# Analysis of Current and Future Computer Science Needs via Advertised Faculty Searches for 2023

Craig E. Wills
Computer Science Department
Worcester Polytechnic Institute
WPI-CS-TR-22-07
December 2022

**Abstract**

This work uses the same methodology applied over nine years to study where Computer Science departments are choosing to invest faculty positions using data obtained from advertised tenure-track searches for the current hiring season. While the number of and areas for faculty searches does not necessarily translate into the same for faculty hires, we believe that they provide insight into current and future needs within the discipline.

We analyzed ads from 437 institutions seeking to fill close to 1000 tenure-track faculty positions in Computer Science. The number of institutions is a 9% increase from last year at this time (mid-November) and is the highest number institutions searching in the nine years of this study. The previous high was 409 for hires to begin in 2019. The number of tenure-track positions sought is up 9% from last year and also at a nine-year high. The number of BS/BA institutions seeking faculty is at an nine-year high with top PhD and private PhD institutions at nine-year highs in the number of positions being sought.

We clustered the specific Computer Science topics mentioned in ads into 16 areas. In terms of specific areas, we found that the clustered area of Security accounts for the most with 19% of all sought positions with AI/Data Mining/Machine Learning dropping to second at 18% The area of Data Science is at 12% of positions, but aggregating the Data Science, AI/DM/ML and Databases clusters results in 30% of all hires sought in these data-oriented areas, which is a bit lower than previous years. The area of Systems/Networking was fourth in the percentage (10%) of positions sought.

Differences are also seen when analyzing results based on the type of institution. As was the case last year, positions in the clustered area of AI/Data Mining/Machine Learning have the highest percentages for PhD institutions. Again positions related to Security have the highest percentages for MS and BS/BA institutions. Security is the second-most sought area for PhD institutions while AI/Data Mining/Machine Learning is the second-most sought area for MS and Systems/Networking for BS/BA institutions.

# 1 Introduction

The number of faculty searches in Computer Science during this hiring season for tenured and tenure-track positions starting in 2023 again affords the opportunity to study areas of Computer Science where departments are choosing to invest in new faculty hires. This is the ninth such report detailing results from a study of faculty hiring ads in Computer Science. It uses a similar methodology as done in previous years [1, 2, 3, 6, 8, 9, 10, 11, 13]. The longitudinal aspect also allows insight into the number of positions and the areas being sought over time.

The focus of this work has always been to study where departments specifically, and the discipline more generally, are choosing to invest precious tenure-track faculty positions. It is an opportunity to understand where Computer Science departments think they are in terms of current needs as well as where they think they are going. It is also an opportunity to see how many institutions are searching and for how many positions.

With this focus, there are a number of caveats to our study:

1. Our study is not exhaustive in that it does not necessarily take into account all searches currently underway for this hiring season. We describe the methodology used to discover ads, but ads may have been only placed in other venues or not have been placed in the timeframe of our study.

2. While our study focuses on preferred areas for faculty applicants, not all ads identify such preferred areas. These searches are accounted for in the data, but are not considered when analyzing particular areas of interest.

3. Similarly not all ads identify the specific number of positions being sought. In analyzing these searches we make assumptions on the number of positions being sought.

4. Our study analyzes searches and not hires. The number and areas of actual faculty hires may not match what is being sought.

# 2 Methodology

We used four primary sources for obtaining ads for Computer Science faculty positions: the Computer Research Association (CRA) Job postings[1] the Association for Computing Machinery (ACM) list of jobs[2], the Chronicle of Higher Education Vitae site[3] and the HigherEdJobs site[4]. We again augmented these sources with positions posted on the SIGCSE mailing list, which often includes ads for more undergraduate-focused institutions. We considered ads posted on these venues between August 2022 and mid-November 2022, which is the same timeframe used in our previous studies.

Only ads for tenured and tenure-track positions by departments containing Computer Science or closely-related programs were considered. We did not consider other positions such as lecturers,

[1] https://cra.org/ads/

[2] http://jobs.acm.org/jobs/search

[3] https://chroniclevitae.com/job_search/new

[4] https://www.higheredjobs.com/faculty/

instructors or researchers and we only considered institutions awarding at least a BS or a BA degree. Searches for Deans or Department Chair positions were noted, but not considered because they do not reveal information regarding areas. Similarly, searches for other departments and programs with interest in faculty with Computer Science background were noted, but also not considered.

# 3 Results

## 3.1 Institutions and Positions

Using this methodology our resulting dataset contains information for faculty searches from 437 institutions (413 are in the U.S.). 348 (80%) of these institutions indicate a specific number of positions being searched for with the remaining searches using non-specific phrases such as "multiple positions," "several positions" or just "positions" to indicate the number. As comparison, our previous-year study [13] with a comparable timeframe found searches for 400 institutions (366 in the U.S.) with 72% of these institutions indicating a specific number of positions being searched for.

The left-side of Figure 1 shows all nine years of results for the number of institutions searching for tenure-track faculty. It shows that the number of institutions searching for tenure-track faculty is the largest in the nine years of our studies.

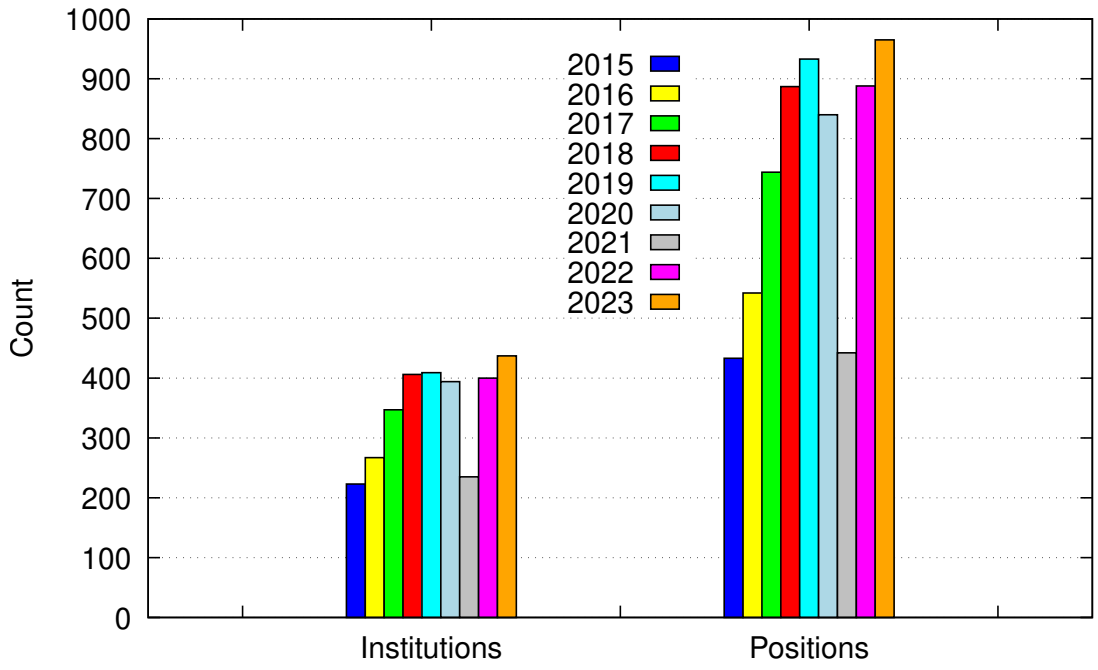


Figure 1: Nine-Year Results for Number of Institutions Searching and Total Number of Positions Being Sought

In terms of the total number of positions, in the past we experimented with treating such "Multiple Position" searches as meaning two, three or four positions and settled on a value of three. In

related work [4, 5, 7, 12] where we surveyed institutions on their hiring outcomes we found those seeking multiple positions responded seeking a median of three positions. Many of the institutions seeking multiple positions are in the U.S. News Rankings of the 100 Best Graduate schools for Computer Science[5]. In the related work we found the median number of four positions being sought by these institutions.

The right-side of Figure 1 shows the total number of positions searched for using a value of four for "multiple position" searches for the top-100 institutions and a value of three for all other institutions. The result is a total of 965 positions, which is a 9% increase from last year (using the same assumptions for "multiple positions" searches) and the highest number in the nine years of our studies. We analyze the number of institutions and positions based on the type of institution later in the report.

Finally, in terms of institutions and positions we did encounter additional ads for Computer Scientists that were noted, but not considered in our analysis. We found 23 Dean and Chair leadership searches (up from 18 last year) as well as many faculty searches in other departments. These other departments include Electrical & Computer Engineering, Information School/Science/Technology, Bio-related, Health and Business. Ads found for these other departments were not considered in our analysis.

## 3.2 Results by Topic

In the same way that not all ads list a specific number of positions, it is also the case that not all ads list specific or preferred topics of interest[6]. 323 (72%) of the 437 institutions listed specific topics, similar to last year. In studying particular topics of interest, we only considered the ads from these institutions for our analysis.

In the initial step of our study, we determined the number of times that a specific topic was mentioned in an ad. Thus an ad for a single faculty position with preferred interest for the topics of HCI, Security, Machine Learning and Robotics would count one "mention" for each of these four topics. Another institution looking to focus three positions for the topic of Security would be one mention for Security. A total of 1678 specific topics are mentioned in ads (versus 1333 last year).

While mentioned topics are one metric, another approach is to consider a faculty search as a "vote" for a topic of current and future need. Using this approach a single position with four topics of interest would be investing 0.25 positions for each topic, while three positions focused in a single topic would invest 3.0 positions in that single topic.

The problem with weighting topics based on the number of positions is that not all ads list a specific number of positions. We use the same assumption as previously described for multiple-position searches resulting in a total of 965 "positions" being searched for with 695 (72%) of the positions indicating preferences for specific topics. Figure 2 shows the percentage of mentions and positions for topics with at least one percent for either mentions or positions. They are shown in rank order based on the percentage of positions.

The results show that the topic of Security again accounts for the highest percentage of both mentions and positions, although it accounts for relatively more positions. Security was also the

[5] `https://www.usnews.com/best-graduate-schools/top-science-schools/computer-science-rankings`

[6] We use the term "topic" to refer to a sub-domain of Computer Science listed in ads and the term "area" to refer to a clustering of topics.

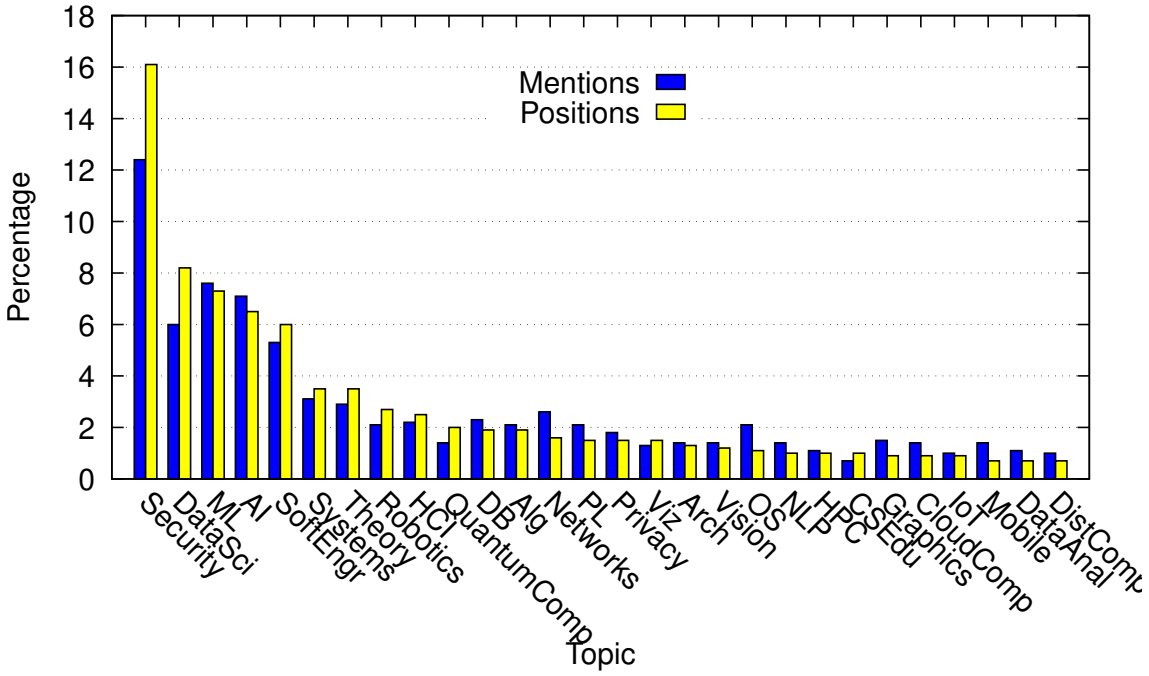


Figure 2: Topic Percentage by Mentions and by Positions

top topic for each metric the past many years. Data Science has the second highest percentage of positions with Machine Learning having the second highest percentage of mentions and third highest percentage of positions. AI is third in the percentage of positions. Software Engineering is fourth in the percentage of positions and Data Science is fourth in the percentage of mentions.

## 3.3 Clustering Topics into Areas

Figure 2 does not show topics that appear less frequently in ads nor does it group similar topics, such as Data Science and Data Analytics or Security and Privacy. To address these issues, we clustered topics into 16 areas. These clustered areas and the set of topics constituting the area are shown in Table 1. Topics with a small number of mentions and not clearly fitting into a cluster are included in two other clusters—one with topics in traditional Computer Science (OtherCS) and one with topics more interdisciplinary in nature (OtherInter). These are the same clustered areas as used in previous studies.

## 3.4 Results Based on Clustered Areas

Given the clustered areas in Table 1, Figure 3 shows the same results as Figure 2 except it uses the 16 areas rather than the topics directly. The areas are again ordered by percentage of positions. This year the clustered area of Security has the highest percentage of positions (19%) and is second highest with 15% of mentions. The AI/DM/ML clustered area has the highest percentage of mentions (18%) and second highest percentage of positions (16%). Data Science has the third highest

Table 1: Topics Grouped in Each Clustered Area

| Area | Constituent Topics |
|---|---|
| AI/DM/ML | Artificial Intelligence, AI Ethics/Fairness, Computational Linguistics, Data Mining, Deep Learning, Knowledge Representation, Machine Learning, Natural Language Processing, Reinforcement Learning |
| Arch | Architecture, Computer Organization, Hardware |
| Compiler/PL | Compilers, Programming Languages |
| CompSci | Biological Computing, Bioinformatics, Biomedical, Computational Biology, Computational Medicine, Computational Neuroscience, Computational Science, Network Science, Scientific Computation |
| DataSci | Big Data, Data Analytics, Data Engineering, Data Science, Data Systems, Visual Computing, Visualization |
| DB | Databases, Data Management, Information Management, Information Retrieval, Information Systems |
| HCI/IntMedia | Accessibility, Animation, Augmented Reality, Cognitive Science, Computer-Supported Cooperative Work, Entertainment Computing, Extended Reality, Games, Human-Computer Interaction, Interactive Media, Metaverse, Virtual Reality |
| ImageSci | Graphics, Image Processing, Pattern Recognition, Vision |
| Mobile | Human-Centered Computing, Mobile Systems, Wearable Computing |
| Robotics/CPS | Autonomous/Vehicular Systems, Cyber-Physical Systems, Embedded Systems, Intelligent Systems, Internet of Things, Robotics |
| Security | Block Chain, Cryptography, Forensics, Privacy, Security, Trusted Computing |
| SoftEngr | Software Design, Software Development, Software Engineering, Software Quality, Software Systems |
| Sys/Net | Cloud Computing, Data Centers, Data Intensive Systems, Distributed Computing, Edge Computing, High Performance Computing, Networking, Operating Systems, Parallel Computing, Storage, System/Network Administration, System Analysis, Systems |
| Theory/Alg | Algorithms, Discrete Math, Formal Methods, Quantum Computing, Theory |
| OtherCS | Applied Computing, CS Education, Data Structures, Ethics, Information Technology, Introductory CS, Meaningful Computing, Modeling, Next Generation Computing, Responsible Computing, Simulation, Social Computing, Social Media, Speech Recogniton, Web Technologies |
| OtherInter | Climate, Computer Engineering, Computational Geometry/Math, Computational Materials, Design Automation, Digital Economics, Education, Energy, Environmental Informatics, Financial Technology, Green Computing, Health, Health Informatics, Interdisciplinary, Product Design, Risk Management, Statistics, Sustainable Computing |

percentage of positions (12%) with Systems/Networking having the third highest percentage of mentions (13%) and the fourth most positions (10%).

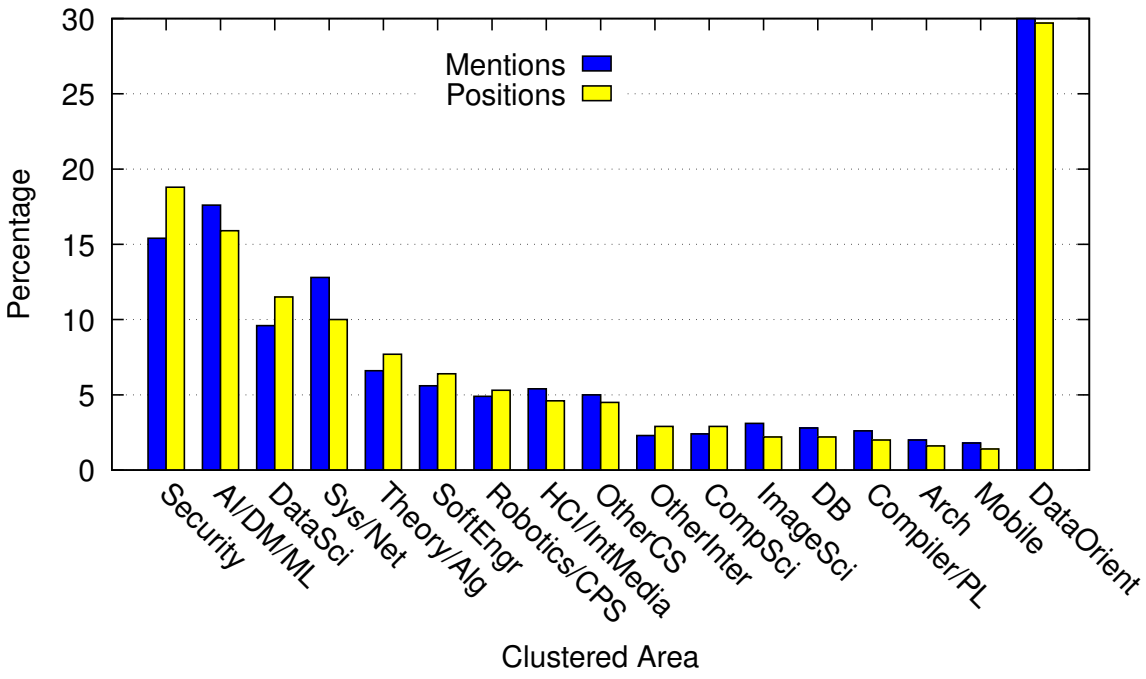


Figure 3: Clustered Area Percentage by Mentions and Positions

The right-most clustered area in Figure 3 is the Data Oriented cluster that further aggregates results for the DataSci, AI/DM/ML and DB clusters. This aggregated cluster was introduced because of overlap between the three data-oriented clusters while still retaining the three distinct clusters as defined in Table 1. As shown in the figure, this aggregated cluster accounts for 30% of mentions and positions.

### 3.5 Results Comparison with Previous Years

Figure 4 shows a more complete comparison of clustered area results based on percentage of positions for the past five years of our studies. Clustered areas are ordered based on 2023 percentages.

The results shows the number of positions being sought in the Security area to be at a four-year high. The percentage of positions being targeted for AI/DM/ML hires did drop again to 16% this year from a peak of 20%. The DataSci area again ranks third. The Sys/Net and Theory/Alg areas shows similar percentages as last year. The aggregated DataOrient (AI/DM/ML, DataSci and DB) cluster dropped to a five-year low despite having 30% of all positions being sought for these areas.

## 4 Results by Type of Institution and Highest Degree Offered

As means to better understand the results we augmented the dataset to include additional information about each institution.

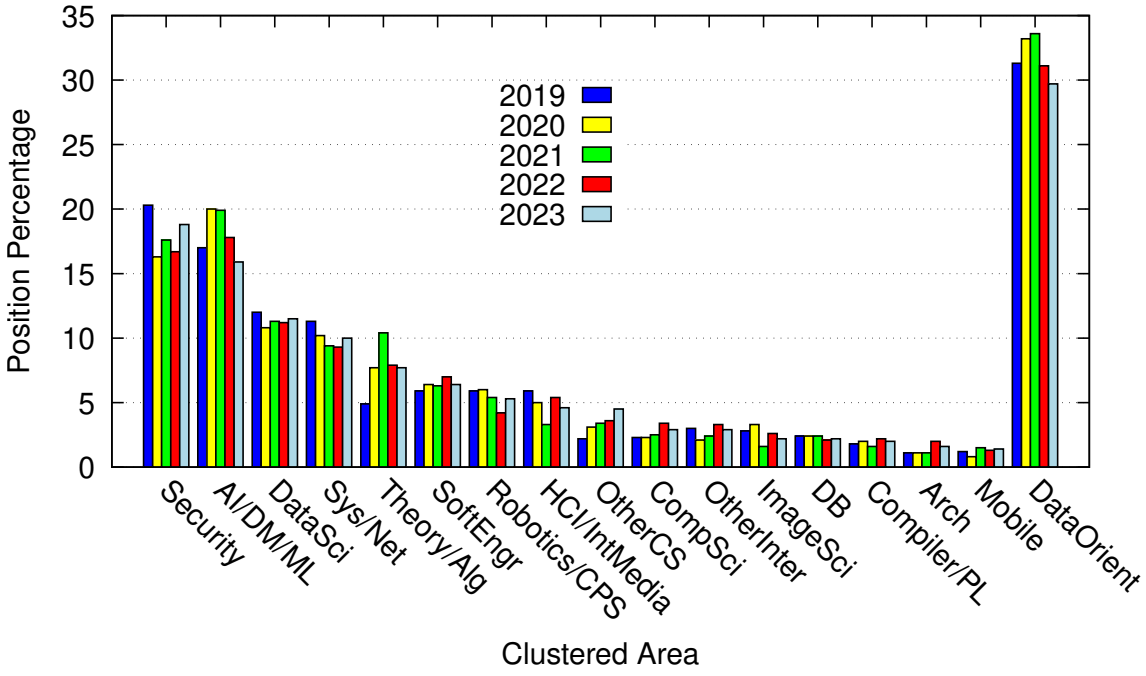


Figure 4: Five-Year Comparison of Clustered Area Percentage by Positions

## 4.1 Results by Type of Institution

Table 2 shows a breakdown of results based on whether the institution is public, private or non-U.S.-based. The results show that 221 (51%) of the institutions are public and account for 550 (57%) of the total positions. The percentage of public institutions is the same as and the percentage public positions is up from 47% in last year's study. There are 192 (44%) private institutions accounting for 347 (36%) of positions. The 24 non-U.S.-based institutions account for 6% of the total and 102 (7%) of the positions.

Table 2: Summary of Position Searches by Institution Type

| Institution Type | Number of Institutions | Advertised Number of Positions 1 | 2 | 3+ | Multiple | Total Positions | % Positions w/ Specific Topic |
|---|---|---|---|---|---|---|---|
| Public | 221 | 101 (46%) | 37 (17%) | 32 (14%) | 51 (23%) | 550 | 76% |
| Private | 192 | 129 (67%) | 24 (12%) | 9 ( 5%) | 30 (16%) | 347 | 63% |
| Non-U.S. | 24 | 8 (33%) | 1 ( 4%) | 7 (29%) | 8 (33%) | 68 | 84% |
| All | 437 | 238 (54%) | 62 (14%) | 48 (11%) | 89 (20%) | 965 | 72% |

## 4.2 Results by Highest Degree Offered

We also characterize each institution based on the highest degree it offers. For example, undergraduate-only programs may not have the same needs as PhD programs. For this portion of the study we augmented our dataset to include the highest degree offered by each program—BS/BA, MS or PhD. Our dataset includes 170 PhD institutions—comparable to last year. In order to study faculty investments at the most prominent U.S. programs, we further subdivided this group by using the U.S. News Rankings of the 100 Best Graduate schools for the top-100 U.S. and then more PhD institutions including those not in the U.S. The "PhD100" list accounts for 89 institutions in our dataset. The remaining PhD programs, including 24 non-U.S.-based, are denoted as "PhDMore." Table 3 shows summary results based on the four highest degree types. The left-side of Figure 5 shows longitudinal results for the number of institutions searching over a nine-year period. It shows the number of PhD100 institutions seeking tenure-track faculty to be at a nine-year high.

Table 3: Summary of Position Searches by Highest Degree Offered

| Institution Type | Number of Institutions | Advertised Number of Positions 1 | 2 | 3+ | Multiple | Total Positions | % Positions w/ Specific Topic |
|---|---|---|---|---|---|---|---|
| PhD100 | 89 | 12 (13%) | 6 ( 7%) | 17 (19%) | 54 (61%) | 399 | 72% |
| PhDMore | 81 | 28 (35%) | 9 (11%) | 17 (21%) | 27 (33%) | 201 | 82% |
| MS | 95 | 57 (60%) | 21 (22%) | 11 (12%) | 6 ( 6%) | 157 | 77% |
| BS/BA | 172 | 141 (82%) | 26 (15%) | 3 ( 2%) | 2 ( 1%) | 208 | 59% |
| All | 437 | 238 (54%) | 62 (14%) | 48 (11%) | 89 (20%) | 965 | 72% |

Table 3 reveals differences between the different types of institutions. Ads for 82% of the BS/BA institutions are for a single position while 61% of the ads for PhD100 institutions are for multiple positions, which are a bit smaller than percentages last year. As shown, the distributions translate into a total number of 399 positions for PhD100 institutions. We note that this number is particularly sensitive to the number of positions assumed for "multiple position" searches as over half of these searches are not specific in the number of positions being sought.

The right-side of Figure 5 shows nine-year results for the number of positions being searched for by the four types of institutions. It shows that the number of positions being sought by PhD100, MS and BS/BA institutions are at nine-year highs.

The last column of Table 3 shows that only 59% of positions from BS/BA institutions identify specific areas of interest while 82% of PhDMore institutions do so with the percentages for PhD100 and MS institutions in between. In order to understand differences on areas of interest between different types of institutions for 2023 searches, we break down the results in Figure 3 based upon the type. Figure 6 shows the results (in the same rank order as Figure 3) grouped by the four types of institutions.

Figure 6 shows a number of interesting results. AI/DM/ML continues to be of most interest for PhD100 and PhDMore institutions (with Security second). Positions related to Security have the highest percentages for MS and BS/BA institutions (with AI/DM/ML second for MS and Sys/Net second for BS/BA). The area of DataSci accounts for a similar percentage of positions except

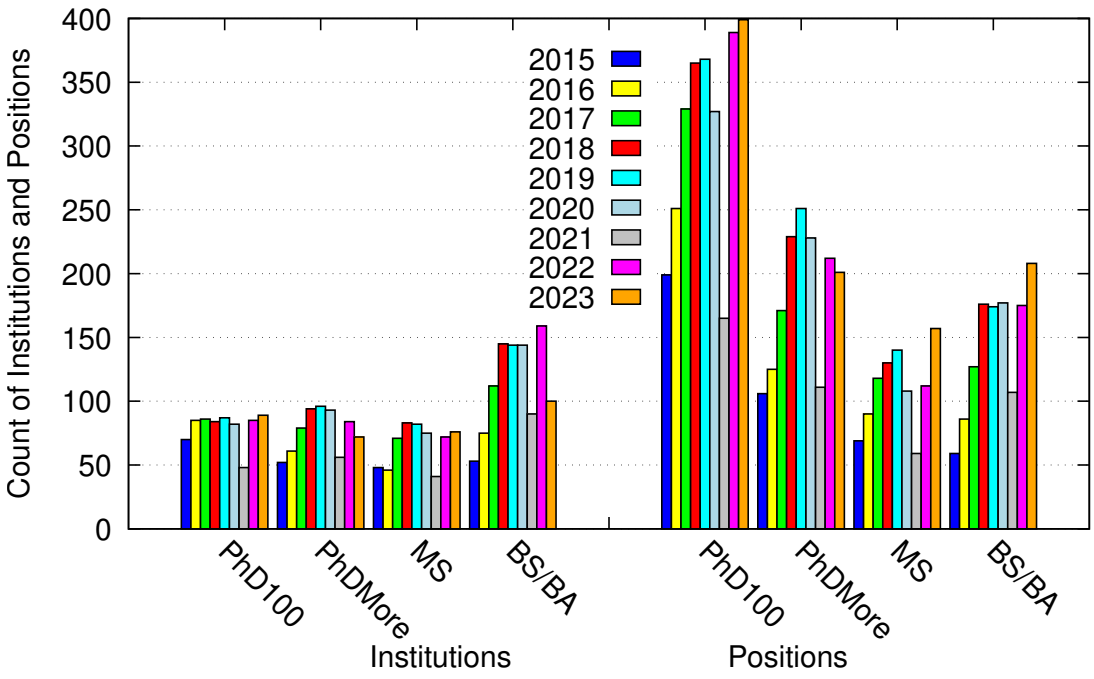


Figure 5: Nine-Year Counts of Institutions Searching and Positions Being Sought by Highest Degree Offered

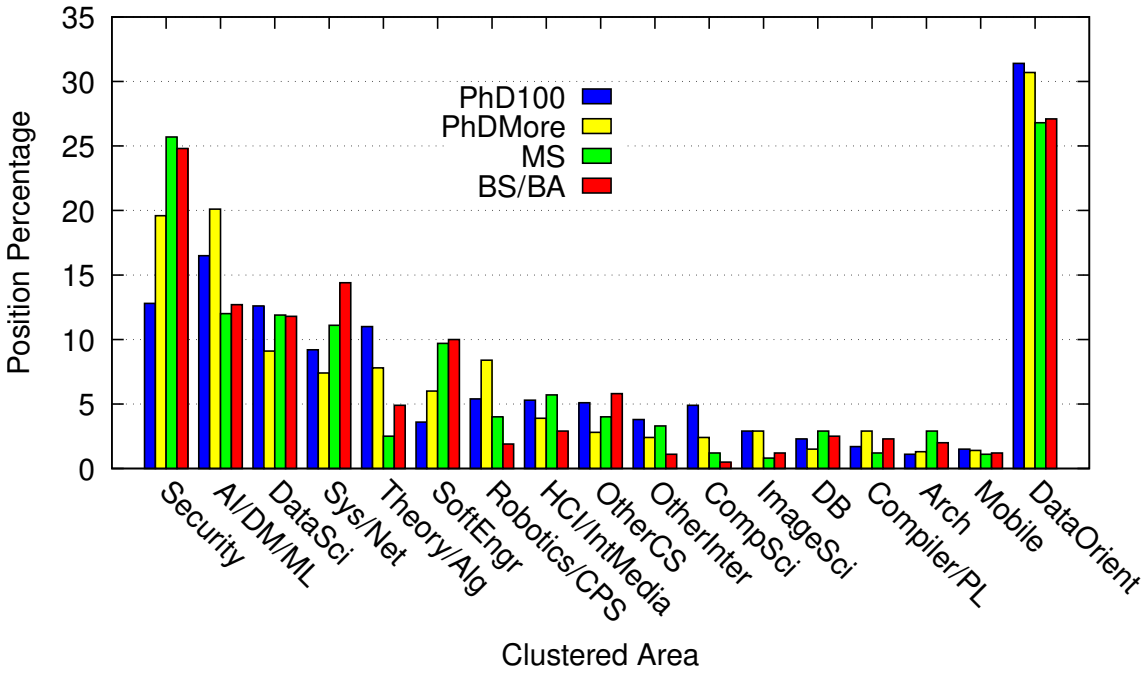


Figure 6: Clustered Area Percentage by Highest Degree Offered

for PhDMore with this area having the third highest percentage for all, but the BS/BA institution group.

In other notable results, the Theory/Alg area is of more interest for PhD100 institutions. The area of SoftEngr is sought by a much higher percentage of MS and BS/BA institutions while Robotics/CPS is relatively more popular among PhD100 and PhDMore institutions. Finally, the last set of results show that 31% of positions being sought by PhD100 and PhDMore institutions are for the Data Oriented aggregated cluster with the non-PhD institutions a bit less.

## 4.3 Results by Combination of Institution Type and Highest Degree Offered

A third summary of positions searches is shown in Table 4 where institutions are classified based on a combination of type and highest degree offered. For this analysis, PhD100 and U.S. PhDMore institutions are combined as are U.S. MS and BS/BA institutions (designated as "MB" in the table and subsequent graphs). The non-U.S. institutions are dropped in this analysis, but their results are shown in Table 2 as well as included in Table 3 and Figure 5.

Table 4: Summary of Position Searches by Institution Type and Highest Degree Offered

| Institution Type | Number of Institutions | Advertised Number of Positions 1 | 2 | 3+ | Multiple | Total Positions | % Positions w/ Specific Topic |
|---|---|---|---|---|---|---|---|
| Pub/PhD | 98 | 20 (20%) | 11 (11%) | 22 (22%) | 45 (46%) | 363 | 77% |
| Prv/PhD | 48 | 12 (25%) | 3 ( 6%) | 5 (10%) | 28 (58%) | 169 | 67% |
| Pub/MB | 123 | 81 (66%) | 26 (21%) | 10 ( 8%) | 6 ( 5%) | 187 | 73% |
| Prv/MB | 144 | 117 (81%) | 21 (15%) | 4 ( 3%) | 2 ( 1%) | 178 | 60% |
| All U.S. | 413 | 230 (56%) | 61 (15%) | 41 (10%) | 81 (20%) | 897 | 71% |

The results in Table 4 show that public institutions account for the majority of PhD-producing schools while there is a higher number of private MS&BS/BA institutions. 58% of private PhD institutions are searching for multiple positions while 74% of PhD institutions (public and private) identify specific topics on interest in their ads. Figure 7 shows nine-year results for the number of institutions searching and the number of positions sought based on this institution classification. The left side of the figure show a nine-year high for the number of public and private MS&BS/BA institutions searching for tenure-track faculty.

The right side of the figure shows the number of positions sought increased in 2023 and are at nine-year highs for public PhD, public MS&BS/BA and private MS&BS/BA institutions. Again, a caveat is that the high percentage of "multiple position" ads for PhD institutions makes the count highly dependent on the number of positions assumed for such ads. The numbers that are shown do use the same assumptions for all nine years.

Figure 8 shows the percentage of positions for each of the clustered areas using this classification for institutions. The figure both shows similarities and differences with results shown in Figure 6. The area of Security is again the area of most interest for public PhD and both MS&BS/BA institution types. In contrast, AI/DM/ML again accounts for the highest percentage of the positions for private PhD institutions.

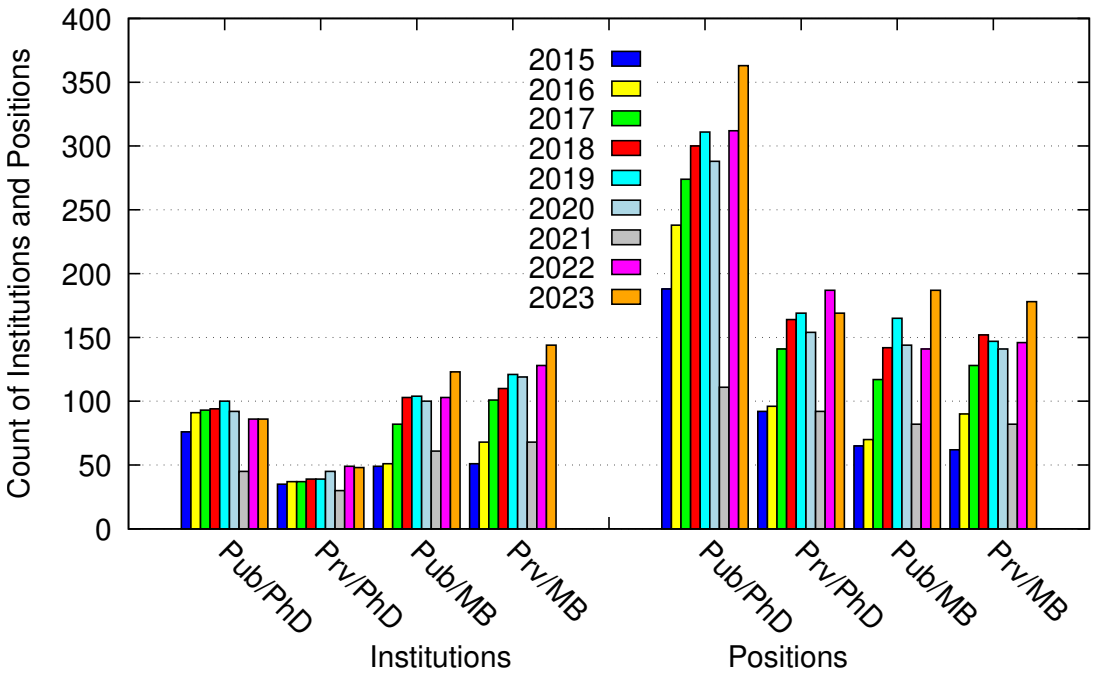


Figure 7: Nine-Year Counts of Institutions Searching and Positions Being Sought by Institution Type and Highest Degree Offered

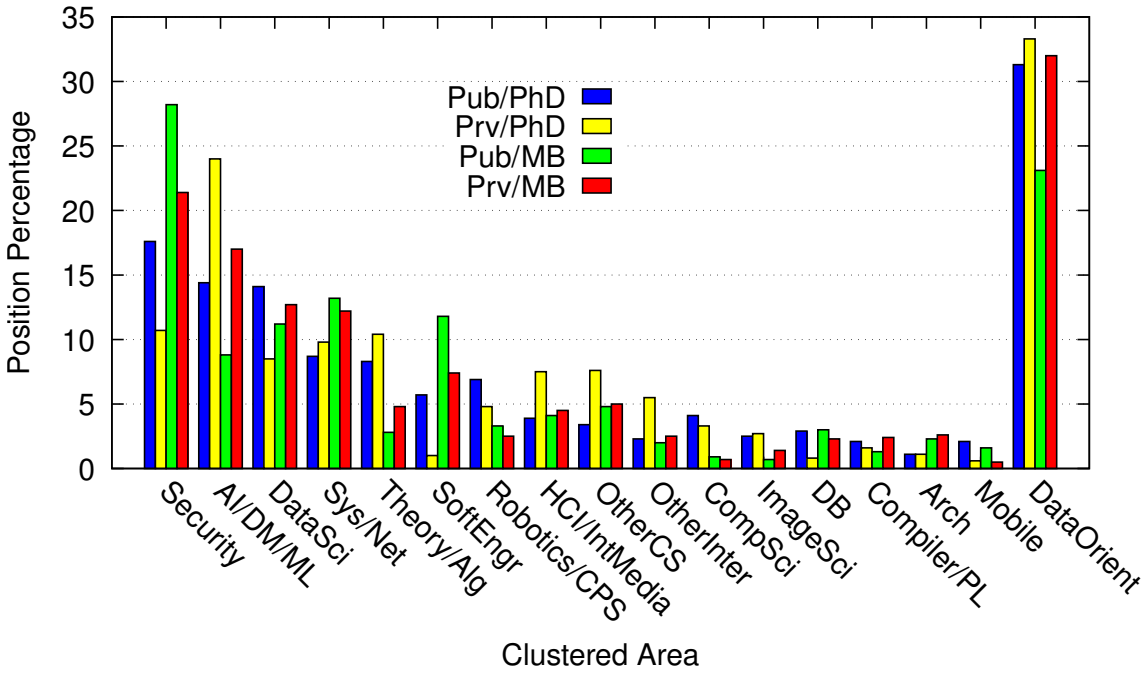


Figure 8: Clustered Area Percentage by Institution Type and Highest Degree Offered

The DataSci clustered area has the smallest representation (9%) for public PhD institutions. In contrast, the Sys/Net area has relatively higher representation for both public and private MS&BS/BA institutions. The Theory/Alg area is highest for private PhD institutions while SoftEngr is relatively higher for MS&BS/BA institutions. The last set of results in Figure 8 shows that 33% of positions for private PhD institutions are in the Data Oriented cluster with 31% for public PhD, 32% for private MS&BS/BA, and 23% for public MS&BS/BA institutions.

# 5 Summary and Future Work

This work uses the same methodology applied over nine years to study where Computer Science departments are choosing to invest faculty positions using data obtained from advertised tenure-track searches for the current hiring season. While the number of and areas for faculty searches does not necessarily translate into the same for faculty hires, we believe that they provide insight into current and future needs within the discipline.

We analyzed ads from 437 institutions seeking to fill close to 1000 tenure-track faculty positions in Computer Science. The number of institutions is a 9% increase from last year at this time (mid-November) and is the highest number institutions searching in the nine years of this study. The previous high was 409 for hires to begin in 2019. The number of tenure-track positions sought is up 9% from last year and also at a nine-year high. The number of BS/BA institutions seeking faculty is at an nine-year high with top PhD and private PhD institutions at nine-year highs in the number of positions being sought.

We clustered the specific Computer Science topics mentioned in ads into 16 areas. In terms of specific areas, we found that the clustered area of Security accounts for the most with 19% of all sought positions with AI/Data Mining/Machine Learning dropping to second at 18% The area of Data Science is at 12% of positions, but aggregating the Data Science, AI/DM/ML and Databases clusters results in 30% of all hires sought in these data-oriented areas, which is a bit lower than previous years. The area of Systems/Networking was fourth in the percentage (10%) of positions sought.

Differences are also seen when analyzing results based on the type of institution. As was the case last year, positions in the clustered area of AI/Data Mining/Machine Learning have the highest percentages for PhD institutions. Again positions related to Security have the highest percentages for MS and BS/BA institutions. Security is the second-most sought area for PhD institutions while AI/Data Mining/Machine Learning is the second-most sought area for MS and Systems/Networking for BS/BA institutions.

A continued direction for future work is to examine how these searches translate into actual hires. Such follow-up was done in previous years [4, 5, 7, 12]. Another direction to extend the work is to examine faculty hiring in areas such as Data Science that reside between Computer Science and other traditional disciplines. Examination of faculty hiring for teaching-track positions is also a potential direction of future work.

# References


[1] Craig E. Wills. Analysis of current and future Computer Science needs via advertised faculty searches. *Computing Research News*, 27(1), January 2015. Full report at http://web.cs.wpi.edu/~cew/papers/CSareas15.pdf.

[2] Craig E. Wills. Analysis of current and future Computer Science needs via advertised faculty searches for 2016. *Computing Research News*, 28(1), January 2016. Full report at http://web.cs.wpi.edu/~cew/papers/CSareas16.pdf.

[3] Craig E. Wills. Analysis of current and future Computer Science needs via advertised faculty searches for 2017. *Computing Research News*, 29(1), January 2017. Full report at http://web.cs.wpi.edu/~cew/papers/CSareas17.pdf.

[4] Craig E. Wills. Outcomes of advertised Computer Science faculty searches for 2017. *Computing Research News*, 29(10), November 2017. Full report at http://web.cs.wpi.edu/~cew/papers/outcomes17.pdf.

[5] Craig E. Wills. 2018 Computer Science tenure-track faculty hiring outcomes. *Computing Research News*, 30(7), August 2018. Full report at http://www.cs.wpi.edu/~cew/papers/outcomes18.pdf.

[6] Craig E. Wills. Analysis of current and future Computer Science needs via advertised faculty searches for 2018. *Computing Research News*, 30(1), January 2018. Full report at http://www.cs.wpi.edu/~cew/papers/CSareas18.pdf.

[7] Craig E. Wills. 2019 Computer Science tenure-track faculty hiring outcomes. *Computing Research News*, 31(10), November 2019. Full report at http://www.cs.wpi.edu/~cew/papers/outcomes19.pdf.

[8] Craig E. Wills. Analysis of current and future Computer Science needs via advertised faculty searches for 2019. *Computing Research News*, 31(1), January 2019. Full report at http://www.cs.wpi.edu/~cew/papers/CSareas19.pdf.

[9] Craig E. Wills. Analysis of current and future Computer Science needs via advertised faculty searches for 2020. *Computing Research News*, 32(1), January 2020. Full report at http://www.cs.wpi.edu/~cew/papers/CSareas20.pdf.

[10] Craig E. Wills. Analysis of current and future Computer Science needs via advertised faculty searches for 2021. *CRA Bulletin*, December 2020. Full report at http://www.cs.wpi.edu/~cew/papers/CSareas21.pdf.

[11] Craig E. Wills. Updated analysis of current and future Computer Science needs via advertised faculty searches for 2021. *Computing Research News*, 33(1), January 2021. Full report at https://web.cs.wpi.edu/~cew/papers/UpdatedCSareas21.pdf.

[12] Craig E. Wills. 2022 Computer Science tenure-track faculty hiring outcomes. *Computing Research News*, 34(10), November 2022. Full report at http://www.cs.wpi.edu/~cew/papers/outcomes22.pdf.

[13] Craig E. Wills. Analysis of current and future Computer Science needs via advertised faculty searches for 2022. *Computing Research News*, 34(1), January 2022. Full report at `http://www.cs.wpi.edu/~cew/papers/CSareas22.pdf`.