Centering women of color in STEM

Where women from historically excluded groups do (and don't) complete physics degrees in the US and UK

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The project

Four teams; 3 in the US, 1 in the UK

Goal: Create a portal where users can look up institutions' graduation rates of women in from historically excluded groups in physics, math and computer science, compared with:

1. Their wider population of women from these groups
2. Other institutions

Long-term goal: Add other countries to the data set

This presentation

1. Background on the US data
2. Sneak peek at what will be available on the US portal
3. Sneak peak at the UK portal
4. Illustration of how data available in UK and US differ
5. Big picture: questions and insights that can emerge from the data on this portal

US data

Data

- 12 years (2008-2019) of data from the Integrated Postsecondary Education Data System (IPEDS)
  - Race, gender, majors of Bachelor's degree recipients for each institution
  - Selected Physics, Math, and Computer Science
  - Excluded any program that averaged < 1 major/year

Definitions

- Women of Color (WoC)
  - women classified in the IPEDS data base as American Indian or Alaska Native; Asian; Black or African American; Hispanic or Latino (of any race); Native Hawaiian or other Pacific Islander; and two or more races
- Historically Excluded Minority (HEM) Women
  - women classified in the IPEDS data base as Black or African American; Hispanic or Latino (of any race); or American Indian or Alaska Native

What do the data look like?

US data

	Physics	Math	Computer Science
Number of institutions	748	1,266	1,403
Total number of degrees	80,962	283,461	575,533
Women	16,222 (20%)	118,606 (42%)	106,691 (19%)
Women of Color	3,581 (4%)	29,303 (10%)	43,320 (8%)
Historically excluded minority women	1,760 (2%)	14,952 (5%)	22,595 (4%)

How do we compare institutions?

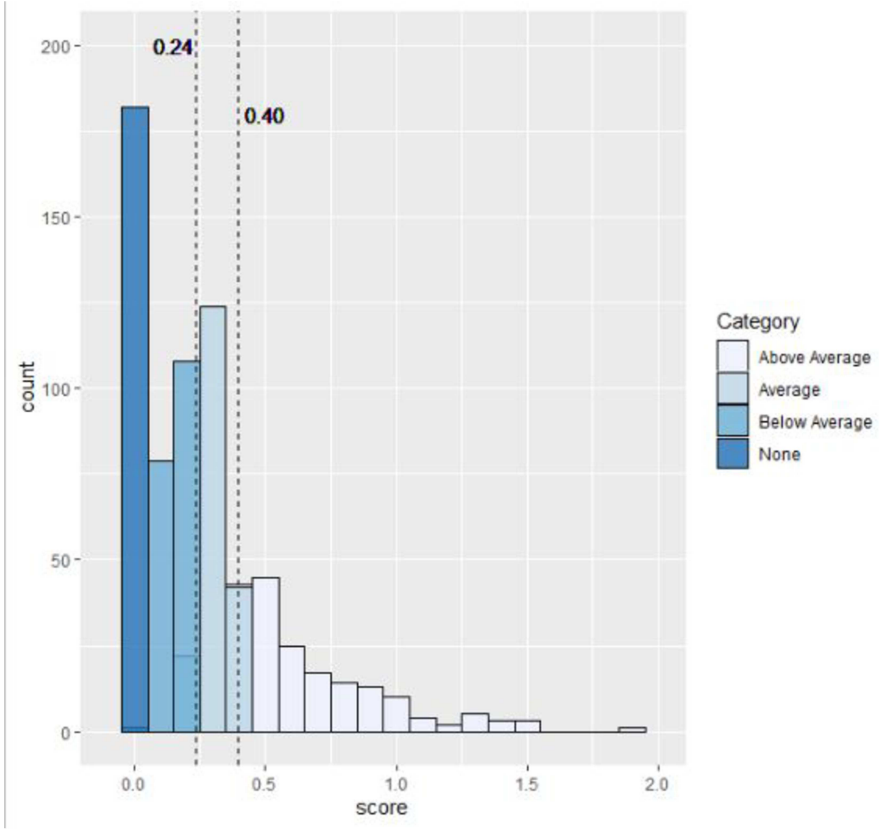
- Number of physics degrees earned by women of color
  - Normalize by size of department
  - Normalize by ratio of women of color at institution

$$Score_{WoC\ phys} = \frac{\left(\frac{n_{WoC\ phys\ degrees}}{n_{phys\ degrees}}\right)}{\left(\frac{n_{WoC\ inst\ degrees}}{n_{inst\ degrees}}\right)}$$

US data

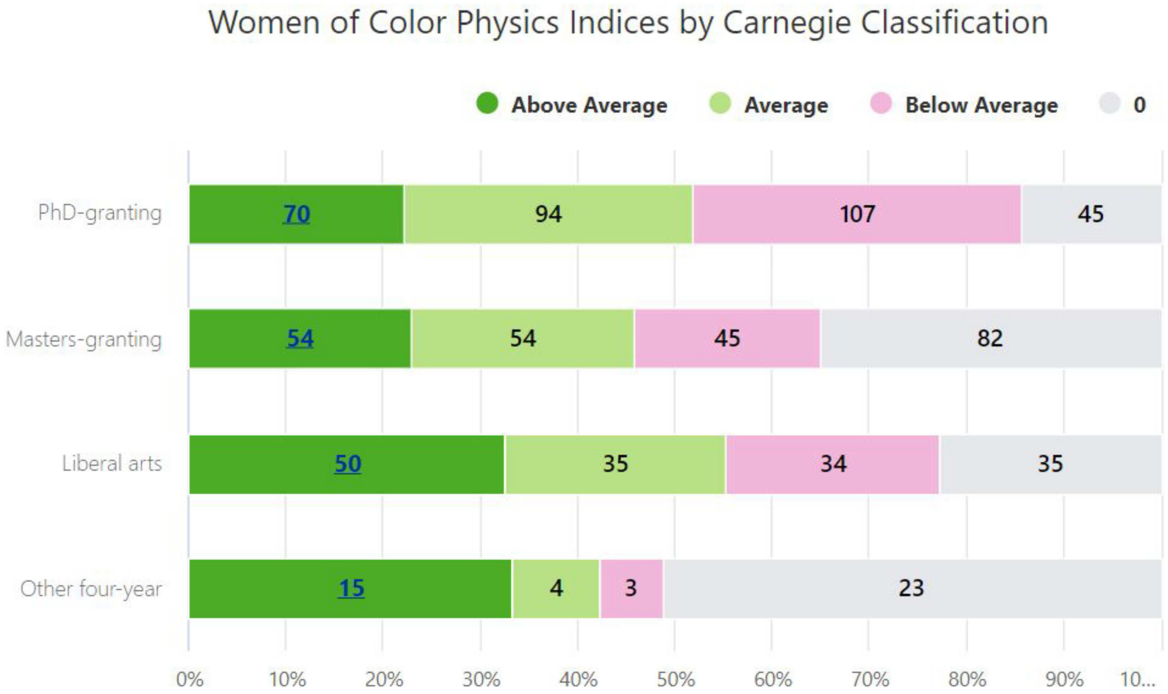
Example: Women of Color in Physics

- 747 physics departments
- Possible categories
  - None (182)
  - Below Average (188)
  - Average (188)
  - Above Average (189)

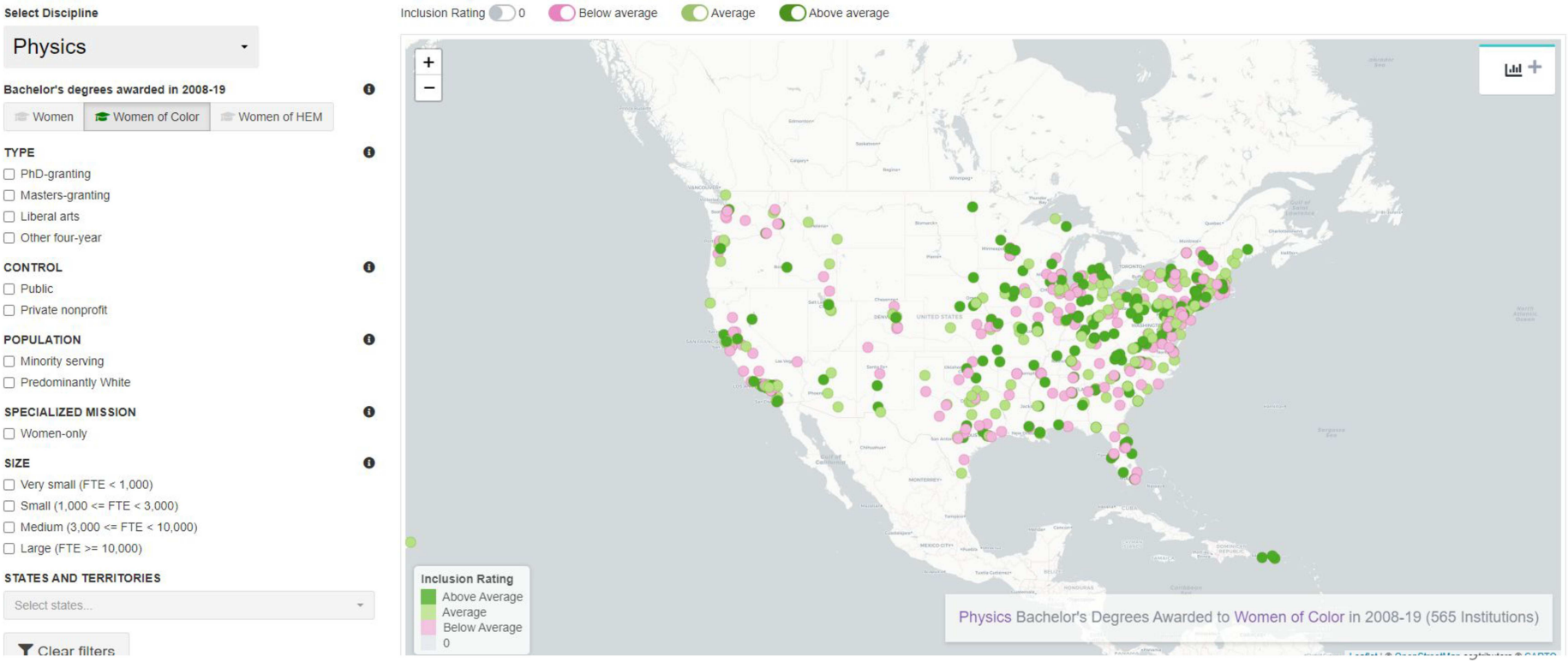


Portal: Compare Trends

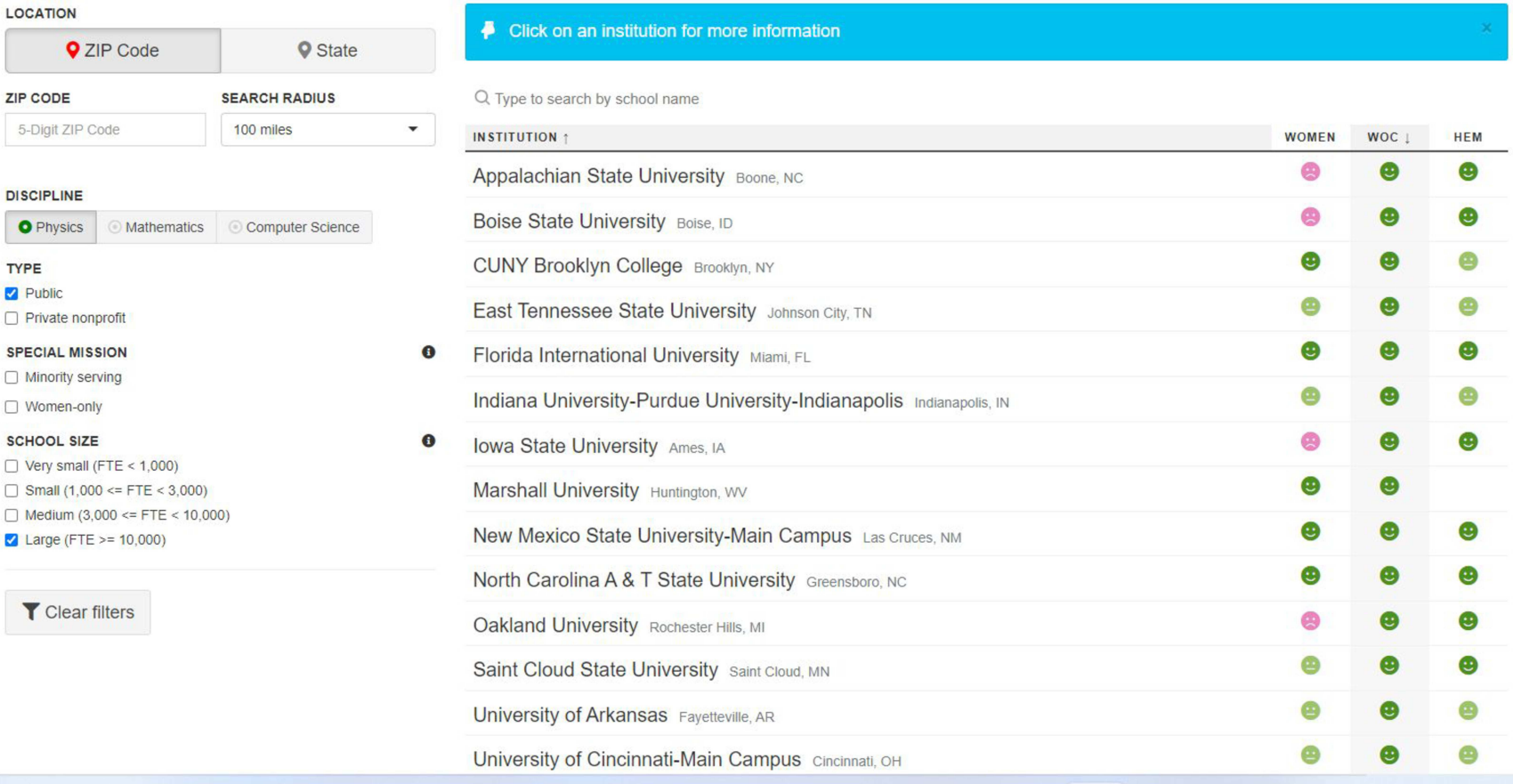
US data



Portal: Compare Institutions Map



Portal: Compare Institutions Chart

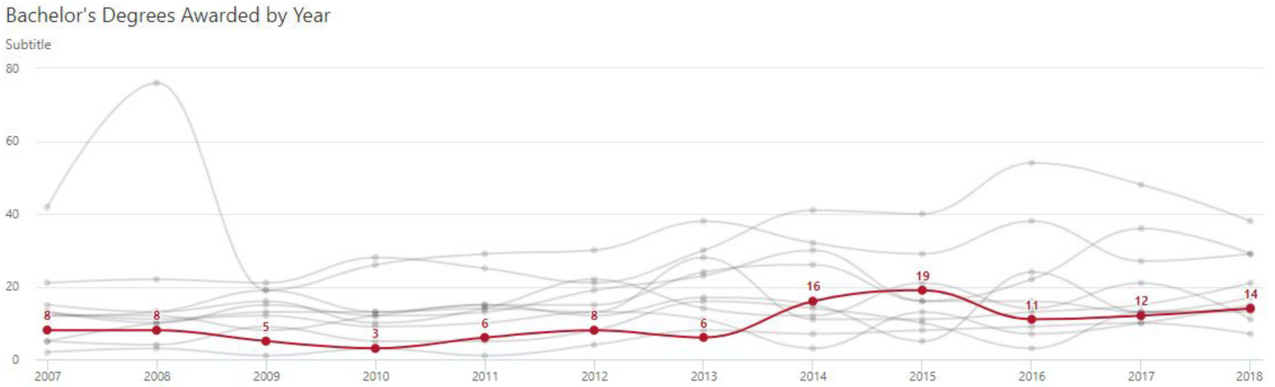


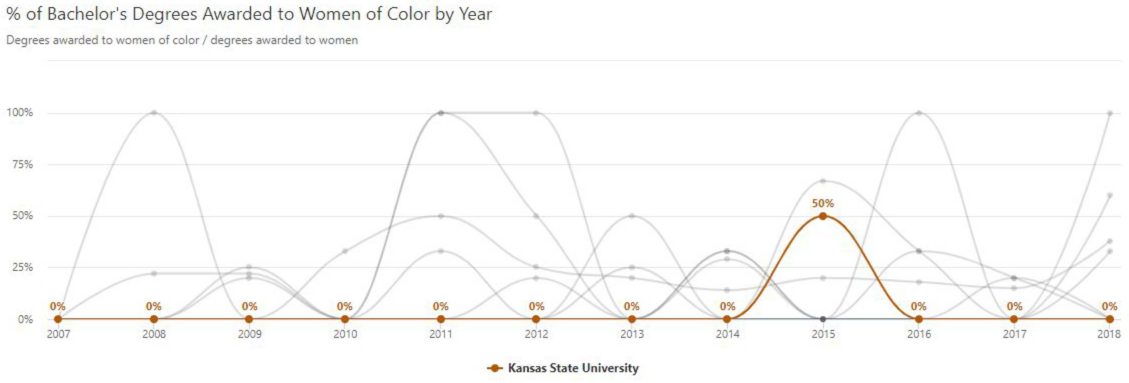
Portal: Compare institution raw data

Kansas State University

Physics degrees awarded in 2008-19

Peer Group
Auburn University
Clemson University
Colorado State University-Fort Collins
Iowa State University
Louisiana State University and Agricultural & Mechanical College
North Carolina State University at Raleigh
Oklahoma State University-Main Campus
Oregon State University
University of Massachusetts-Amherst
Washington State University





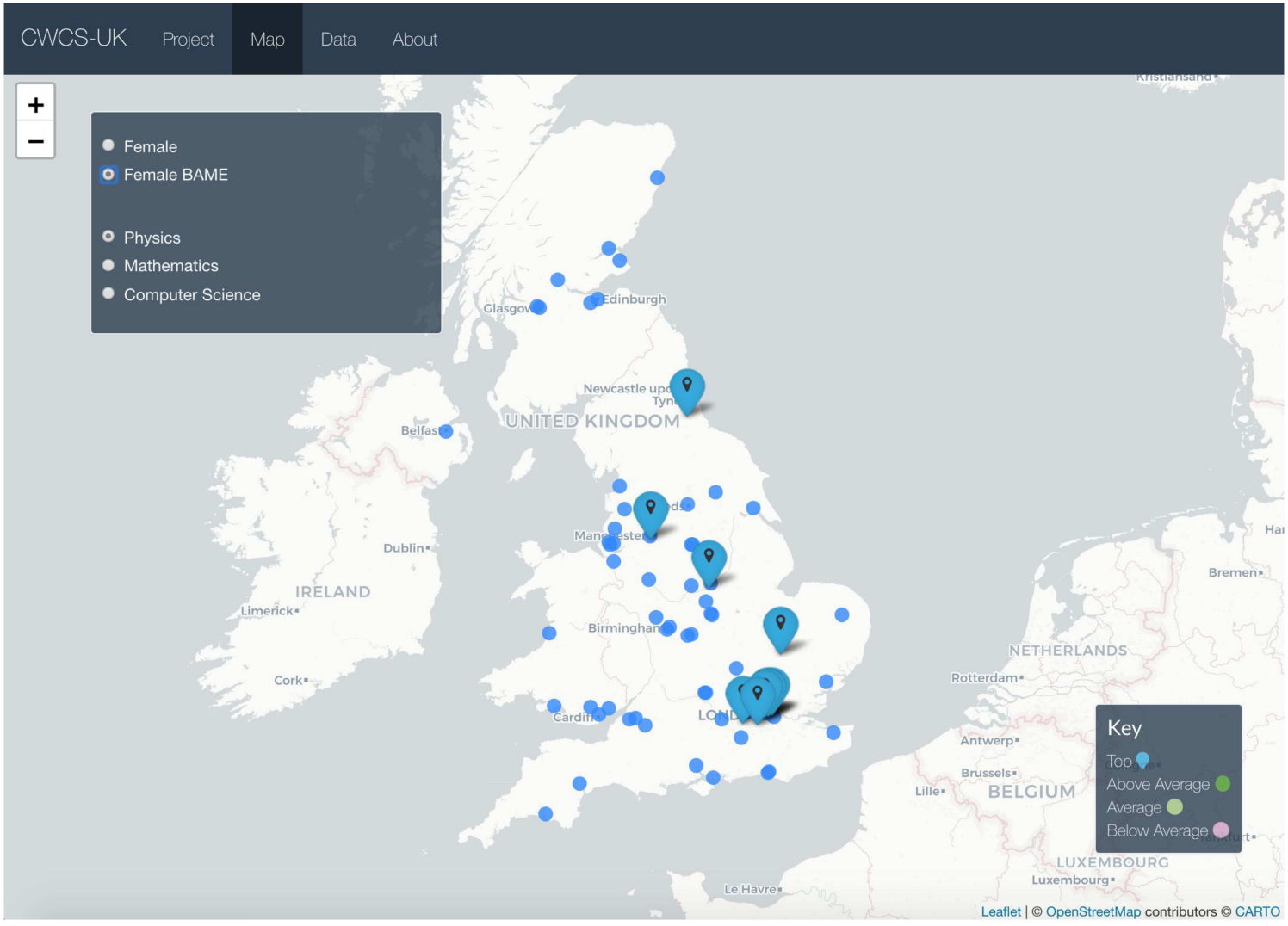
- Female
- Female BAME

- Physics
- Mathematics
- Computer Science

AthenaSwanUniversityNumber	JunoNumber	DepartmentFBAMEpaScore	UniversityScoreFBAME	FacultyFBAMEpaScore	JobsScorepa
0.05	0.05	0.17	0.17	0.17	0.17

Search:

Provider	Score	AthenaSwanUniversityNumber	JunoNumber	DepartmentFBAMEpaScore	UniversityScoreFBAME	FacultyFBAMEpaScore	JobsScorepa	FBAMEGappaScore	NSSScore
Imperial College of Science, Technology and Medicine	5	★★★		↑	↑	–	–	↑	–
King's College London	5	★★	Champion	↑	↑	–	–	↑	–
Kingston University	5	★★		↑	↑		↑	↑	–
Queen Mary University of London	5	★★★	Champion	↑	↑	–	–	↑	–
Royal Holloway and Bedford New College	5	★★	Champion	↑	↑	–	–	↑	↑
The University of Cambridge	5	★★★	Champion	↑	–	–	↑	↑	
The University of Manchester	5	★★	Champion	↑	↑	–	–	↑	–
University College London	5	★★	Champion	↑	↑	–	–	↑	–
University of Durham	5	★★	Champion	↑	–	–	–	↑	↑
University of Nottingham	5	★★★	Champion	↑	↑	–	–	↑	
Cardiff University	4	★★	Champion	↑	–	–	–	↑	–
Keele University	4	★★	Supporter	–	↑	–	–	↑	
Loughborough University	4	★★		↑	–	–	–	↑	↑
The Nottingham Trent University	4	★★		↑	↑	↑	–	↓	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Female BAME
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Computer Science
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Edinburgh
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UNITED KINGDOM
Belfast
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Limerick
Cork
Manchester
Birmingham
Cardiff
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Bremen
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Antwerp
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Centering Women of Colour in Science

Back to 'Engineering and Physical Sciences'

Women of colour are deeply underrepresented in some STEM disciplines at the undergraduate level, principally physics/astrophysics/astronomy, computer science, math, aerospace engineering, civil engineering, electrical engineering and mechanical engineering.

Women who persist in these fields, especially women of colour, experience isolation, microaggressions and sexual harassment (Barthelemy, McCormick, & Henderson, 2016; Gonsalves, Danielsson, & Pettersson, 2016; Johnson, Ong, Ko, Smith, & Hodari, 2017). However, little is known about the finer details of this underrepresentation: for example, the kinds of institutions where women of colour are markedly underrepresented and those in which they thrive; institutional policies and practices that lead to inclusive cultures; benchmarks about what constitutes an above-average departmental performance of intersectional inclusion. We are using quantitative analyses of physics graduation rates of women of colour at US and UK universities to create a portal of publically available data.

This project is a collaborative effort between the US and the UK.

The overarching goal of this project is:

> To create a portal through which data on STEM graduation rates of women and women of colour at US and UK universities can be accessed.

There are three measurable objectives we will use to achieve this overarching goal. They are to:

1. Compile US and UK institutional graduation data, by race and gender, for physics/astrophysics/astronomy, computer science, and mathematics and statistics.
2. Build a public interface to allow users to access the data;
3. Collect user analytics to improve the database.

Funding

This project is funded by the UKRI and ESRC and based at the University of Birmingham.

Further information

SBE-UKRI summary - Centering Women of Color in STEM: Data-Driven Opportunities for Inclusion

National Science Foundation summary - Centering Women of Color in STEM: Identifying and Scaling Up What Helps Women of Color Thrive

Additional pages:

1. Explanation of data analysis
    a. Data explanation for maths people
    b. Data explanation for educationalists
    c. Real-life data explanation
2. Useful links
    a. Blogs and vlogs created by (BAME) females in STEM fields
    b. Organisations, Professional groups, and resources for (BAME) females in STEM fields
3. Literature
    a. Global literature on (BAME) women in STEM
    b. UK literature on (BAME) women in STEM

What we can do with this data?

Insights

For women searching for a good academic home, as a student or faculty member:

- Institutions' numbers do not necessarily indicate an inclusive or exclusive climate; however, they can complement what you find by talking with members of the departments you are considering

Insights

For researchers–I have so many ideas!

- From the 75 year old mother of one of the PIs: “How do institutions get away with the zeros?”--having no women of color, or in ten cases no women at all, over an 11 year time period.
- How do the faculty in those institutions explain this? How do the students explain it?
- Are there patterns among these institutions that would help us identify the dynamics of exclusion?

Insights

For researchers

- What are the institution types that graduate higher rates of women from historically excluded groups? Why do these types of institutions have higher rates? Are there any practices or policies that can be adopted by other institutions?
- Are there policies or practices shared among particular institutions with higher graduation rates that can be adopted more widely? (similar to the TEAM-UP insights)
- Are there features (number of women faculty, for instance) that correlate with graduation rates of women from historically excluded groups?

The beta version of the Portal!

Please excuse the clearly-under-construction nature of the portal itself. You can read more about it–and get to the data–here:

https://www.zaposa.com/home2/centering-women-of-color-in-stem

Acknowledgements

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