Non-tenure-track teaching faculty are becoming more important to doctoral departments to help them meet their educational goals and responsibilities, particularly in response to the current enrollments surge. In the Generation CS report (available at http://cra.org/data/Generation-CS/), 65% of doctoral departments reported in fall 2015 that they had increased the number of teaching faculty on continuing appointments in response to increased enrollments, and an additional 16% were considering it. Similarly, between fall 2006 and fall 2016, the proportion of Taulbee Survey respondents reporting at least one full-time non-tenure-track teaching faculty member increased from 81% to 87% and, more notably, the median number of such teaching faculty at the departments reporting nonzero counts rose from 3 to 6.

See page 2 for full article.

The 2016 Taulbee Survey: Supplementary Report on Course-level Enrollment

The 2016 Taulbee Survey report, published in the May 2017 issue of CRN, did not include the results of a component that was introduced in the most recent survey—namely, bachelor’s enrollment data from specific courses in the curriculum. This component was introduced as a result of what was learned in the CRA Enrollment Report (see http://cra.org/data/generation-cs).

See page 4 for full article.
Non-tenure-track teaching faculty are becoming more important to doctoral departments to help them meet their educational goals and responsibilities, particularly in response to the current enrollments surge. In the *Generation CS* report (available at [http://cra.org/data/Generation-CS/](http://cra.org/data/Generation-CS/)), 65% of doctoral departments reported in fall 2015 that they had increased the number of teaching faculty on continuing appointments in response to increased enrollments, and an additional 16% were considering it. Similarly, between fall 2006 and fall 2016, the proportion of Taulbee Survey respondents reporting at least one full-time non-tenure-track teaching faculty member increased from 81% to 87% and, more notably, the median number of such teaching faculty at the departments reporting nonzero counts rose from 3 to 6.

### Fine-tuning the Taulbee’s Teaching Faculty Titles

Currently, the CRA Taulbee Survey asks for head counts and salaries of full time non-tenure-track teaching faculty, but does not distinguish between different types of teaching faculty. In fall 2016, we added a few questions to the Taulbee to help guide our decisions about whether to change the teaching faculty data collection and reporting in the future. When asked if they would be interested in more fine-grained data about teaching faculty, 59% of the academic units said yes, 18% said no, 2% said maybe, and 21% had no opinion, suggesting that there is sufficient interest to pursue this.

In order to collect Taulbee data by categories of teaching faculty, it is necessary to establish and define the categories. As a first step toward achieving this goal, the fall 2016 Taulbee asked an open-ended question about teaching faculty titles and levels used within the academic unit. One hundred and twenty units responded. As expected, the units varied widely in the number of titles and the specific titles they used. The titles included:

- **Multiple levels of lecturer were reported by 49 units (41%).** Examples are lecturer and senior lecturer, lecturer, senior lecturer, and principal lecturer; lecturer I - IV; or lecturer with or without security of employment.

- **An assistant-associate or assistant-associate-full pattern was reported by 39 (33%).** There were many variations on the complete title such as teaching, clinical, instructional, collegiate, or professor of the practice.

- **A single level of lecturer was reported by 36 (30%).** In some units this was the only non-tenure-track teaching title, but in others there were, for example, both lecturers and professors of the practice.

- **Professor of the practice with no levels given was reported by 20 (17%).**

- **A single level of instructor was reported by 12 (10%).**

- **Multiple levels of instructor were reported by 9 (8%).**

- **Other was reported by 18 (15%), and it included fellow, faculty associate, teaching professor (without assistant/associate levels), teaching specialist, security of employment, and visiting faculty.**

We observe the following patterns from these responses:

1. Half of those who provided data indicated there were teaching faculty with professorial titles (i.e., the word “professor” was part of the title, in conjunction with the local choice of modifier) either at one or more levels. This seems like a useful distinguishable subclass. From the point of view of salary data and demographic collection, it may be helpful to distinguish those departments that have only one rank for these titles and those that have multiple ranks (and presumably a promotion path from one to the next).

2. Lecturer seems much more widely used than instructor or other titles for those not having professorial titles. If there are identifiable reasons to further split lecturers from instructors from teaching specialists and the like, as a result of data collected about qualifications, duties, or other terms of employment, that would be appropriate. Otherwise, lumping these title variations together, but separate from the professorial title group, might be best.
Again, a distinction may be useful for those departments having only one such level within this category and those having multiple levels.

3. All of this data are about full-time teaching faculty, and data collection should be careful to avoid mixing part-time faculty with these titles, especially casual adjuncts, into the data.

The next step will be to determine the specific categories to use for more detailed data on teaching faculty. Because more time is needed for this process, the fall 2017 Taulbee questions about teaching faculty will be unchanged; changes will be implemented in the fall 2018 survey.

CRA Board Committee on Teaching Faculty

Separate from the Taulbee question but working in parallel, a CRA Teaching Faculty Committee led by CRA board member Penny Rheingans (University of Maryland, Baltimore County) is focusing on larger questions about teaching faculty. This group is divided into three subcommittees: one is working on a Best Practices Memo that makes recommendations to departments on their management of teaching faculty; one is working with an ACM SIGCSE group collecting information from teaching faculty themselves about the policies and practices governing their work; and one is surveying academic units in fall 2017, in parallel with the Taulbee Survey, to gather more data about the expectations and policies for teaching faculty with various titles. Information from the department-level survey will be used to define the categories of teaching faculty to be used in the Taulbee Survey in fall 2018.

Members of the academic computing community are invited to provide suggestions about the best practices of their own departments and other issues that the Best Practices Memo should address. Chairs of CRA doctoral-granting member departments and members of the CRA Deans group should already have received an email inviting them to comment. Members of these groups who did not receive an email can contact Betsy Bizot at bizot@cra.org for their link. Other readers of this article who would like to provide input can follow this link to the form: https://goo.gl/forms/HLIw6E2zcXzRBj632

Not Previously Reported: The Teaching Load of Non-Tenure-Track Teaching Faculty

The Taulbee includes a set of department profile questions asked every three years, with the last one asked in 2015. Questions about teaching load are part of the profiles section, but prior to 2015 were only asked about tenured and tenure-track faculty. In 2015, we also asked about the average teaching load for non-tenure-track teaching faculty. Those results were not included in the 2015 Taulbee report, but are shown below. For comparison, the table also shows the median load for tenure-track faculty at the same type of institution. Overall, non-tenure-track teaching faculty have about twice the teaching load of tenure-track faculty.

<table>
<thead>
<tr>
<th></th>
<th>Non-Tenure-Track Teaching Faculty</th>
<th>Tenure-Track</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Minimum</td>
</tr>
<tr>
<td>US CS Public</td>
<td>85</td>
<td>2.0</td>
</tr>
<tr>
<td>US CS Private</td>
<td>24</td>
<td>2.0</td>
</tr>
<tr>
<td>US CE</td>
<td>4</td>
<td>4.0</td>
</tr>
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<td>US Info</td>
<td>10</td>
<td>3.0</td>
</tr>
<tr>
<td>Canadian</td>
<td>5</td>
<td>6.0</td>
</tr>
</tbody>
</table>

*Quarter system loads were converted to semester equivalent by multiplying by 0.67. Multiply by 1.5 to convert these values back to quarter system.
2016 Taulbee Survey Supplementary Report on Course-level Enrollment

By Stu Zweben and Betsy Bizot

The 2016 Taulbee Survey report, published in the May 2017 issue of CRN, did not include the results of a component that was introduced in the most recent survey–namely, bachelor’s enrollment data from specific courses in the curriculum. This component was introduced as a result of what was learned in the CRA Enrollment Report (see http://cra.org/data/generation-cs). Unfortunately, we were unable to compile the data in time to feature the results in the May issue.

We asked departments to provide fall 2016 enrollment data for four representative courses in their undergraduate computer science program: an introductory course for non-majors, an introductory course for majors, a mid-level course, and an upper-level course. For each course, we also asked respondents to delineate the number of CS majors, the number of women, and the number of persons from underrepresented minorities (URMs) in the course. More than ninety departments provided us with fall 2016 data. Of these departments, between 71 and 74, depending on the level of the course, also provided data for fall 2015 to the CRA Enrollment Survey. Most, but not all, used the identical courses in 2015 and 2016. In this article, we will confine our analysis to the 65-68 departments that provided data for the same courses in both years as this gives us the best “apples to apples” comparison.

Year-to-year change can be calculated in several ways. The most straightforward is to look at the percent change in the total between year 1 and year 2 for all academic units that reported both years. Table 1 takes this approach; it shows the number of departments reporting each category of data, the totals in each category for those departments in 2015 and 2016, and the percent change of the total from 2015 to 2016. The change in the totals is the community-wide change (of all reporting units), and is the way we look at changes in enrollments and degrees in the annual Taulbee report. However, large changes in a few departments will have a disproportionate effect on the overall change. To mitigate this effect, particularly with respect to changes in enrollment among demographics (the percent of students who are majors, women, or underrepresented minorities) for which we have fewer data points, we also look at the medians of the unit-level values in each year. Unit medians are reported in Table 2 and shown in Figure 1. These median differences are elaborated upon in the next three sections.

### Table 1: Numbers of students enrolled in representative courses, overall and by subgroup

<table>
<thead>
<tr>
<th>Category</th>
<th>Total Students</th>
<th>Majors</th>
<th>Non-majors</th>
<th>Women</th>
<th>URMs from MSIs</th>
<th>URMs from non-MSIs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intro Non-Majors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>19393</td>
<td>932</td>
<td>8646</td>
<td>3445</td>
<td>57</td>
<td>946</td>
</tr>
<tr>
<td>2016</td>
<td>20211</td>
<td>975</td>
<td>9139</td>
<td>3360</td>
<td>51</td>
<td>1091</td>
</tr>
<tr>
<td># Departments</td>
<td>66</td>
<td>32</td>
<td>32</td>
<td>39</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>% Change</td>
<td>4.2%</td>
<td>4.6%</td>
<td>5.7%</td>
<td>-2.5%</td>
<td>-10.5%</td>
<td>15.3%</td>
</tr>
<tr>
<td><strong>Intro Majors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>23180</td>
<td>6291</td>
<td>9409</td>
<td>2916</td>
<td>528</td>
<td>1117</td>
</tr>
<tr>
<td>2016</td>
<td>24788</td>
<td>6210</td>
<td>10879</td>
<td>3317</td>
<td>517</td>
<td>1438</td>
</tr>
<tr>
<td># Departments</td>
<td>67</td>
<td>48</td>
<td>48</td>
<td>40</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>% Change</td>
<td>6.9%</td>
<td>-1.3%</td>
<td>15.6%</td>
<td>13.8%</td>
<td>-2.1%</td>
<td>28.7%</td>
</tr>
<tr>
<td><strong>Mid-Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>12211</td>
<td>5250</td>
<td>3728</td>
<td>1480</td>
<td>253</td>
<td>568</td>
</tr>
<tr>
<td>2016</td>
<td>14684</td>
<td>2838</td>
<td>5059</td>
<td>1761</td>
<td>316</td>
<td>738</td>
</tr>
<tr>
<td># Departments</td>
<td>68</td>
<td>50</td>
<td>50</td>
<td>39</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>% Change</td>
<td>20.3%</td>
<td>11.2%</td>
<td>35.7%</td>
<td>19.0%</td>
<td>24.9%</td>
<td>29.9%</td>
</tr>
<tr>
<td><strong>Upper-Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>8413</td>
<td>4069</td>
<td>1980</td>
<td>933</td>
<td>106</td>
<td>309</td>
</tr>
<tr>
<td>2016</td>
<td>9203</td>
<td>4589</td>
<td>2149</td>
<td>957</td>
<td>108</td>
<td>374</td>
</tr>
<tr>
<td># Departments</td>
<td>65</td>
<td>48</td>
<td>48</td>
<td>36</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>% Change</td>
<td>9.4%</td>
<td>12.8%</td>
<td>8.5%</td>
<td>2.6%</td>
<td>1.9%</td>
<td>21.0%</td>
</tr>
</tbody>
</table>
**Overall Enrollment Results**

The data indicates that median enrollment in both the mid-level and upper-level courses increased by double-digit percentages from 2015 to 2016 (13.2 percent for mid-level and 18.0 percent for upper-level). With this raw growth, the percentage of students in these courses who were CS majors remained relatively constant (65.8 percent in 2015 and 66.3 percent in 2016 for the mid-level course, and 82.0 percent in 2015 and 82.4 percent in the upper-level course). Thus, the number of majors in these courses rose considerably, even though the fraction of majors in the courses did not. In fact, the overall average one-year growth per U.S. CS department in total CS majors, as reported in the May 2016 Taulbee Survey report, was 24.8 percent. That average includes many more departments than are represented in the course-level data, and also includes some departments that reported in only one of the two years. The data therefore suggests that we will continue to see double-digit percent increases in the number of CS degrees produced at the bachelor’s level for at least the next couple of years.

Since there is a fairly constant fraction of majors in these courses, there also is a fairly constant fraction of non-majors, suggesting that there is continued strong growth in the enrollment by non-majors in courses beyond the introductory level. Table 1 shows the overall growth in non-majors enrollment was 35.7 percent in the mid-level course and 8.5 percent in the upper-level course. The data therefore suggests that we will continue to see double-digit percent increases in the number of CS degrees produced at the bachelor’s level for at least the next couple of years.

In the introductory level course for majors, the one-year change looks quite different from that in the higher-level courses. There is only a 1.1 percent increase over 2015 in the median enrollment in the introductory course for majors. The median percentage of students who are majors in this course declined slightly (from 43.5 percent in 2015 to 41.9 percent in 2016). Is this a sign that the tremendous decade-long CS enrollment growth we’ve experienced may be abating? The 2016 Taulbee Survey report noted a whopping 19.9 percent increase per department in new CS majors at U.S. CS departments in one year. However, once again this data includes departments that reported in only one of the two years. In the subset of 48 departments that not only provided enrollment data in 2015 and 2016 for the introductory course for majors, but also provided it to the CRA Enrollment Survey for 2005 and 2010, the median enrollment change from 2015 to 2016 was 31.1 percent. Further, as shown in Table 1, the total enrollment growth in this course was 6.9 percent among the 67 departments that provided total enrollment data. It also should be noted that percent of students who are CS majors in the introductory course for majors is less precise than we would like, because it depends in part on when the institution allows students to declare a major. This often occurs after the introductory course has been successfully completed. Thus, we feel it is premature to jump to conclusions about the predictive nature of the 11 percent median enrollment increase in the introductory course for majors, although it does bear watching.

<table>
<thead>
<tr>
<th></th>
<th>Total Students</th>
<th>% Majors</th>
<th>% Women</th>
<th>% URMs in Non-MSIs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intro Non-Majors 2015</strong></td>
<td>180</td>
<td>2.7</td>
<td>36.7</td>
<td>13.8</td>
</tr>
<tr>
<td><strong>Intro Non-Majors 2016</strong></td>
<td>188</td>
<td>3.0</td>
<td>34.4</td>
<td>12.6</td>
</tr>
<tr>
<td><strong># Departments</strong></td>
<td>66</td>
<td>50</td>
<td>39</td>
<td>29</td>
</tr>
<tr>
<td><strong>% Change</strong></td>
<td>4.4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intro Majors 2015</strong></td>
<td>280</td>
<td>43.5</td>
<td>21.0</td>
<td>12.9</td>
</tr>
<tr>
<td><strong>Intro Majors 2016</strong></td>
<td>283</td>
<td>41.9</td>
<td>21.8</td>
<td>15.1</td>
</tr>
<tr>
<td><strong># Departments</strong></td>
<td>67</td>
<td>49</td>
<td>40</td>
<td>28</td>
</tr>
<tr>
<td><strong>% Change</strong></td>
<td>1.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mid-Level 2015</strong></td>
<td>144</td>
<td>65.8</td>
<td>17.4</td>
<td>10.7</td>
</tr>
<tr>
<td><strong>Mid-Level 2016</strong></td>
<td>163</td>
<td>66.3</td>
<td>20.0</td>
<td>11.2</td>
</tr>
<tr>
<td><strong># Departments</strong></td>
<td>68</td>
<td>50</td>
<td>39</td>
<td>28</td>
</tr>
<tr>
<td><strong>% Change</strong></td>
<td>13.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Upper-Level 2015</strong></td>
<td>100</td>
<td>82.0</td>
<td>14.1</td>
<td>8.7</td>
</tr>
<tr>
<td><strong>Upper-Level 2016</strong></td>
<td>118</td>
<td>82.4</td>
<td>15.9</td>
<td>8.9</td>
</tr>
<tr>
<td><strong># Departments</strong></td>
<td>65</td>
<td>48</td>
<td>37</td>
<td>27</td>
</tr>
<tr>
<td><strong>% Change</strong></td>
<td>18.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The introductory course for non-majors experienced a median growth of 4.4 percent from 2015 to 2016 in total enrollment. This is yet another indication that interest in CS courses continues to be high.

**Diversity Results**

Except in the introductory course for non-majors, the median percentage of women in courses at each level was either fairly constant or increasing. The most notable increase was in the mid-level course, where the median percentage of women went from 17.4 in 2015 to 20.0 in 2016. The median percentage of women in the upper-level course also increased, from 14.1 to 15.9 percent. We see a slight drop-off from the median percentage of women in the introductory course for majors in 2015 (21.0 percent) to the median percentage of women in the mid-level course in 2016 (20.0 percent), and a somewhat larger drop-off between the median percentage of women in the mid-level course in 2015 (17.4 percent) and the median percentage of women in the upper-level course in 2016 (15.9 percent). Because the median percentage at each level is for a single representative course, not for all students at that level, some of the differences between levels may be attributable to the specific courses on which the institutions chose to report. Overall, however, this trend of decreasing representation of women at higher course levels is congruent with other data.

It will be interesting to see how predictive the median upper-level enrollment percentage of women is of the overall percentage of 2016-17 CS bachelor’s graduates who are women. Next year’s Taulbee Survey will report this number. This year’s percentage was 17.9. However, the percentage of women reported in the upper-level course includes both CS majors and non-majors, while the reported graduates in the Taulbee Survey are just CS majors. So the expected predictability of the upper-level enrollment by women on the fraction of CS major graduates who are women is unclear. Also note that only approximately 60 percent of the departments that provided overall course enrollment data also provided course-level data about gender.

The data for underrepresented minorities also includes both majors and non-majors, and excludes departments from minority-serving institutions (MSIs); while MSIs educate significant numbers of URM students, as shown in Table 1, they are not comparable to non-MSIs when the metric is the percent of students who are URMs. The introductory course for majors shows a one-year gain, from 12.9 percent to 15.1 percent, in the median percentage of students who are from underrepresented ethnic groups. The mid-level and upper-level data in the two years show slight increases (10.7 to 11.2 and 8.7 to 8.9, respectively). As was the case for gender diversity, there is a drop-off in median ethnic diversity from the introductory course for majors in 2015 (12.9 percent) to the mid-level course in 2016 (11.2 percent) and from the mid-level course in 2015 (10.7 percent) to the upper-level course in 2016 (8.9 percent). Median enrollment from underrepresented ethnic minority groups also fell somewhat in the introductory course for non-majors (13.8 percent to 12.6 percent).

**Final Remarks**

We intend to continue requesting course-level enrollment data in the Taulbee Survey, which can help us spot changes in enrollment patterns at a more fine-grained level than was previously possible. We also intend to report the results of the data thus collected as part of the full report that is published in CRN in May 2018. We are thankful to all who provided data this year, and hope that more will do so in the coming year. We also are grateful to Tracy Camp, who provided helpful comments and suggestions about an earlier version of this article.
In the 2015 Taulbee report published in the May 2016 CRN, there were errors in the teaching load values presented in Table Prof1. Of particular import, the median values (the best comparison of typical teaching loads) for US CS Private, US CE, and US Information groups in the original report were higher than they should have been. Means also differ. To the right is a corrected version of this table.

### 2015 Taulbee Report Erratum

#### Table Prof 1. Official Teaching Load of Tenured and Tenure Track Faculty (Updated 7/31/17)

<table>
<thead>
<tr>
<th>Department Type</th>
<th># Dept</th>
<th>Minimum</th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th># Dept</th>
<th>Semester</th>
<th>Quarter</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>US CS Public</td>
<td>97</td>
<td>2</td>
<td>3.2</td>
<td>3</td>
<td>9</td>
<td>100</td>
<td>90</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>US CS Private</td>
<td>32</td>
<td>1</td>
<td>2.7</td>
<td>2</td>
<td>6</td>
<td>34</td>
<td>27</td>
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<tr>
<td>US CE</td>
<td>7</td>
<td>2</td>
<td>3.3</td>
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<td>7</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>US I</td>
<td>10</td>
<td>2</td>
<td>3.2</td>
<td>3</td>
<td>4</td>
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<td>9</td>
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<td>0</td>
</tr>
<tr>
<td>Canadian</td>
<td>8</td>
<td>3</td>
<td>3.4</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>8</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Grand Total</td>
<td>154</td>
<td>1</td>
<td>3.1</td>
<td>3</td>
<td>9</td>
<td>162</td>
<td>140</td>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>

*Teaching load is given for a semester calendar. Loads for a quarter system were multiplied by 2/3. To convert back to quarter-system equivalent, multiply these values by 1.5.*

The teaching load questions are asked with the other Department Profiles questions every three years and will be asked next in fall 2018.

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### Eben Tisdale Fellows Attend Presentation at CRA Government Affairs Office

By Brian Mosley, CRA Policy Analyst

On Tuesday, July 11, the CRA Government Affairs Office welcomed the 2017 class of Eben Tisdale Fellows ([http://www.tfas.org/tisdale](http://www.tfas.org/tisdale)) to the CRA Washington, DC office. These fellows, all of whom are undergraduates at universities and colleges across the United States, spent the summer at high-tech companies, firms, or trade associations in Washington, learning the intricacies of technology policy. Additionally, they took two class credits at George Mason University, and attended briefings at the U.S. Capitol, Department of State, World Bank, Federal Reserve, and other institutions. The fellows visited the office to attend a presentation by Brian Mosley, CRA’s Office of Government Affairs policy analyst, that covered the policy concerns and issues the association works on and influences at the federal level.

This year’s Tisdale Fellow for CRA is Emily Tang (far right). Tang is a junior at the Massachusetts Institute of Technology, pursuing a double major in electrical engineering and computer science with an additional focus on linguistics and applied international studies. This summer, Tang has been tracking key federal appropriations and assisting CRA staff in the preparation of a number of events. We’ve been thrilled to have her on staff!

The Tisdale Fellows in the above picture are, from left to right: Rebecca Whalen, Hewlett Packard Enterprise; Annaliese Yukawa, Technology CEO Council; Yalun Feng, Dell; Hailey Quigley, BSA | The Software Alliance; and Emily Tang.
Collaborative Research as the Key to Advancing AI

By Brent Hailpern
IBM Research is a Lab and Center member of CRA

IBM’s Cognitive Horizons Network is advancing the science behind cognitive computing by working with the best minds in the world.

Just about every day we learn about a new application of cognitive computing. From predicting schizophrenia to analyzing Wimbledon fan experiences, cognitive computing and artificial intelligence have arrived and are making a measurable difference in our daily lives.

But with all the excitement around real-world applications of this powerful technology, it is easy to forget that the Cognitive Era, as we call it at IBM, is still in its infancy. And there is a tremendous amount of work yet to be done.

Collaborating with leading minds around the world is the key to fulfilling the true potential of cognitive computing. And that’s why IBM formed the Cognitive Horizons Network (CHN), a network of the world’s leading universities committed to working with IBM to accelerate the development of core technologies needed to advance the promise of cognitive computing.

Currently, members of the network are focusing on seven topics:

Video comprehension – Massachusetts Institute of Technology (MIT): Developing machines that can emulate the human ability to understand inputs from multiple video streams and predict potential future events in real-time. The lab will address technical challenges around both pattern recognition and prediction methods in the field of machine vision that are currently impossible for machines alone to accomplish. For instance, humans watching a short video of a real-world event can easily recognize and produce a verbal description of what happened in the clip as well as assess and predict the likelihood of a variety of subsequent events, but for a machine, this ability is currently impossible. This collaboration with MIT will bring together leading brain, cognitive, and computer scientists to conduct research in the field of unsupervised machine understanding of audio-visual streams of data, using insights from next-generation models of the brain to inform advances in machine vision.

Cognitive environments – Rensselaer Polytechnic Institute (RPI): Building environments that explore and advance natural, collaborative problem-solving among groups of people and machines, with the goal of improving how people work together to make decisions. The lab is built around a futuristic ‘Situations Room’ that can be adapted to industry-specific environments (including Cognitive Boardrooms, Design Studios, Diagnosis Rooms and Immersive Classrooms) and is designed to surface new ways to improve how people work together.

Optimized systems – University of Illinois at Urbana Champaign (UIUC): Developing the stack of applications, accelerators, software, hardware and networking needed to support larger and more complex cognitive workloads. With the increased computational demands of cognitive computing, the researchers will further optimize Power Systems for cognitive workloads. Researchers will have access to the OpenPOWER Foundation’s systems technology as well as technical development and support from IBM Systems Group. The new hardware designs and cognitive algorithms will be released to the open source community and OpenPOWER Foundation, of which both IBM and the University of Illinois are members.

Conversational technologies – University of Michigan: Developing technology to allow people to interact more naturally and effectively with computers through text or speech dialogues. The lab will develop a cognitive system that functions as an academic advisor for undergraduate computer science and engineering majors at the university. The system will allow researchers to explore how smart machines interact with people in goal-driven dialogues. To do this, the team will capture and annotate large volumes of conversations.
of approved recorded human-to-human conversations between undergraduates and their advisors on topics such as course selection, career advice, extracurricular recommendations and homework resources. The team will use these conversations to train the system on how to respond to interactions with students, and ultimately learn how to automatically navigate and successfully reply in conversations with those using the system.

Deep learning – Université de Montréal’s Montreal Institute for Learning Algorithms (MILA): Developing next-generation deep learning algorithms and techniques to help computers improve their understanding and interpretation of language, speech, and vision. The lab conducts advanced research in basic sciences on artificial intelligence, machine learning and deep learning, exploring areas such as generative modeling, unsupervised learning, representation and optimization.

Cognitive Cybersecurity – University of Maryland, Baltimore County (UMBC): Applying cognitive computing to cybersecurity via analytics and machine learning, while also exploring specialized computer power optimized for these new intensive computing workloads. The lab explores new ways to apply cognitive technologies – which are able to digest, learn from, and reason over vast amounts of structured and unstructured data – to help cybersecurity professionals gain an advantage in the battle against cybercrime. The research in the lab is conducted on IBM and OpenPOWER technology. The IBM Power Systems being implemented in the lab at UMBC are infused with acceleration technology from the OpenPOWER Foundation, making them ideally suited for cognitive and advanced analytics workloads, critical to the cyber security work the researchers will be conducting.

In addition, researchers will receive technical development and support from IBM Systems Group.

Health Empowerment – Rensselaer Polytechnic Institute (RPI): how the application of advanced cognitive computing capabilities can help people to understand and improve their own health conditions. The center’s vision is to advance the understanding of chronic disease prevention through data-driven discovery and analysis of factors that can help predict the propensity to develop chronic conditions and provide personalized health recommendations and lifestyle guidance for clinicians to deliver to their patients. Specifically, the center plans to develop cognitive tools for health empowerment that use analytics, knowledge-driven learning, and semantics-based interrogation to address data-to-knowledge gaps to enable clinicians and patients to help manage and prevent of chronic diseases and conditions.

This ongoing collaboration is critical to make the promise of AI a reality for business and society. Though we have made incredible strides over the last several years – since IBM Watson first competed on and won Jeopardy! – there are several areas of computer science, engineering, cognitive science, and application domains like medicine, accounting, and law that need to be advanced and brought together if cognitive systems are going to meet the demands of the digital world. In fact, the entire cognitive computing stack – from how people collaborate to make decisions to building advanced computing infrastructure – must be evolved if we are to meet the needs of a demanding world.

For more information about IBM’s Cognitive Horizons Network, please click here.
CRA Board Member Highlight

By H. V. Jagadish

I study how data and people interact. For more than a decade, I have been studying how to help humans access and manage information. While there is a lot of good work on human-computer interaction and on data visualization, much less work exists on “human-data interaction.”

Why can anyone use Google to get information of interest while it is so difficult to get useful information from a structured database? The difference lies in the specificity of the request. A web search engine receives your request and tries to guess your intention. You know that it has a limited understanding of your need, and are happy to have it get you into “the zone,” from where you can explore for yourself. On the other hand, a traditional database query engine can give you complete answers to complex questions but requires that you precisely specify your query. If you make a small mistake, you are out of luck. Wouldn’t it be helpful to devise database query mechanisms that you can actually use and get reasonable results from even if you don’t ask it totally correctly? Complementarily, can the system help you ask a better question in the first place? Similar concerns also apply to the creation of a database, and helping users manage their data.

With these motivations, my research has addressed a number of specific issues: How to summarize complex schema for a user; how to design better web forms; how to give users a hint of the answer as they are specifying a query; how to fill in missing parts of a query; how to understand queries specified in English; and how to generalize from user-provided examples. To address these challenges, there are three main sources of information we can exploit: the schema or the structure of the database; the actual data, such as specific values and their statistics; and the log, namely queries previously asked by this user or others. We use all three sources of information when appropriate.

Recently, Big Data has become a popular term, along with Data Science. In consequence, there has been a large increase in the number of people managing and analyzing data, many of who possess little training in information management. These people cannot be successful unless we have systems that adequately support human-data interaction. As such, there is a greater need than ever for research in human-data interaction, and also a greater appreciation of it.

When we think of human-data interaction, we usually focus on how to facilitate this interaction. Indeed, most of my work has been in this area. However, in the last couple of years, I have started thinking about a completely different aspect of humans’ interaction with data: how Big Data impacts humans. The first thing one thinks of in this context is, of course, privacy. Also, fairness has recently started to get some attention.

About the Author

H. V. Jagadish is the Bernard A. Galler Collegiate Professor of Electrical Engineering and Computer Science, and a distinguished scientist at the Institute for Data Science, at the University of Michigan in Ann Arbor. Previously, he was director of the Software Systems Research Laboratory at the University of Michigan from 2007 to 2014.

Jagadish has written approximately 200 major papers about information management and has 37 patents. He has served on the board of the Computing Research Association since 2009, and was an author of the recent CRA report on data science. He has participated in several National Academies efforts, including its panel on improving federal statistics using multiple data sources. He is an ACM fellow, and his many awards include the ACM SIGMOD Contributions Award in 2013 and the University of Michigan’s David E. Liddle Research Excellence Award in 2008.
But many other research and societal issues warrant our consideration. For example, what constitutes a representative set of training data? How do we make it difficult for people to fudge data or game the system? What is the impact of data science methods on diversity in education, employment, and other areas? How do we think about the oversight of research, such as through an institutional review board, when the “experiment” is to perform analysis on data that have already been collected? I blog about these issues at http://bigdatadialog.com.

Most importantly, I feel strongly that technical people should speak up about the ethical issues surrounding data. They are the only ones with a technical understanding of Data Science algorithms and processes. If they do not speak up, societal decisions will get made with less understanding of the technology. Therefore, technical people should address their work’s consequences. To enable data scientists to do this, there must be education about ethics and responsible data analysis as part of every Data Science degree. To facilitate such learning, I have developed a MOOC and made it available with a Creative Commons license. The course material is at https://www.edx.org/course/data-science-ethics-michiganx-ds101x. Please feel free to peruse this modular study material and to adapt or reuse it in your own teaching.
Students Believe Computing Careers Provide Less Opportunity for Family, but More Opportunities to be Influential and Altruistic

By Jane Stout, CERP Director

CERP analyzed data from 11,626 undergraduate computing students surveyed during the fall 2016 semester via the Data Buddies Project and the BRAID Research initiative. Students were asked to report on the degree to which they believed a computing career would allow them to (a) be in a position of influence in society, (b) serve humanity, and (c) spend time with family. As seen in the graphic, most students believe computing careers afford ample opportunity to be in a position of influence in society and to serve humanity. However, students believe computing careers afford relatively less opportunity to spend time with family. This finding has negative implications for diversity in computing because students from underrepresented racial and ethnic groups and/or students who are first-generation college students tend to place a strong value on family [1,2]. These findings suggest computing careers may be unattractive to these groups of students.

Degree to which students believe a career in computing allows for the following:

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little</th>
<th>Somewhat</th>
<th>Quite a bit</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be in a position of influence in society</td>
<td>3%</td>
<td>11%</td>
<td>28%</td>
<td>36%</td>
<td>22%</td>
</tr>
<tr>
<td>Serve humanity</td>
<td>2%</td>
<td>11%</td>
<td>30%</td>
<td>37%</td>
<td>20%</td>
</tr>
<tr>
<td>Spend time with family</td>
<td>3%</td>
<td>15%</td>
<td>42%</td>
<td>29%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Notes. Students were asked the following question on a scale from [1] Not at all to [5] Very much: In your opinion, to what extent would a career in computing allow you to do the following? (1) be in a position of influence in society, (2) serve humanity, and (3) spend time with family. A repeated measures Analysis of Variance indicated students believe a computing career affords the opportunity be in a position of influence, serve humanity, and spend time with family to a differential degree, $F(2,11625) = 664.44, p < .001$. Specifically, post hoc tests using a Bonferroni correction indicated students believe a computing career allows one to be in a position of influence ($M = 3.63, SD = 1.04$) and serve humanity ($M = 3.61, SD = 1.00$) to a significantly greater degree than spend time with family ($M = 3.29, SD = .96$), $p < .001$. 

August 2017  crar.org/crn
References


This analysis is brought to you by the CRA’s Center for Evaluating the Research Pipeline (CERP). CERP provides social science research and comparative evaluation for the computing community. To learn more about CERP, visit our [website](https://cra.org/crn) and [subscribe to our newsletter](https://cra.org/crn).

This material is based upon work supported by the National Science Foundation under Grant Number ([CNS-1246649](https://cra.org/crn) and [DUE-1431112](https://cra.org/crn)). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Saturday, July 1st, was the start of a new term at CCC!

The Computing Community Consortium (CCC) Chair Elizabeth Mynatt and Vice Chair Mark Hill are continuing in their respective roles for another year. The other members of the 2017-2018 CCC Executive Committee include Daniel P. Lopresti, Lehigh University, Jennifer Rexford, Princeton University, and Ben Zorn, Microsoft Research.

In addition to a new Exec Committee, six new CCC Council members have joined us for the start of their three-year terms. Nadya Bliss, Arizona State University, Elizabeth Churchill, Google, Juliana Freire, New York University, Keith Marzullo, University of Maryland, Greg Morrisett, Cornell University, and Manuela Veloso, Carnegie Mellon University.

As readers of the Computing Community Consortium (CCC) blog know, CCC seeks to promote information technology research by exposing and developing synergies among researchers, research beneficiaries, and research funders. CCC does this through visioning activities, white papers, a blog, etc.

CCC is pleased to see some of its efforts amplified by specific research communities, e.g., artificial intelligence. Here I highlight my own computer architecture community to encourage you to emulate this amplification in your community.

Over the years, CCC has conducted a number of visioning activities related to computer architecture including 2012’s 21st Century Computer Architecture, 2016’s Arch2030: A Vision of Computer Architecture Research over the Next 15 Years, and 2016’s Nanotechnology-Inspired Information Processing Systems of the Future. In 2017 alone, architecture-related whitepapers include Challenges to Keeping the Computer Industry Centered in the US and Democratizing Design for Future Computing Platforms. Finally, the CCC blog includes architecture-related posts, such as the popular 2014 Capabilities Reincarnated: Compatibility and Better Memory Protection and Whistling Past the Graveyard: What the End of Moore’s Law Means to All of Computing, a 2016 Snowbird panel.

The ACM Special Interest Group on Computer Architecture (SIGARCH) has been working to create vision in computer architecture writ large under the leadership of SIGARCH Chair Sarita Adve. First, SIGARCH has adopted visioning. The 2016 International Symposium on Computer Architecture (ISCA) included a workshop that produced the Arch2030 report mentioned above with encouragement and some funds from CCC. At ISCA 2017, however, SIGARCH has inaugurated its own visioning with a Workshop on Trends In Machine Learning, led by Olivier Temam. SIGARCH also announced an open call for future visioning workshop proposals, spearheaded by Luis Ceze, Joel Emer, and Karin Strauss, patterned after the CCC call. An explicit goal is to catalyze and enable innovative research between computer architecture and other areas.

Second, inspired by the CCC blog, SIGARCH has started a “Computer Architecture Today” blog to highlight ideas and visions, via key work by Alvin Lebeck (the founding editor) and Babak Falsafi (SIGARCH communications lead). See, for example, the post Die Stacking is Happening and the post regarding ISCA 2017. SIGARCH efforts are just starting, and I predict the best is yet to come.

We at CCC applaud this activity and encourage your community to do the same!
Material Robotics (MaRo) Workshop at 2017 Robotics Science and Systems (RSS)

Contributions to this post were made by Yigit Menguc from Oregon State University.

The Computing Community Consortium (CCC) recently sponsored a workshop at the 2017 Robotics Science and Systems Conference called Material Robotics (MaRo).

The goal of the workshop was to bring together researchers in robotics and materials science to learn from each other and identify the research challenges and applications of robotic materials.

The original vision of a “robot” introduced by playwright Karel Capek in 1920 was that of an autonomous machine molded in the image of humans. Interestingly, the play begins with a discussion of the materials that make up the robots and introduces the techniques used to spin and extrude such materials into synthetic body parts. Apparently, it was intuitive to imagine robots not just in our image but also from the same kind of active squishy materials. Considering robots as closely influenced by and contributing to the study of materials can make this vision a reality.

Robotic materials are a new class of multifunctional composites that tightly integrate sensing, actuation, computation, and communication. Material robots are a new class of autonomous machines that exploit material properties to extend and expand normal robotic operations.

The convergence of the two approaches results in such capabilities as changing appearance, stiffness or shape in response to the environment while performing large-scale distributed computation right where the signals are generated and control is needed.

The keynote talks from Prof. George Whitesides (Harvard) and Dr. Tom McKenna (Office of Naval Research) highlighted the potential impact of simple machines that embed computation directly into the soft morphology of the device. The discussions by the workshop participants explored the need for standards in the nascent field but ultimately rejected the constraints imposed by standardization. Instead of directly comparing successes with established technologies of “hard” robotics, the young field of “soft” material robotics will be well served with a pragmatic view of marketability where the markets are determined by immediate potential impact on human society. The first clear examples of impacts that can be seen emerging from the field are in food handling, elder care, and marine robotics. Other areas of impact are sure to follow.

For more information, please see the workshop website.
Agriculture provides approximately 1 in 10 U.S. jobs and supports food and nutrition security as well as energy independence. However, U.S. global competitiveness is at risk because of accelerated investments by many other countries in agriculture, food, energy, and resource management. A renewed private-public effort is needed to build next-generation farm-infrastructures to stay competitive, protect and grow workforce, as well as manage risks of market and environmental shocks jeopardizing food, energy, and water security. So how do we start?

Recently, the Computing Community Consortium (CCC) in collaboration with the Electrical and Computer Engineering Department Heads Association (ECEDHA) released white papers describing a collective research agenda for intelligent infrastructure. We will be blogging about each paper over the next few weeks.

Here are many examples of infrastructure investment needs and opportunities:

<table>
<thead>
<tr>
<th>Areas</th>
<th>Intelligent Infrastructure and Research Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workforce Development</td>
<td>Augmented reality: precision agriculture video-games to engage urban, youth. Teleoperation: create jobs in economically distressed labor-surplus areas while addressing farm labor shortage.</td>
</tr>
<tr>
<td>Cyber Physical Systems &amp; Robotics</td>
<td>Robust high-precision positioning to counter GPS outage, jamming, &amp; spoofing for precision agriculture. Integration of data from sensors across satellites, UAVs, farming-equipment, and under-soil. Automation for labor intensive tasks, e.g., picking berries, pruning grape vines. Robotic bees for pollination in areas of declining bee population.</td>
</tr>
<tr>
<td>Spatiotemporal Machine Learning, Data Analytics</td>
<td>Leverage new high-resolution (e.g., daily, 1 meter) data from constellation of small satellites to monitor crops. Speed-up detection of spatiotemporal hotspot of farm pests, diseases and stresses. Improve forecast of food, water &amp; energy demands and models of resource availability. Optimize resource allocation via active management of sensors and actuators.</td>
</tr>
<tr>
<td>Networking, Internet of Farm Things</td>
<td>Improving broadband network access in rural farming areas. Edge Cloud Computing to reduce need for transferring large amounts of data. Leverage whitespace (i.e., locally underutilized frequencies) to move data from in-situ farm sensors to computers in farm houses.</td>
</tr>
<tr>
<td>Decision Support</td>
<td>Advanced spatiotemporal image, and video analysis techniques, e.g., geospatial deep-learning to automate tasks e.g., identify crop stress, fruits/vegetables ready to be harvested.</td>
</tr>
<tr>
<td>Citizen Engagement</td>
<td>Social Media, Apps, and Easy to use Decision Support for growers and ranchers. Downstream behavioral change through apps (e.g., reduce food waste). Cognitive and behavioral science applied to enhance feedback for technology improvement, scientific advancement and innovation.</td>
</tr>
</tbody>
</table>
Nearly 200 attendees representing a variety of institutions and roles participated in the Forum, including university leaders, corporate partners, engineering faculty, K-12 teachers, and academic diversity officers.

Organized around the Framework for Promoting Gender Equity in Organizations, the annual WEPAN Change Leader Forum offered many ways for participants to interact with experts and like-minded individuals from the academic, corporate, government and non-profit sectors. Creating the Mindset for Action, the 2017 Forum theme, inspired attendees to take action and make real progress in advancing cultural change and responsibility within their own organizations and institutions.

Sessions were offered for novice and expert attendees across four distinct tracks:

**Activating a Growth Mindset in Students**

**Building Cultural Competence & Responsibility in Communities**

**Creating Inclusive Classroom, Departmental and College Environments**

**Supporting the College to Workforce Pathway**

Presenters shared experiences and best practices through panel discussions, workshops, Hi-Fives for Change talks, and showcase presentations. The Forum also featured several keynote sessions and the WEPAN annual awards luncheon. New for 2017 was the addition of pre-conference workshops that offer participants an in-depth learning opportunity in four different areas.

The Forum began on Monday, June 12 with four well-attended pre-conference workshops which gave participants tools to enact change at their home institutions. "Men Allies for Gender Equity" presented by Roger Green (North Dakota State University) equipped men to serve as effective allies for gender equity in STEM settings. Tricia Berry (University of Texas at Austin) presented “Running an Effective “Girl Day” Outreach Program” which shared best practices and lessons learned from UTWEP’s award-winning Girl Day program. “Cultivating Communities of Support and Success Through Mentorship and Leadership” facilitated by Paige Smith, Elizabeth Kurban, and Cinthya Salazar (all from University of Maryland) along with Catherine Amelink (Virginia Tech) inspired attendees to create opportunities for mentorship and leadership within living and learning communities. Finally, “Realizing Potential with Mindset” presented by Meagan Pollock (National Alliance for Partnerships in Equity) provided
attendees with a toolkit with specific strategies to use in the classroom in order to foster a growth mindset in themselves and in their students.

The Forum officially kicked-off on Monday afternoon with the opening keynote panel presentation “A Research Agenda on Gender in Engineering and Computing”, featuring panelists Kathleen Buse (Case Western Reserve University), Catherine Ashcraft (University of Colorado Boulder), Jane Stout (CRA) and facilitator Tricia Berry (The University of Texas at Austin). The panelists discussed the third and final part of the AAUW “Moving the Needle” project – the Research Agenda, which is designed to assist both researchers in prioritizing their work and also leaders in government, foundations and corporations as they prioritize funding and other resources.

Monday afternoon featured a networking session to foster collaboration among conference attendees, concurrent sessions aligned with the Forum theme, a State of WEPAN address by President Teri Reed, and group dinners to enable deeper conversations about significant topics addressed at the Forum.

Tuesday, June 13 began with an opportunity to refocus with a morning yoga session. Forum programming began with the keynote panel discussion “Women of Color: ImpACTing STEM’s Past, Present, and Future”, featuring speakers Ivonne Diaz-Claisse (HISPA), Patty Lopez (Intel), Lindsey Malcom-Piqueux (University of Southern California), Shirly Montero Quesada (University of Colorado at Boulder), Renetta Tull (University of Maryland, Baltimore County) and facilitator DiOnetta Jones Crayton (Massachusetts Institute of Technology).
Tuesday also featured a number of concurrent sessions, Showcase poster presentations, and the annual WEPAN Awards Luncheon. Eleven awards were presented to individuals and institutions who demonstrate extraordinary service, significant achievement, model programs, and exemplary work environments that promote a culture of inclusion and the success of women in engineering. A full list of honorees is available at [http://www.wepan.org/mpage/AwardWinners17](http://www.wepan.org/mpage/AwardWinners17).

Tuesday’s program concluded with the keynote session “Speaking Up to Bias: Bystander Intervention to Bias in the Academy”, a roleplaying presentation led by Stephanie Goodwin (Wright State University). The interactive presentation addressed bystander reactions to social biases and how these reactions can help or hinder decisions to speak up. Attendees were equipped to apply these concepts to everyday incidents of bias in academia, identifying concrete strategies for interrupting bias across academic workplace and social settings.

Wednesday, June 14 began with the “Creating the Mindset for Action” keynote panel. Panelists Jenna Carpenter (Campbell University), Gretal Leibnitz (ProActualize Consulting and WEPAN), Gregory Washington (University of California – Irvine) and Glenn Weckerlin (Chevron) discussed key initiatives and actions that can drive the community towards 50/50 by 2050. The goal was to leave attendees feeling inspired, empowered and armed with critical thoughts and ideas on driving for change as attendees return to their home institutions. The Forum concluded with the Hi-Fives for Change Luncheon, featuring high-energy five minute presentations sharing research results and successful initiatives.

The Forum was made possible through the tireless efforts of WEPAN staff members Glenda LaRue, Usha Ramamurthy and Lesley Smith, Forum Chair Sheila Ross (Milwaukee School of Engineering), Board Liaison Lee Ann Cochran (Battelle), Marketing Chair Stephanie Martin (Nucor), Session Coordinator Chair LaTonia Stiner-Jones (Ohio State), and many more volunteers. WEPAN thanks the multiple institutions and organizations who sponsored the Forum: [http://www.wepan.org/mpage/CLFSponsors](http://www.wepan.org/mpage/CLFSponsors).


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**About the Author**

Dr. Sheila Ross is an Associate Professor in the department of Electrical Engineering and Computer Science at the Milwaukee School of Engineering (MSOE), where she serves as advisor for the SWE Collegiate Section and honor society Eta Kappa Nu. She served as Chair of the WEPAN 2017 Change Leader Forum conference committee, and applies what she has gained from involvement in WEPAN to lead multiple diversity efforts at MSOE. She earned her B.S. degree *summa cum laude* in Electrical Engineering and Computational Mathematics from Marquette University, and her M.S. and Ph.D. degrees in Electrical Engineering from the University of Wisconsin – Madison.
Engaging undergraduates in research can be an effective way to increase their confidence, perception of science, and sense of belonging [4]. But at many large research universities, it can be difficult for undergraduate students—especially early undergraduates—to find research opportunities. Furthermore, even when they find opportunities, they might not have the background, training, or support to be successful. These issues are particularly acute for women and other underrepresented groups in computer science as they tend to have less pre-college computer science experience [2,3].

At the University of California, San Diego, we created the Computer Science and Engineering (CSE) Early Research Scholars Program (ERSP) to provide early-research opportunities to students, particularly focusing on women and students from racial and cultural groups that are underrepresented in computer science. ERSP provides a structured, supported introduction to research for students who lack the background, confidence, or connections to approach individual faculty to find research projects. Students apply during the spring of their first year at UC San Diego, and they are selected based on their academic performance in their early classes, their motivation to participate in the program, and their understanding of the issues facing students from minority groups in computer science.

They participate in the program during the following academic year. At the start of the year they are grouped into teams of four and matched with a research mentor, who is a faculty member or researcher in CSE (and who is usually assisted by one or more graduate students or post-docs). During the fall, the students take an introduction to CS research course and observe their mentor’s research group meetings. They also work in the fall with their research mentor and the ERSP program director to develop a research proposal. During the winter and spring, they carry out their proposed research as a team under the dual mentorship of the ERSP staff (the program director and a graduate student assistant) and their research mentor. The students present their work in a poster session at the end of the spring quarter. An overview of ERSP’s timeline is shown below.

The team-based, dual mentoring structure is key to ERSP’s framework. During the research phase, which occurs in the winter and spring, students meet weekly with each of their research mentors, the ERSP graduate student assistant, and the ERSP director. The ERSP graduate student and director provide general research mentoring, helping students to work effectively as a team, plan tasks and meet self-imposed deadlines, communicate well with their team and their research mentor, and learn new skills on their own. This general mentoring frees up the research mentors to focus on more technical mentoring.
Reaching a Steady State
ERSP has been running for three years, and has reached a steady state of 40 participants in 10 projects per year. Over these three years, 99 undergraduates, including 72 women and one gender non-binary student, and 19 students from underrepresented racial and ethnic groups, have participated. ERSP retention is high: 70% of Cohort 1, 75% of Cohort 2, and 87% of Cohort 3 completed the full program.

We are working with CRA’s Center for Evaluating the Research Pipeline (CERP) to understand the impact ERSP has on its participants. An interview study conducted in spring 2017 indicates that the program is achieving its goals of exposure to research and building confidence and community for at least some participants [5]. For example, a student from Cohort 2 reports:

*I can probably see myself in a grad program - Master’s and possibly Ph.D. later if that changes - easier now after this experience*

because before I was like “I’m not THAT smart. These people are like geniuses. No one does academic research just because they’re average. All these people are insanely intelligent.” But doing the research, I feel like I could do that. [5]

UC San Diego has a high number of first-generation college students, so it is not surprising that by default most students don’t even consider graduate school. ERSP helps some of these students see graduate school a path they could pursue. Along the same lines, ERSP also helps students build their professional networks, as this statement from a Cohort 1 student illustrates:

... the program is only a year long; I became friends with and got to know the graduate students that are supervised by the professors I got paired with. I kept working with the professors up until the third year. [5]

Finally, ERSP helps students develop teamwork skills. Multiple students discussed the challenges of working successfully in a team, as this quote from a Cohort 1 student illustrates:

*I was like “OK, I can work with this type of person. I don’t want to work with this kind of worker.” Things like that. You just learn a lot about group dynamics.* [5]

In fact, teamwork and group dynamics are one of the most challenging parts of ERSP. Undergraduates at UC San Diego (as at many universities) are busy, and prioritize “getting it done” over practicing communication and teamwork skills, which they often view as slowing down the process.
Yet to be successful in their careers and in their lives, students must learn to productively work together, respecting their team members, and overcoming friction, even in the face of personality clashes. ERSP’s mandatory group-based framework, together with the dual-mentoring structure, helps them appreciate the reality and inevitability of these challenges and provides them with skills to overcome these issues.

**Promising Results**

Results from quantitative survey data are subtler, and indicate that the quality of the group collaboration affects participants’ feelings of support and interest in pursuing further research opportunities. Students whose group collaborated well showed a stronger sense of growth mindset, felt more supported by the department and their peers, and showed more interest in pursuing research in industry or government [6]. Although we do not know the causal relationship in this result, it further supports the need to work with ERSP groups to ensure successful team dynamics.

Our evaluation has also revealed other guidelines about how to best structure the program. In terms of project design, the best ERSP projects are those that are calibrated to students’ skill sets and allow students to see even superficial progress quickly and then to dive deeper as they acquire more technical knowledge and skills.

For example, in one project, students collected air sensor measurements from several locations in the San Diego area, and then built models to predict air quality in other locations based on those measurements. The data collection phase allowed them to make concrete progress on their research task while they acquired the knowledge needed to apply the mathematical models.

Finally, logistical issues are one of the most challenging aspects of the program. Students and faculty have busy schedules, and the difficulties of finding meeting and work times can delay projects for weeks. We employ a few techniques to minimize scheduling difficulties. First, we use students’ schedules as a primary factor in setting group assignments at the start of the quarter. Although we also try to consider students’ interests, ensuring that they can attend their advisor’s research group meeting, and that they will have enough time to meet as a group during the week is the primary goal. Second, at the start of each quarter, we ask students to submit a weekly schedule with at least 2 hours outside of meeting times that the group will meet as a team. This practice has proven essential, as we have found that without this requirement, group members tend to work in isolation, occasionally communicating via an asynchronous channel, and do not collaborate nearly as successfully.
A Transformative Experience

Overall, we have found ERSP to be transformative for our department and its students. It has helped build a culture and practice of early undergraduate research, particularly for students from groups that are underrepresented in computer science. If you are interested in adopting ERSP at your institution, please see our ITiCSE 2016 paper [1] and our website (ersp.ucsd.edu), or contact Christine Alvarado (cjalvarado@eng.ucsd.edu) for more information.

References


Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant No. CNS-1339335.

About the Author

Christine Alvarado is an associate teaching professor and vice chair for undergraduate affairs in the Computer Science and Engineering Department at the University of California, San Diego. She received her undergraduate degree in computer science from Dartmouth in 1998, and Master’s and Ph.D. degrees in computer science from MIT in 2000 and 2004, respectively. Her current efforts are focused on designing curriculum and programs to make computing and computing education more accessible and appealing, with the specific goal of increasing the number of women and underrepresented minorities who study computing. She is a co-chair of the AP Computer Science Principles development committee and a member of the CRA-Education committee. She has previously served on the College Board’s commission to design the new Advanced Placement Computer Science Principles, as a co-chair of the NCWIT Academic Alliance, and as general co-chair for the 2015 Grace Hopper Celebration of Women in Computing.
Lori Pollock Named CRA Education Committee Co-Chair

At the CRA Education (CRA-E) Committee meeting in June, Lori Pollock (University of Delaware) stepped up to replace Ran Libeskind-Hadas (Harvey Mudd College) as CRA-E co-chair. She will join current co-chair Susanne Hambrusch (Purdue University), and Libeskind-Hadas will remain a member of the CRA-E committee.

During his six years as co-chair from 2011-2017, CRA-E has taken on several new initiatives including:

• Launching the Conquer website, a resource for faculty and undergraduates interested in research, graduate school, and research careers in computing

• Introducing the CRA-E Undergraduate Research Faculty Mentoring Award to recognize faculty mentors who have provided exceptional mentorship

• Starting the CRA-E Graduate Fellows program to involve graduate students in CRA-E activities

• Holding several workshops on Best Practices in Mentoring Undergraduate Research

• Creating a video series showcasing young researchers with Ph.D.s who are now working in industry

• Publishing two reports (Findings from a Pipeline Study based on Graduate Admissions Records and Exploring the Baccalaureate Origin of Domestic Ph.D. Students in Computing Fields)

Reflecting on his tenure as co-chair, Libeskind-Hadas said, “I’ve thoroughly enjoyed co-chairing CRA-E for the past six years. The committee’s mission of sustaining a healthy pipeline of students pursuing careers in computing research is critically important. It’s been a pleasure working with co-chair Susanne Hambrusch, the dedicated members of this committee, and the outstanding CRA staff. I’m excited that Lori Pollock is co-chairing the committee with Susanne, and I look forward to working with them and the rest of my CRA-E colleagues.”

CRA-E also recently launched its own Facebook page. In addition to following CRA-E on Facebook, you can also to subscribe to the CRA-E newsletter for the latest news and information.
CRA Board Members

Sarita Adve, University of Illinois
Nancy Amato, Texas A&M University
Ronald Brachman, Cornell Tech
Carla Brodley, Northeastern University
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Susan Davidson, University of Pennsylvania
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CRA Board Officers

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Column Editor

Expanding the Pipeline
Patty Lopez, Intel
Professional Opportunities

CalPoly

Full-Time Lecturer - Electrical Engineering

ELECTRICAL ENGINEERING DEPARTMENT:
FULL-TIME LECTURER. The Electrical Engineering Department within the College of Engineering at Cal Poly, San Luis Obispo, is seeking to hire one full-time Lecturer beginning September 7, 2017. Primary duties will be to teach undergraduate Electrical and Computer Engineering courses in the areas of Digital and Computer Design Coursework, Electric Circuit Analysis, Electronic Design, Control Systems, Communication Systems, and Signal Processing.

To apply, visit www.calpolyjobs.org, complete required online faculty application, and apply to requisition #104536. Applicants are encouraged to submit materials by the REVIEW BEGIN DATE: August 10, 2017 for full consideration. EEO.

Clemson University

Lecturer - School of Computing

The School of Computing at Clemson University invites applicants for a Lecturer position beginning August 2017. Responsibilities will include teaching (primarily for undergraduate classes), student advising, participation in departmental and university committees, and other typical faculty responsibilities. Teaching assignments will be determined based on school needs and candidate interests. The ability to teach courses in operating systems, networks or software engineering is desirable, though not required. Lecturers are eligible for promotion to the rank of Senior Lecturer.

More information and application procedures may be found at http://www.clemson.edu/computing/connect/positions.html

Clemson University does not discriminate against any individual or group of individuals on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran’s status or genetic information. Clemson University is an Affirmative Action/Equal Opportunity Employer.

Hong Kong Baptist University

Professor / Associate Professor / Assistant Professor in Computer Science

FACULTY OF SCIENCE
Department of Computer Science
Professor / Associate Professor / Assistant Professor in Computer Science (PR322C/16-17)

The Faculty of Science has identified Environment and Health, a highly interdisciplinary theme research area across the departments, as a Faculty Niche Research Area, and aims to establish world-class research teams and facilities for tackling key questions relating to human health and environmental impacts. Major resources will be allocated to this Faculty Niche Research Area, to develop the needed experimental platforms as well as modelling and data analysis capabilities. The ultimate goal is to uncover mechanistic links between various environmental factors and human diseases, leading to new strategies of disease prevention, diagnostics and treatment.

To work on the niche research area “Environment and Health”, the Department of Computer Science now invites applications for tenure-track faculty positions, in the areas of health informatics, artificial intelligence, data analytics, machine learning, security and privacy, and cloud computing. The appointees are expected to teach undergraduate and postgraduate courses including programme management, perform high-impact research, as well as contribute to professional and institutional services. Collaboration with other faculty members in research and teaching is also expected.

Applicants should possess a PhD degree in Computer Science, Computer Engineering, Information Systems, or a related field, and sufficiently demonstrate abilities to conduct high-quality research in one of the Department’s key research areas: (i) computational intelligence, (ii) databases and information management; (iii) networking and systems; and (iv) pattern recognition and machine learning. Applicants should also demonstrate strong commitment to undergraduate and postgraduate teaching in computer science and/or information systems, possess track record of innovative research and high-impact publications, and demonstrate the
ability to bid for and pursue externally-funded research programmes. Candidates for the senior positions should also have a strong track record of research and teaching accomplishments.

Initial appointment will be made on a fixed-term contract of three years. Reappointment thereafter is subject to mutual agreement and availability of funding.

For enquiry, please contact Prof P C Yuen, Head of Department (email: pcyuen@comp.hkbu.edu.hk). More information about the Department can be found at http://www.comp.hkbu.edu.hk.

Rank and salary will be commensurate with qualifications and experience. The University offers competitive package which include retirement/gratuity benefits, annual leave, medical and dental scheme, housing assistance and relocation allowance wherever appropriate.

Application Procedure:
Applicants are invited to write in response to the requirements and provide an updated curriculum vitae and/or fill in the application form which is obtainable (a) by downloading from http://pers.hkbu.edu.hk/applicationforms; or (b) in person from the Personnel Office, Hong Kong Baptist University, AAB903, Level 9, Academic and Administration Building, 15 Baptist University Road, Kowloon Tong, Kowloon, Hong Kong. The completed application form should be sent to the same address. Please quote PR number on all correspondence. Applicants are requested to send in samples of publications, preferably three best ones out of their most recent publications. Applicants should also request two referees to send in confidential letters of reference to the Personnel Office direct. Applicants not invited for interview 4 months after the closing date may consider their applications unsuccessful. All application materials including publication samples, scholarly/creative works will not be returned after the completion of the recruitment exercise unless upon request. Details of the University’s Personal Information Collection Statement can be found at http://pers.hkbu.edu.hk/pics.

The University reserves the right not to make an appointment for the posts advertised, and the appointment will be made according to the terms and conditions then applicable at the time of offer.

Review of applications will begin on 1 June 2017 and will continue until the position is filled.

Idaho State University

Assistant/Associate Professor of Computer Science (3058)

Be part of a great team! Idaho State University’s College of Science and Engineering seeks an Assistant/Associate Professor of Computer Science.

For complete job description, requirements, and application instructions visit jobs.isu.edu.

Michigan Technological University

Department of Computer Science Lecturer Position

Applications are invited for Lecturer positions beginning August 2017 or Spring 2018. An applicant for a Lecturer position must have a master’s or doctoral degree in Computer Science or Computer Engineering, or equivalent, and is expected to demonstrate potential for excellence in teaching and the ability to contribute to the departmental service needs. The candidate should be able to teach across the CS curriculum, particularly second and third-year computer systems courses. ABET experience is a significant plus. Lecturers are appointed for two-year, renewable terms, and there is opportunity for promotion to Senior and Principal Lecturer. Review of applications will begin immediately and continue until the position is filled. The Department has 19 faculty, 450 undergraduate students in two degree programs (Computer Science and Software Engineering) and 48 M.S. and Ph.D. students. Please visit http://www.mtu.edu/cs/ for more information.

Women and under-represented minorities are particularly encouraged to apply. Applications should be submitted online at www.jobs.mtu.edu. To learn more about the opportunity, please visit https://www.jobs.mtu.edu/postings/5265 or contact the Department Chair, Dr. Min Song, at mins@mtu.edu or (906) 487-2209. Michigan Tech is an ADVANCE institution, one of a limited number of universities in receipt of NSF funds in support of our
commitment to increase diversity and the participation and advancement of women in STEM. Michigan Tech is a member of the AGEP network of universities dedicated to increasing the number of underrepresented minorities obtaining graduate degrees in STEM fields. Michigan Tech acknowledges the importance of supporting dual career partners and retaining a quality workforce.

Michigan Tech is an EOE which includes protected veterans and individuals with disabilities.

New Mexico Institute of Mining & Technology

Instructor and Coordinator for Women in Computer Science (WiCS)

The Department of Computer Science and Engineering at New Mexico Institute of Mining and Technology (NMT) invites applications for a non-tenure-track Instructor position to teach introductory courses and coordinate Women in Computer Science (WiCS) activities within the department.

Responsibilities include teaching two freshman/sophomore courses per semester (fall, spring, and summer), which includes integration of best practices for engaging women and other underrepresented groups in computer science, sharing course materials with other instructors, focus on excellence in instruction and engagement of students, assessment of learning, and continuous improvement, building and maintaining WiCS mentoring, internship, research programs to enhance female engagement and success in computer science, developing and distributing material for promoting WiCS including print, online, and social media forms; respond to inquiries about NMT WiCS programs; visiting schools to introduce WiCS via engaging, interactive discussions and mini workshops; continuing research on best practices for engagement and success of underrepresented students in CS; working with Principal Investigator and Department Chair to assess effectiveness of our WiCS program, continue improving program, and publish results to promote WiCS, the department, and newly developed best practices, and working with department faculty to write proposal to increase funding for WiCS, e.g. to raise funds for research opportunities for students in WiCS.

Applicants must have potential for teaching excellence. At the time of appointment, the candidate must have a Master’s degree in Computer Science (CS) or Information Technology (IT) or a closely related field; or a Bachelor’s degree in those fields plus relevant experience. We seek candidates who have the ability to facilitate the learning of CS/IT topic areas by freshman/sophomore students, manage and coordinate lab and teaching assistants; learn new programming languages and relevant open-source tools; and learn and use a course management system, e.g., Canvas. In addition, we seek candidates who have the ability to develop, enhance, and maintain the unrepresented students mentoring, internship, and research opportunity program.

The successful candidate will join a department with two full-time instructors, seven tenured / tenure-track faculty, and about 200 undergraduate and 35 graduate students. Our B.S. in Computer Science program has been accredited by the Computing Accreditation Commission of ABET, Inc. (since October 2006). We have an active ACM (Association for Computing Machinery) chapter, apart from holding regular meetings, undergraduate students organize and participate in programming and cyber security competitions. For further information, contact the department at secretary@cs.nmt.edu.

Applicants should submit a letter of interest, resume, a statement of teaching philosophy, and the names of three references to Computer Science Search, Human Resources, Box 049, New Mexico Institute of Mining and Technology, 801 Leroy Pl., Socorro, New Mexico 87801 or via email to jessica.dennis@nmt.edu. College transcripts will be required if selected to interview. Review of application material will begin immediately. The search will remain open until the position is filled.

New Mexico Tech is an equal opportunity/affirmative action employer.
North Carolina State University

Postdoctoral Researcher

We are looking for a postdoctoral researcher who is interested in the use of programming language, compiler, and artificial intelligence techniques to improve the computing efficiency of applications built on many components (e.g., Spark applications).

The initial funding is for 1 year; extensions are possible. Prior experience in programming language design and compiler construction is desired. Some background knowledge on artificial intelligence (e.g., planning) can be helpful. The job requires self motivation and the willing to take research initiative.

The work will be done under the context of a project sponsored by the United States Department of Energy. Strong communication skills in English are required.

Applicants should submit applications through the following website: https://jobs.ncsu.edu/postings/86646.

The position starts as soon as possible.

Location: North Carolina State University at Raleigh, North Carolina, USA.

For questions, contact Prof. Xipeng Shen (xshen5@ncsu.edu, https://people.engr.ncsu.edu/xshen5/).

Northeastern University

Lecturer, Assistant Teaching Professor, Associate Teaching Professor, Full Teaching Professor – MS in IA

Position Summary: The College of Computer and Information Science (CCIS) at Northeastern University invites applications for one or more positions at the rank of Lecturer/Assistant Teaching Professor/Associate Teaching Professor/Full Teaching Professor beginning in September 2017 or January 2018 at our campus in Boston or online. We are seeking highly-motivated individuals committed to excellence in teaching. Full-time appointments are renewable, career-focused non-tenure-track positions with responsibilities in teaching and service. Primary responsibilities include teaching and developing graduate courses. We are seeking faculty who can teach in one or more of the following areas: Cybersecurity (Foundations), Cryptography, Network Security, Computer System Security, Software Security, Cyberlaw, Information System Forensics, Risk Management, or Cybersecurity Data Mining/Machine Learning. Forensics Management of Critical Infrastructure, and other relevant topics in Cyber Security. The successful candidate will create course content and materials and collaborate with colleagues to develop new academic relationships within the university and the business community. Student advising and service to the college and university are an integral component of the position. Opportunities for research and scholarship are possible on the teaching track and several of our faculty are research active within the field of Computer Science and within the area of Education Research in Computer Science.

Northeastern University is a global university recognized by our renowned co-op program and our focus on experiential learning. We are experiencing dramatic growth in enrollment and academic innovation. The College of Computer and Information Science is one of the fastest growing colleges in the university. It is home to over 1200+ undergraduate students and 1000+ graduate students. We have three undergraduate majors (Computer, Data and Information Science) and over 26 combined majors (CS+X). In the graduate program we offer masters in CS, Data Science, Information Assurance and Cyber Security. Health Informatics and Health Data Analytics. Many of our programs are interdisciplinary programs with other colleges here at Northeastern.

Qualifications: Candidates must hold a PhD in Computer and/or Information Science or a related field from an accredited institution by the start date. Teaching experience at either the undergraduate or graduate level is strongly preferred. Rank of appointment at either the Lecturer, Assistant Teaching Professor, Associate Teaching Professor, or Full Teaching Professor level will be determined on prior teaching experience and will be discussed with candidates during the interview process. Successful candidates will have demonstrated an expert grasp of knowledge of the field at all levels and be creative in their approach to teaching in an environment of cooperative, interdisciplinary and experiential...
education. Strong written, oral and interpersonal skills are required in order to communicate effectively with students in person and online.

For more information about the College, please visit [http://www.ccs.neu.edu](http://www.ccs.neu.edu).

Additional Information: Please submit a cover letter of interest highlighting teaching accomplishments and relevant professional experience, a curriculum vitae, and the names and contact information of at least three references.

**Boston Campus Online**

Compensation is commensurate with qualifications and includes an outstanding benefits package.

Northeastern University is an Equal Opportunity, Affirmative Action Educational Institution and Employer, Title IX University. Northeastern University particularly welcomes applications from minorities, women and persons with disabilities. Northeastern University is an E-Verify Employer.

**Saint Louis University**

**Visiting Researcher on Network Management and Medical Cloud Computing**

We have openings for visiting researchers on SDN/NFV/Network Management (PhD student level). Applications may be disaster-responsiveness or medical imaging (e.g. research on networked applications that interface with microscope management software). Details on eligibility and how to apply at [http://cs.slu.edu/~esposito/Esposito-job-posting.pdf](http://cs.slu.edu/~esposito/Esposito-job-posting.pdf)

**Senior and Junior Tenure-Track Faculty Positions in Artificial Intelligence**

The Department of Computer Science at the National University of Singapore (NUS) invites applications for one Distinguished Professorship and several tenure-track faculty positions in artificial intelligence, machine learning, computational neuroscience and related areas of robotics. The Department enjoys ample research funding, moderate teaching loads, excellent facilities, and extensive international collaborations. We have a full range of faculty covering all major research areas in computer science and a thriving PhD program that attracts the brightest students from the region and beyond. More information is available at [www.comp.nus.edu.sg/careers](http://www.comp.nus.edu.sg/careers).

NUS offers highly competitive salaries and is situated in Singapore, an English-speaking cosmopolitan city that is a melting pot of many cultures, both the east and the west. Singapore offers a safe and family-friendly environment with high quality education and healthcare at all levels, as well as very low tax rates. Singapore has also recently launched a S$150 million national initiative, AI.SG, to expand research, development, and adoption of AI technologies. AI.SG will be hosted at NUS.

Candidates for the Distinguished Professor position should have an established record of outstanding research achievements, thought leadership, and international stature in artificial intelligence.

Candidates for Assistant Professor positions should demonstrate excellent research potential in AI and a strong commitment to teaching.

Truly outstanding Assistant Professor applicants will be considered for the endowed Sung Kah Kay Assistant Professorship.

**Application Details:**

Submit the following documents (in a single PDF) online via: [https://faces.comp.nus.edu.sg/](https://faces.comp.nus.edu.sg/)

- A cover letter that indicates the position applied for and the main research interests
- Curriculum Vitae
- A teaching statement
- A research statement

Provide the contact information of 3 referees when submitting your online application, or, arrange for at least 3 references to be sent directly to csrec@comp.nus.edu.sg.

Application reviews will commence immediately and continue until positions are filled.

Please submit your application by 1 December 2017.

If you have further enquiries, please contact the Search Committee Chair, Weng-Fai Wong, at srec@comp.nus.edu.sg.
Texas A&M University  
Tenure Track Faculty

The Texas A&M University Department of Accounting in the Mays Business School invites applications for a tenured/tenure track faculty position focusing on data analytics beginning in January or August 2018. The position is open to rank. Applicants should have a doctoral degree in accounting or a related field, a demonstrated potential to publish in leading scholarly journals, and a commitment to teaching excellence. Ideal candidates will interface actively with the Mays Innovation Research Center (MIRC), which will launch in September of 2017. The MIRC is a multi-disciplinary research center dedicated to understanding the true nature of innovation and will provide resources for data science and data analytics related to innovation research.

Please send a cover letter and C.V. that includes: 1) research/publication record; 2) indicators of teaching activity/ effectiveness; 3) work and other experience. All applications should be directed to: James Benjamin, Head, Department of Accounting, 4353 TAMU, College Station, TX 77843-4353 (or by e-mail to j-benjamin@tamu.edu).

Review of applications will begin on immediately and will continue until the position is filled.

The successful candidate should have a Ph.D. in Computer Science, or a closely related field (ABDs will be considered if the degree is near completion); demonstrated excellence in teaching; and a strong commitment to the education of undergraduates. For more information about the department, please visit: http://computerscience.tcnj.edu/

About the Department of Computer Science and TCNJ:
The Department of Computer Science at The College of New Jersey (TCNJ) invites applications for a ten-month, non-tenure track visiting faculty position in computer science starting August 2017. Candidates must have a Ph.D. in Computer Science, or a closely related field (ABDs will be considered only if the degree will be completed prior to the start date); demonstrated excellence in teaching; and a strong commitment to the education of, and research with, undergraduates.

Contact Information
To apply, please submit the following materials electronically and consolidated into a single PDF file, by email to cs@tcnj.edu (for any materials larger than five megabytes, please provide a download link).

- Letter of application
- Curriculum vitae
- Statement of teaching philosophy

The Citadel, The Military College of South Carolina
Dean, School of Science & Mathematics

The Citadel invites nominations and applications for the position of Traubert Dean of the School of Science and Mathematics. Candidates must have an earned doctorate and be committed to promoting teaching and scholarship among students and faculty at a predominantly undergraduate institution.

If interested, please see complete position advertisement at www.citadel.edu/careers

The College of New Jersey
Visiting Faculty Position in Computer Science (Non-Tenure Track)

The Department of Computer Science at The College of New Jersey invites applications for a ten-month, non-tenure track visiting faculty position in computer science starting August 2017. We are seeking broadly trained applicants from all areas of computer science, who are passionate about teaching computer science in a primarily undergraduate, residential, liberal arts-centered institution. The successful candidate must be able to teach computer science courses at all levels of the curriculum, including introductory, core, and advanced level. The applicant should highlight any specialized courses that she or he could offer to augment our curriculum.

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Professional Opportunities

- Evidence of exemplary undergraduate teaching, including examples of relevant work from previous students.
- Three confidential letters of recommendation are required, including at least two commenting on teaching effectiveness. Letters should be emailed directly by the recommenders to cs@tcnj.edu with the name of the candidate in the subject line. Letters forwarded by the applicant will not be considered.

Review of complete applications will begin immediately and continue until the position is filled.

To enrich education through diversity, The College of New Jersey is an Equal Opportunity Employer. The College has a strong commitment to achieving diversity among faculty and staff, and strongly encourages women and members of underrepresented groups to apply. Final offer of employment will be contingent upon successful completion of a background investigation.

Tufts University

Lecturer (nontenure-track)

The Department of Computer Science in the School of Engineering at Tufts University invites applications for a full-time Lecturer position to begin as soon as possible in AY 2017-18 (either Fall 2017 or Spring 2018).

The ideal Lecturer candidate will possess prior teaching experience, especially with undergraduate students, and have an engaging teaching style. The candidate must have a strong commitment to undergraduate teaching and mentoring.

A doctoral degree is preferred but not required.

The initial appointment will be for two years with the possibility of renewal.

Application materials should be submitted online through Interfolio at https://apply.interfolio.com/42628.

For more information, please see the complete text of the position announcement at http://www.cs.tufts.edu/Jobs/employment-opportunities.html.

Inquiries should be emailed to cssearch@cs.tufts.edu.

Review of applications will begin July 10, 2017 and will continue until the position is filled.

Tufts University is an Equal Opportunity/Affirmative Action Employer. We are committed to increasing the diversity of our faculty and staff and fostering their success when hired. Members of underrepresented groups are welcome and strongly encouraged to apply.

University of California, Davis

Assistant Professor, Tenure-Track

We invite applications for a tenure-track Assistant Professor position beginning 07/01/2017. Requires a Ph.D. in Statistics or a related field. All areas of statistics will be considered. Individuals specializing in statistical methods for large and complex or massive data are especially encouraged to apply.

Assistant Professor, Term, Computer Science

Job Summary:
The Department of Computer Science at the University of San Francisco invites applications for a full-time, one-year non-renewable term position at the Assistant Professor rank to begin this August for the 2017-2018 academic year.

Minimum Requirements:
a Ph.D. in Computer Science or a related field. Ph.D. candidates that have completed all requirements other than the dissertation (ABD) will be considered if the expected date of earned degree is prior to August 2017. A strong record of teaching at the university level and an understanding of and commitment to support the mission of the University of San Francisco are required.

For information on how to apply, please visit the following link: http://apprtrkr.com/1034026

EEO Policy

The University of San Francisco is an equal opportunity institution of higher education. As a matter of policy, the University does not discriminate in employment, educational services and academic programs on the basis of an individual’s race, color, religion, religious creed, ancestry, national origin, age (except minors), sex, gender identity, sexual orientation, marital status, medical condition (cancer-related and genetic-related) and disability, and the other bases prohibited by law. The University reasonably accommodates qualified individuals with disabilities under the law.
Professional Opportunities


The University of California is an Equal Opportunity/Affirmative Action Employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, disability, age or protected veteran status.

University of Georgia
Lecturer Position in Computer Science

The University of Georgia invites applications for a Lecturer position starting August 01, 2017.

For more details and application information, please see http://cobweb.cs.uga.edu/~thiab/Lecturer_Job_Ad_052017.pdf

To apply, please go to https://facultyjobs.uga.edu/postings

The search committee will begin reviewing applications on June 30, 2017, until the position is filled.

University of Massachusetts Amherst
Postdoctoral Research Associate

The College of Information and Computer Sciences is looking for a Postdoctoral Research Associate to work in the Machine Learning for Data Science lab.

For a complete position announcement including minimum qualifications and application instructions, please see http://umass.interviewexchange.com/candapply.jsp?JOBID=86436

The University of Massachusetts Amherst is an Affirmative Action/Equal Opportunity Employer of women, minorities, protected veterans and individuals with disabilities and encourages applications from these and other protected group members.

University of Missouri
Assistant, Associate, Full Professors in Big Data Analytics

Under the new leadership of Dean Elizabeth Loboa, the College of Engineering at the University of Missouri is in the process of hiring approximately 40-50 new faculty in the area of Big Data Analytics, Biomedical Innovations, and Sustainability (Food, Energy, Water, and Smart Cities). These new hires will have the potential to be joint hires with the other colleges/schools at the University of Missouri (MU). MU offers a rich environment for collaboration with other faculty in Arts & Sciences, Health Professions, Medicine, Nursing, Veterinary Medicine, and Agriculture. Food and Natural Resources. MU specifically invites and encourages applications from qualified women and members of groups underrepresented in science. We are an Equal Opportunity/ Affirmative Action/ADA employer firmly committed to fostering ethnic, racial, and gender diversity in our faculty.

We invite applications for tenured or tenure-track positions at the Assistant, Associate, and Full Professor level. Candidates are expected to have strong potential for establishing a competitive externally funded research program. The successful candidate will also be expected to teach undergraduate and/or graduate courses in these areas. For more detailed information about the positions, visit our website at http://engineeringcareers.missouri.edu/

Qualifications: Applicants should have an earned a PhD in engineering or a related field. Those with relevant postdoctoral experience are particularly encouraged to apply.

Closing Date: Applications will be reviewed as received and will continue until the positions are filled.

Application: Applicants should submit a CV, a research plan, a teaching statement and a list of three to five professional references electronically to http://hrs.missouri.edu/find-a-job/academic/index.php. Inquiries can be directed to Sheila Grant, Associate Dean of Research, College of Engineering, University of Missouri, email: GrantSA@missouri.edu.

The University of Missouri is a Tier I research institution and one of only 60 public and private U.S. universities invited to membership in the prestigious Association of American Universities. Missouri was founded in 1839 in Columbia as the first public university west of the Mississippi River. Today, with an enrollment of more
than 35,000 students, 13,000 full-time employees and 300,000 alumni. Mizzou is a $2.2 billion enterprise and an important investment for the state and nation.

Virginia Tech

Postdoctoral Researcher

Seek one or two postdoctoral researchers who are interested in the use of system engineering and data analytics to ensure system and software security. Current focus is on the use of machine learning methods for analyzing behaviors of systems and programs under attacks. Exploit reproduction, algorithm design, prototype implementation, and empirical validation are key characteristics of the individuals we hope to recruit. Recent related projects have explored call-level probabilistic program anomaly detection in Linux and static-program-analysis based malware detection. Emphasis on study of approaches effective and practical for real applications in security and the understanding of complex programs.

Funding for 1 year is available with possible extension. Background in system security is desirable. Person must be self-motivated and willing to take the initiative in research. Experience with reproducing exploits and attacks in Linux, program analysis tools, and machine learning tools would be desirable. Primary responsibility is to conduct research. Secondary responsibility is to help with research supervision of grad students and undergrad students.

Projects will be in collaboration with faculty at Penn State University. Strong communication skills are required.

Starting date:
Immediately or until the position is filled

Duration:
1 year (renewal is subject to funding availability)

Location:
Virginia Tech campus at Blacksburg, VA.

Please contact Dr. Danfeng (Daphne) Yao (danfeng@vt.edu, http://people.cs.vt.edu/~danfeng/).
Yale University

Dean of the School of Engineering & Applied Sciences (SEAS)

Yale University invites applications and nominations for the position of Dean of the School of Engineering Applied Sciences (SEAS), a division within Yale’s Faculty of Arts and Sciences, to begin on January 1 or July 1, 2018. Reporting jointly to the Dean of the Faculty of Arts and Sciences and the Provost, the Dean will provide leadership and strategic oversight for the five SEAS departments: Biomedical Engineering; Chemical and Environmental Engineering; Computer Science; Electrical Engineering; and Mechanical Engineering. Materials Science, which currently comprise roughly 80 ladder faculty members. SEAS anticipates additional ladder appointments in the near future to support recent campus-wide initiatives in science and engineering. Qualified candidates must meet the standards for a tenured appointment at the Full Professor level in one of Yale’s academic departments.

A detailed description of the position can be found here [http://seas.yale.edu/about/seas-dean-search?destination=node%2F2371].

Letters of application should include a current CV and cover letter, and should be submitted to: https://apply.interfolio.com/42675 by August 15, 2017.

Letters of nomination should be sent to fas.dean@yale.edu.