practices around data science teaching. It will broaden participation in data science instruction at BU, and through that participation bring high-quality data science course experiences to students both in CDS and in the faculty member's home department."

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CDS = Computing *for* Real-world Impact
Hubs for impact on Health, Sustainability, Equity, and Civic Tech
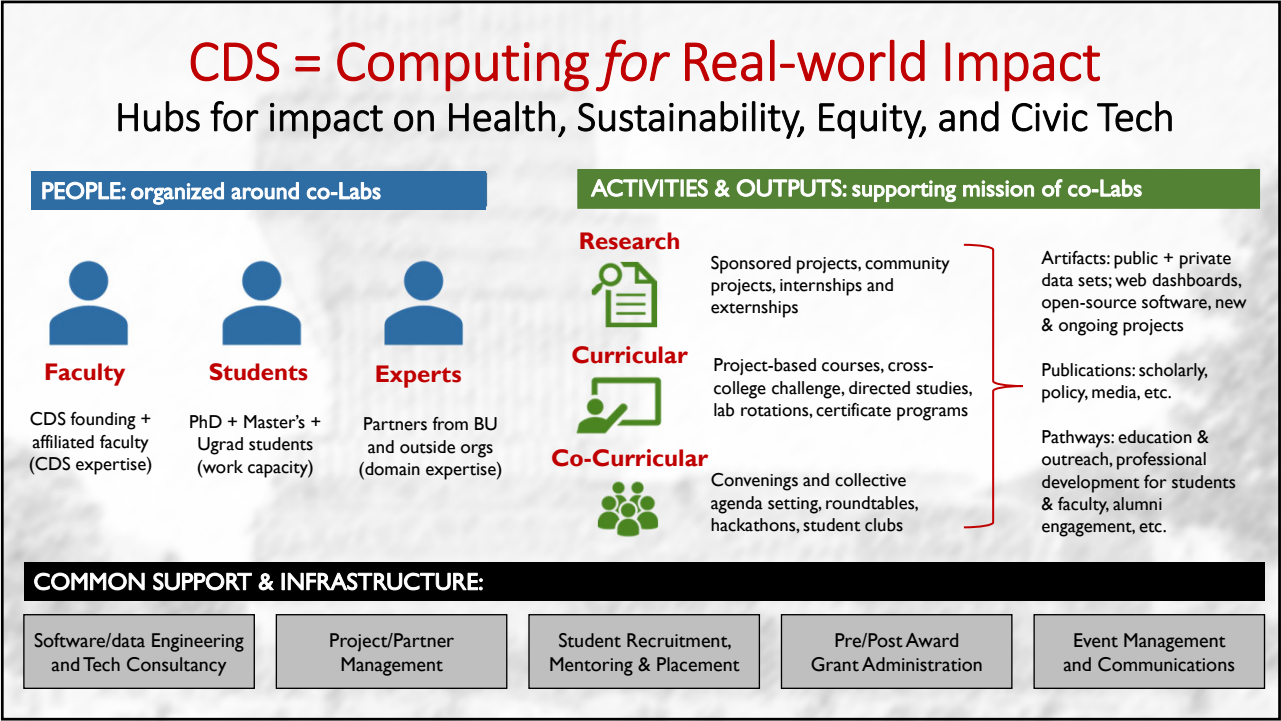
PEOPLE: organized around co-Labs

Faculty
CDS founding + affiliated faculty (CDS expertise)

Students
PhD + Master's + Ugrad students (work capacity)

Experts
Partners from BU and outside orgs (domain expertise)

ACTIVITIES & OUTPUTS: supporting mission of co-Labs

Research
Sponsored projects, community projects, internships and externships

Curricular
Project-based courses, cross-college challenge, directed studies, lab rotations, certificate programs

Co-Curricular
Convenings and collective agenda setting, roundtables, hackathons, student clubs

Artifacts: public + private data sets; web dashboards, open-source software, new & ongoing projects

Publications: scholarly, policy, media, etc.

Pathways: education & outreach, professional development for students & faculty, alumni engagement, etc.

COMMON SUPPORT & INFRASTRUCTURE:

Software/data Engineering and Tech Consultancy	Project/Partner Management	Student Recruitment, Mentoring & Placement	Pre/Post Award Grant Administration	Event Management and Communications

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CDS Hub for Civic Tech Impact
Tools, Software, and Algorithms for Better Governance

BU Today
News, Opinion, Community

CYBERSECURITY

US Reps Stephen Lynch, Ayanna Pressley Tout ECASH Bill for Those Shut Out of Digital Transactions

Computing & Data Sciences faculty offer direction for design, privacy, and security at BU event

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Justice Media & Computational Journalism co-Lab

COLLABORATING ENTITIES:

BU Boston University Faculty of Computing & Data Sciences

BU Boston University College of Communication

PARTNERS:

WGBH   THE BAY STATE Banner

The Boston Globe   The Intercept_   LexisNexis

ACTIVITIES:

Curricular

XCC 433: Justice Media Computational Journalism Course
- CDS/ CS/CE/ COM Students
- 4 Hub Units (Writing Intensive)
- Investigative computational journalism projects with partners

Co-Curricular

Curricular and Co-Curricular: Data Science and ML Projects (2018-2020)
- Federal prosecutorial misconduct (The Intercept)
- State procurement contracts & Black businesses (WGBH)
- Police Payroll (WGBH)
- Police campaign contributions (The Globe & Banner)
- Real Estate in Boston's Minority Neighborhoods (Baystate Banner)

Co-Curricular: Summer Bootcamp & Externship Program (Summer 2020)

Research

Research: Racial bias in media coverage (AIEM, WGBH, NAACP)

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Responsible Use of Data co-Lab

"BU is standing up a phenomenal new center for computing and data science. Its students have skills, knowledge, and experience that can benefit our growth as well."
— Adam Fox, Head of Data at MassMutual

Sections   **BU Today**   Search
News, Opinion, Community

UNIVERSITY NEWS

MassMutual Donates ~~$1~~ $4 Million to BU's Faculty of Computing & Data Sciences

Gift will fund a professor with real-world expertise, boost diversity efforts in the field, and award undergraduate stipends

MassMutual
@massmutual

We are pleased to announce a $1 million gift to the Boston University Computing & Data Sciences Center to hire a faculty member with real-world expertise, boost diversity efforts in the field, and award externship stipends to students. Learn more here: spr.ly/6010ysmBQ.

.::. MassMutual

10:29 AM · Aug 24, 2021 · Sprinklr

MassMutual
@massmutual

As part of our efforts to advance #datascience in MA, we're committing an additional $3 million of funding to the @BU_Tweets Faculty of Computing & Data Sciences. Together, we'll develop the tools and software critical for a healthy civic society.

" We are committed to prioritizing the rights, privacy, and ownership of our customers and policyowners. The students and faculty at Boston University's CDS share these common goals of transparency, fairness, and respect with data usage."

Adam Fox
Head of Data   Live Mutual

.::. MassMutual

12:20 PM · Sep 21, 2022 · Sprinklr

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CDS: Vision, Mission, and Progress
By Azer. Bestavros
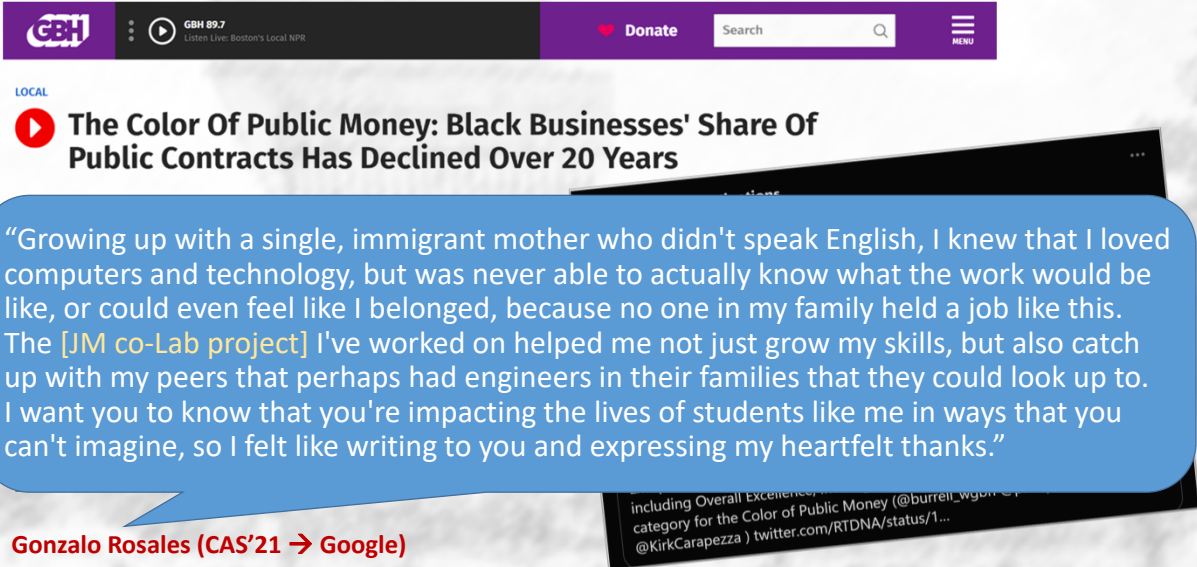
Powered by BU SPARK!

Building community, supporting student-driven innovation and experiential learning opportunities in computing & data sciences

2848+ students **725+** semester projects **7** courses **260+** innovation fellows
60+ mentors **10+** resident experts **25** student clubs **4** hackathons (AY 2022/23)

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CDS: Vibrant Experiences & Impact

The Color Of Public Money: Black Businesses' Share Of Public Contracts Has Declined Over 20 Years

"Growing up with a single, immigrant mother who didn't speak English, I knew that I loved computers and technology, but was never able to actually know what the work would be like, or could even feel like I belonged, because no one in my family held a job like this. The [JM co-Lab project] I've worked on helped me not just grow my skills, but also catch up with my peers that perhaps had engineers in their families that they could look up to. I want you to know that you're impacting the lives of students like me in ways that you can't imagine, so I felt like writing to you and expressing my heartfelt thanks."

Gonzalo Rosales (CAS'21 → Google)

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CDS: By the Numbers (FY 2023)

Faculty & Research

- 3 rounds of faculty searches, yielding 11 core hires: 6 tenure-track (3 women); 1 tenured; 2 joint
- 47 faculty members with appointments in or affiliated with CDS from 24 departments in 11 schools
- 2 endowed professorships in AI and in Environmental DS and 3 endowed PhD fellowships established
- Governance transitioned in 2022 from 30+ founding members to 25 faculty with appointments in CDS
- $4M gift from MassMutual ($2M in endowment) to set up co-Lab on Responsible Use of Data
- $3M of grants and contracts from NSF, foundations, and industry supporting Civic Tech

Students & Curriculum

- 17 students (60% domestic; 54% women) in the PhD program in Computing & Data Sciences
- 78 F'22 matriculants in the Data Science BS program (46% women; 23% first gen; 15% URG)
- 194 majors (39% women) in DS; 63 minors in DS (49% women) from 19 different programs
- 56 undergraduate courses in inventory; 30 offered in AY'23 (12 in F'22 and 18 in S'23)
- 950 (576) undergraduate students enrolled (seats filled) in S'23 (F'22)

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LinkedIn bucds.fyi/linkedin
Twitter @bu_cds
Instagram @bu_cds
Email cds-ap@bu.edu
Facebook @bu.cds
Web bu.edu/cds

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CDS: Vision, Mission, and Progress
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