Faculty Fellows Inspiring the Next Generation of Computer Scientists

Moderator: Rane Johnson-Stempson
Lucy Sanders, CEO NCWIT
Emma Brunskill, Carnegie Mellon
Magdalena Balazinska, University of Washington
Miriah Meyer, University of Utah
Wei Wang, University of California, Los Angeles

July 16, 2012
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Why Women in Computing Matters?

1.4 MILLION computing jobs will open in the U.S. between 2008-2018.

Only 18% of undergraduate computing and information sciences degrees were awarded to women.

Less than 30% of women complete masters or doctorate degrees.

46% of AP test takers are girls, only 19% take CS AP.

2x women leave computing careers than males.

34% higher return on investment when women are in management.
Microsoft Research Faculty Fellowship Program

Each year since 2005, Microsoft Research has recognized innovative, promising new faculty members from a number of research institutions to join the ranks of Microsoft Research Faculty Fellows.

This program now encompasses more than 50 academic researchers whose exceptional talent for research and innovation in computer science identifies them as emerging leaders in their fields.

The selected professors are exploring breakthrough, high-impact research that has the potential to help solve some of today’s most challenging societal problems.

Each fellowship includes a cash award and access to other Microsoft resources such as software, invitations to conferences, and engagements with Microsoft Research.
Faculty Fellows Inspiring the Next Generation of Computer Scientists

Lucy Sanders, CEO NCWIT
July 16, 2012
### Female Percentage of Computer Science Faculty at PhD-Granting Institutions, 1995-2011

<table>
<thead>
<tr>
<th>Year</th>
<th>Full</th>
<th>Associate</th>
<th>Assistant</th>
<th>Newly hired, tenure-track</th>
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<tr>
<td>1994/95</td>
<td>17%</td>
<td>18%</td>
<td>9%</td>
<td>5%</td>
</tr>
<tr>
<td>1999/00</td>
<td>13%</td>
<td>16%</td>
<td>12%</td>
<td>8%</td>
</tr>
<tr>
<td>2004/05</td>
<td>18%</td>
<td>16%</td>
<td>12%</td>
<td>10%</td>
</tr>
<tr>
<td>2009/10</td>
<td>27%</td>
<td>26%</td>
<td>16%</td>
<td>13%</td>
</tr>
<tr>
<td>2010/11</td>
<td>21%</td>
<td>25%</td>
<td>18%</td>
<td>13%</td>
</tr>
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</table>

24% of CIS PhDs were awarded to women in 2010 (19.8% of Taulbee schools).

More than 50% of women in CS or CE doctoral programs think about leaving before the end of their second year (vs. 35% of men.) Women who observed or experienced sexism leave at a 10X greater rate.

Sources: IPEDS; 2012 CRA Taulbee Survey; CRA-W report on CRA-W Grad Cohort, conducted by Joanne Cohoon and Holly Lord.
The Pipeline to Tenure

• Women’s authorship of technical conference papers increased from 7% in 1967 to 27% in 2009.

• Institutions are putting programs into place to support advancement of women faculty (stopping tenure track for family leave, mentoring, etc.).

• Women still get asked to do more service for things-related-to-women and spend more time taking care of home and family.

Mentoring Program for Faculty Advancement
www.ncwit.org/gatechmentoring

1) Interactive tool, “Navigate Your Career,” developed by Carol Colatrella

2) Mentoring and career coaching for faculty women

3) Cross-college workshops (leadership, obtaining and managing individual and collaborative grants, and life-work balance)

4) Integrated evaluation. Chief criterion of success is “faculty advancement” at GT.
Departments Can Take Action

Use clear criteria for hiring and promotion.
Unconscious gender bias can mislead both men and women to make inaccurate judgments in hiring, performance evaluation, and tenure promotion.

Identify and dismantle institutional biases.
Removing institutional barriers ("just the way things are around here") benefits all of an organization's members, not just the minority group.

Offer a support network to women (and men.)
Mentoring, policies for flexibility, and administrative support for gender diversity can have significant impacts for both female and male faculty.
Recommendation Letters

“Her” – more often followed by “training,” “teaching,” or “personal life”

“His” more often followed by “research,” “skills,” and “publications”

Organizational Resources

CRA / CRA-W
Advanced Career Mentoring Workshops (CAPP), REU programs, and ProfessHers mailing list encourage recruitment and retention.

ACM / ACM-W
ACM Women in Computing and ACM newsletters featuring female faculty topics keep women’s careers top of mind. Regional conferences provide encouragement.

NSF ADVANCE
Developing systemic approaches to increasing representation and advancement of women in STEM careers; 30 Institutional Transformation sites.
NCWIT Resources

Programs-in-a-Box
Mentoring-in-a-Box for faculty women, REU-in-a-Box, and Supervising-in-a-Box series provide tips for improving recruitment and retention.

Practices
Practices for combating sexism, creating neutral spaces, and reducing bias in letters of recommendation, hiring, and promotion.

Talking Points and Top Ten Ways
Identifying institutional barriers, and recognizing that men in positions of power can help create positive change.
Education = Opportunity
Across tasks

Across students
Computational Thinking in K-12 Education
MSR Faculty Fellow Mom

Magdalena Balazinska
Computer Science and Engineering
University of Washington

http://www.cs.washington.edu/people/faculty/magda
Magdalena Balazinska

- Assistant Prof... soon to be Associate Prof. 😊
- U. of Washington - Computer Science Department
- PhD from MIT in 2006
- **Research in Database Systems**
  - Distributed stream processing (Borealis)
  - Imprecise, sensor data management (RFID Ecosystem+ Lahar)
  - Big-data analytics, focus on science (Nuage,SciDB)
  - Database usability (CQMS)
  - Interactions between pricing and data mgmt (Data Eco$y$tem)
- **Some awards and honors**
  - NSF CAREER 2009
  - 10 year most influential paper award 2010
  - Microsoft faculty fellow 2007
Science is Facing a Data Deluge!

- Astronomy: High-resolution, high-frequency sky surveys (SDSS, LSST)
- Medicine: Ubiquitous genomics and proteomics
- Biology: Lab automation and high-throughput sequencing
- Oceanography: Massive oceanographic data sets
- Etc.

Scientists need new tools and techniques to effectively analyze all this data!

This need extends beyond science!
Why is This Hard: Example

- Partition
- Local clustering
- Merge
  - P1-P2
  - P3-P4
- Merge
  - P1-P2-P3-P4
- Finalize
  - Annotate original data
Problem: Skew

- Local Clustering
- Merge
- 5 minutes
- 35 minutes

- The top red line runs for 1.5 hours
**SkewReduce**

**Goal**: minimize expected total runtime

- SkewReduce runtime plan
  - Bounding boxes for data partitions
  - Schedule

**Runtime Plan**

6X to 8X runtime improvement

[SOCC’10]
SkewTune

• Key ideas:
  • Ask nothing from the developer
  • Make skew handling completely transparent
  • Mitigate skew at runtime

• Key approach:
  • As long as everyone is doing useful work, do nothing
  • If resources idle, re-partition longest task remaining
HaLoop

- Support for iterative processing in Hadoop

- If system is aware of iterations:
  - Can make developer’s life easier with better API
  - Can improve performance

- Performance improvements:
  - Smart scheduling
  - Various forms of data caching
SnipSuggest and SQB

- SQL Auto-complete and Query Browsing:
  - Takes current context into account
  - History-based domain-specific recommendations

**SQB: Session-based SQL query browsing**

**SnipSuggest: SQL Autocomplete [VLDB’11]**
Summary of Current Big-Data Projects

High-Performance Big-Data Analytics and Cloud Computing (**Nuage**)
http://nuage.cs.washington.edu/

Easier Big-Data Analytics (**CQMS/Nuage**)
http://cqms.cs.washington.edu/

Pricing and Data Management (**Data Eco$y$tem**)
http://cloud-data-pricing.cs.washington.edu/
Other Stuff I Recently Did

New house (2010)

Built from scratch!

Two daughters (2007 and 2010)
How I Manage?

I get help from anyone who’s willing to help!

I mix work and life

Business trip to UCSB

Conference in Greece

NSF Panel in DC

I do what I have to do

I ask for what I need

I don’t try to be perfect

I just do what I can

Conference in France
What it Means to be a Faculty Fellow

- Recognition is important to a faculty career

- Ties with industry help ground research
  - Especially database systems research

- Money provides freedom to take risks
Miriah Meyer
Assistant Professor
School of Computing
Scientific Computing and Imaging Institute
University of Utah
• Education
  - BS in Astronomy, Penn State
  - PhD in Computer Science, University of Utah
  - Postdoc, Harvard University
  - Visiting Scientist, Broad Institute of MIT and Harvard

• Research
  - PhD: construction of geometry from volumes (medical images)
  - Design of interactive visualization tools to explore complex data
  - Visual representations and intuitive interactions
  - Collaboration with scientists in early-stage analysis
  - Methodology for visualization research
Big Data
Bigger Challenges

Wei Wang
University of California, Los Angeles

July 16 2012
Surfing the Data Flood

POPULAR SCIENCE
THE CONTROL CENTERS
Using Data to Feed the World, Solve Cold Cases, Battle Malware, Predict Our Fate
OFFICER ALGORITHM
Can a Crime Be Prevented Before It Begins?
NEW WAYS OF SEEING
A Gallery of Extraordinary Infographics
SPECIAL ISSUE
DATA IS POWER
HOW INFORMATION IS DRIVING THE FUTURE
Data is Everywhere
In the past 20 years, over 2 million research papers have been published!
Data Mining is Challenging

In the past 20 years, over 2 million research papers have been published! BUT ...
Data Mining in Science

Life’s Complexity Pyramid
Integrative Computational Analysis for Systems Genetics

- In silico Models
- Mouse Models
- genotypes
- phenotypes
- gene expressions
- Public databases

- gene networks
- local phylogenies
- variable selection

- phylogeny-based QTL
- network QTL
- statistical validation
- gene identification

- Simulated Null Cluster Index Distribution
  - P-value = 0.378
A step towards personalized medicine
MotifSpace

University of North Carolina at Chapel Hill

Wei Wang

MotifSpace is a tool for visualizing and analyzing protein-protein interactions. It allows researchers to explore the complex networks of interactions that underlie biological processes. The tool helps in identifying motifs and patterns that are common across different proteins, which can provide insights into the functional and evolutionary relationships within these networks.

Figure 1: The architecture of MotifSpace

Figure 2: Visualizing protein-protein interactions

Figure 3: Identifying motifs in protein-protein interaction networks

Figure 4: Pathway visualization in MotifSpace

Figure 5: Protein-protein interaction networks in different biological contexts
Panel Discussion

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What univ. need to do to grow nb of women faculty?

- Interview and hire more women faculty
- Acknowledge impact of child-rearing on women
- Acknowledge impact of pregnancy
- Help grow pipeline of women faculty & researchers

Universities are already doing a lot in this area!
So I believe it is a matter of continuing and doing more
CALL TO ACTION - Miriah

- Support multidisciplinary curricula
- Cross-cutting CS intro for non-majors
- Help women find each other

- Help dual-career couples
- Formal (and informal) faculty mentorship
- On-campus childcare
Call to Action-Wei

• Women in Computing
  • Fellowships for excellent female students to study computer science
  • Special hiring package that makes relocation easier
  • Selective (Less) committee service
  • Seed fund to enable new collaboration
Become a Change Leader

Join the NCWIT Academic Alliance

Work with over 200 peer institutions on effective practices and utilization of the latest research. Microsoft Research funds the NCWIT Seed Fund for practice implementation.

info@ncwit.org for more information.
Opportunities with MSR

Further your research, have your students submit for a GRADUATE SCHOLARSHIP AWARD.

Get involved in changing the world, have your students apply for an INTERNSHIPS & FELLOWSHIPS.

Learn more about our activities by visiting our WEBSITE.
Thank you!

Q&A