Increasing Diversity Through Collaboration with Scholar Programs

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UMBC - Quick Facts

- ~14000 students
- 53% white, 47% minority.
  Asian American (19%), African American (17%), Hispanic (7%), Other (7%), Int. (3%)
- UMBC consistently ranked by NSF in the top-10 universities for the number of CS / IS / CSEE graduates.
- Top 20 in NASA funding
- ~80 million annual research funding
UMBC’s Central IT Organization

Full-Time Staff

- 83 Full-time staff.
  - Approximately 56 staff worked for us as students. ~70%
  - Diversity is low, 20% female, 15% ethnic minority, though improving. Was 7% a few years back
  - Trouble recruiting due to demand in Baltimore Washington area

The Challenge

Dr. Freeman Hrabowski
UMBC President
Student Workforce

- 100+ at any given time, mostly undergrad
- Used in all departments extensively
- Given advanced operational responsibility
- Wide breadth of jobs
  - Network Engineering
  - CyberSecurity
  - HPC Administration
  - Predictive Analytics
  - And many more...
How We Did This

1. Make diversity of student employees a priority in the division.

2. Identify strategic campus partners

3. Create learning opportunities and professional growth - a compelling experience is the best approach.
Making Diversity a Priority

2014
- We don’t actually know because we weren’t making diversity a priority in student hiring.
- 90% Male and 80% Caucasian.

AY 2017-18
- 62% Male, 38% Female
- 41% Caucasian
- 25% African American
- 34% Asian/Middle Eastern
Identify Strategic Campus Partners

1. Center for Women in IT
2. CSEE faculty -- formed partnerships with our Cyberscholars program and Scholars for Service.
3. Opportunistic - when we get the opportunity we take it.
4. Our students are the BEST recruiters for us.
20 YEARS
CWIT - The Center for Women in Technology

Time to Celebrate!

AFFILIATES
17 friends of Scholars --to--
298 CWIT & Cyber Affiliates Members

SCHOLARS
1 Program with 7 Scholars --to--
3 Programs and 103 Scholars

FACULTY & STAFF
A small group of interested faculty around a table--to--
25 Mentors, 10 Application Readers, 9 Research Partners, 7 LLC Advisors

1998 2018

Alumni Engagement
Fundraising
Visioning
Fun!
Center for Women In Technology

Fast Facts:

- 79% of Scholars are Women
- 26% of Scholars identify as Black or Hispanic
- 103 Current CWIT, Cyber, T-SITE Scholars
- 678 Pizzas enjoyed at CWIT events last year
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Create Learning Opportunities

- Identified advanced students to work on CC*IIE grant
- Created a network analytics and visualization student group
- Assist with Design and manage deployment of new building rollouts
- Design wireless enhancement for buildings
- Assist with architectural design of new data center network
Benefits & Lessons Learned

● We are getting are higher performing students
● Better representation of our campus community
● Helps keep young talent in Higher Ed IT
● Engaged students recruit for you
Pipelining really works

Natacha
Internet2 Inclusivity Initiative

- Community Outreach & Dialogue
  - Monthly Calls with Steering Committee

- Collaboration
  - National Center for Women & Information Technology (NCWIT)
  - EDUCAUSE
  - WINS program

- I2I Scholarships at Global Summit and TechEX Events
Partnering Across Research and Central IT
Research and Central IT Structure

- Very centralized IT structure
- Office of VP of Research resides within the academic side of the university
- Research computing run by central IT (or by a server sitting under someone’s desk)
The Problem:

**MRI: Acquisition of a 3D object and motion capture system**  
*PI: Marc Olano; Co-PIs: Shaun Kane, Amy Hurst, Daniel Bailey, Erle Ellis;*

**CC*IIE Networking Infrastructure: Enabling Big Computing and Data Intensive Cyberinfrastructure (EBCDIC)**  
*PI: Jack Suess; Co-PIs: Don Engel, Matthias Gobbert*

**MRI: Acquisition of π², a CAVE2-Inspired Display for Discovery Science, Creativity, and Education**  
*PI: Don Engel, Jian Chen (Former); Co-PIs: Craig Saper, Karl Steiner, Penny Rheingans, Michael Summers;*

**MRI: Acquisition of Cutting-Edge GPU and Phi Nodes for the Interdisciplinary UMBC High Performance Computing Facility**  
*PI: Meilin Yu, Matthias Gobbert (Former); Co-PIs: Marc Olano, Daniel Lobo, Jianwu Wang, Meilin Yu.*
Photogrammetry Scanner

3D Acquisition Facility

Hardware:

- 94 x Canon T5i Cameras
- 8 x Optoma Projectors
- 8 x Paul C Buff ‘Alien Bee’ Flashes
- 4 x Custom Timing Controllers
- 5 x Control Servers
- 1 x Processing Node
Photogrammetry Scanner

Plantelligence

- Lynn Cazabon, Prof. Visual Arts, UMBC
- Scan 5 plants, every 5 minutes, for 2 months
- Simulated day/night cycle
- Automated watering
- Constructed and integrated a turntable
- Produced ~24TiB of images
- Reconstruction bottleneck
Key Issues

- All rendering is funneled through a single PC
- Complex custom software
- Siloed, separate system
- Images are produced quicker than they can be rendered
Pi Squared Visualization Facility

Advanced Visualisation Facility

High-Density, Collaborative Display

Hardware:

- 24 x 1080p60 monitors
- Passive stereoscopic 3D
- ART vision system
- 2 node render cluster
- 6 x NVIDIA Quadro M5000
- Automation hardware
- 10Gb internal network
Things Started to Shift and Come Together

- Completion of 10 year strategic plan
  - Highlighted expanding our research portfolio
- Shift in federal funding models
- A new HPC grant was being discussed
- Central IT and Office of Research were talking more often
- Management of the Visualization wall was given to the Office of Research
Planned Partnership

- CIO bought out AVP of Research, Dr. Don Engel, 1 day a week
- Focus on furthering strategic initiatives
- Day to day priorities left open and flexible
Immediate Changes

- Frequent meetings helped build a clear picture of the landscape
- The Research office became aware of central IT priorities
- Helped IT connect with researchers
- Both sides could now identify gaps
Taking our Pitch on the Road

- Started to visit groups:
  - Deans
  - Academic Departments
  - Strategic Planning Committees
- Awareness campaign
The New Way of Doing Things: HPC Renewal

- Integrated Central IT and AVP of Research in all phases of the proposal
- Better understanding of researchers unmet needs
- Lead to a more refined proposal that was awarded in August 2017, the largest such proposal in UMBC’s history

- Sparked a new set of discussions about integration of facilities
Pipelining the Photogrammetry System

Enabling Parallel Model Reconstruction

- Serial Reconstruction takes ~1-2 hours
- HPCF has 324 nodes
- Parallel Sparse Reconstruction
  - Uses SIFTGPU on image tiles
  - Distributed keypoint matching
  - Parallel camera pose solver
  - Bundle adjustment is still single node (though multithreaded)
- Parallel Dense Reconstruction in Progress
Pi Squared Enhancements

Currently In Progress:

- Full-Resolution Video Playback
  - 50M pixels (11520x4320), 8K+50%
- Streaming Live Content From HPCF
- Generic Application Support
Collaborations Between Central IT and Office of VPR

- Multiple grant submittals in process
- Several new faculty now approaching us
- Co-funding graduate and undergraduate student researchers
- Now being asked to visit departments and leadership groups
Researchers and Accomplishments:

- Supported by DoIT and two assistantships.
- Large annual summer REU program.
- In just the last three years, Maya supported 100 publications
- A $552,353 MRI award (third in support of the facility), the largest-ever MRI award to UMBC.
  - New addition will have 44 general purpose nodes, each with 2 18-core 2.3ghz Intel Skylake CPUs and 384GB of ram (~11GB/core)
  - 8 Big Data nodes with ~40TB of local storage
  - Experimental Node with 4 NVidia V100 GPUs connected with NVLink
  - Comes online Summer 2018