Welcome to Twin-SPIN

Computer Science & Engineering and the Minnesota High Tech Industry: A Symbiotic Relationship In Its Infancy

Mats Heimdahl
Professor and Department Head
Department of Computer Science and Engineering
Very Active Computer Industry

CS&E is Approaching 50

1967
Graduate program in Computer and Information Sciences established

1969-70
Department of Computer Science established

Apologies to all I left out
A Strong CS&E Department

- Outstanding faculty
  - 45 tenure track faculty who are leaders in their respective areas
  - 11 outstanding teaching faculty without whom we would not survive
  - 7 research faculty that are key to our research enterprise

- Extensive undergraduate and graduate program
  - Close to 900 undergraduate majors,
    - Graduates about 320/yr with BS & BA in CS
    - 480 graduate students
    - Graduates ~100+ (yr with MS(CS&SE) and 25-30 with PhD degrees
    - MS in Software Eng. for local industry
    - MS in Data Science launched in the Fall of 2015
  - Our graduates are highly sought after by industry and academia
    - 0% unemployment 3 months after graduation
    - Highest paid major in the college

- Strong demand for courses in computer science and engineering
  - Double digit growth for many years

- Strong relationship with alumni and members of the local industry
  - Industry Affiliates Council

- Research funding healthy

Outstanding Faculty

- Distinguished McKnight University Professorship: 6
- McKnight Land-Grant Professorship: 17
- NSF CAREER Award: 25 since the inception of the program in 1995.
- NSF PECASE Award: 3
  - This number of awards is among the highest for Computer Science departments nationwide.
- Fellows of major professional societies
  - AAAS Fellow, ACM Fellow, IEEE Fellow, AAAI Fellow, SIAM Fellow
- Editors in Chief and Editors of major international journals
- Keynote speakers at national and international conferences
- Winners of best paper awards in major journals and at conferences
Highly Interdisciplinary Research Program

- Spinal Kinematics for Physical Therapy
- Social Interactions In Songbirds
- Computer Aided Design of Nanostructured Optical Material
- Orthodontic treatment planning and simulation
- Biochemical Metabolic Networks
- Chemical Reaction Network in BioRefineries
- Simulation of Helium Shell using HPC
- Robotic Tracking of Invasive Fish
- Understanding Genetic Interactions
- Navigation Assistance for Visually-impaired
- Grid Computing for Clinical Trials
- Social Networks and Interaction
- Security and Safety of Embedded Systems
- Understanding Climate Change

The Way it Used to Be

- Top Grad Students
- Top Faculty
- Top Undergraduates
- Top Interns, Co-ops, and Employees
- Research Results and Continuous Education
Questions

Is Your Primary Interest U-Grads?
Trends: Good or Bad?

- Increased demand for employees
- Increased demand on our programs
- Decreasing state support
- Decreasing or flat federal funding

Computing is The Future

http://lazowska.cs.washington.edu/NCWIT.pdf
or
Snowbird.pdf
What Do Our Students Do?

Computer Science Career Outcomes, 2015-16
- Employed: 84.1%
- Graduate School: 1.6%
- Additional Undergrad: 1.6%
- Military: 0.1%
- Volunteer/Internship: 2.9%
- Seeking Employment: 1.6%
- Travel/Family: 2.9%

Electrical Engineering Career Outcomes, 2015-16
- Employed: 64.5%
- Graduate School: 3.2%
- Additional Undergrad: 2.2%
- Military: 1.1%
- Volunteer/Internship: 3.2%
- Seeking Employment: 5.4%
- Travel/Family: 1.1%

Chemistry Career Outcomes, 2015-16
- Employed: 46.1%
- Graduate School: 1.0%
- Additional Undergrad: 5.9%
- Military: 1.0%
- Volunteer/Internship: 5.9%
- Seeking Employment: 1.0%
- Travel/Family: 2.9%

Mechanical Engineering Career Outcomes, 2015-16
- Employed: 77.1%
- Graduate School: 12.4%
- Additional Undergrad: 1.8%
- Military: 2.4%
- Volunteer/Internship: 2.4%
- Seeking Employment: 3.5%
- Travel/Family: 0.6%

Starting Salaries

Average Starting Salaries:
- Chem: $50,898
- EE: $62,225
- ME: $63,138
- Stats: $63,167
- CEMS: $64,207
- CE: $66,364
- CS: $70,594
Questions

Is It Hard To Hire?
Trends: Good or Bad?

- Increased demand for employees
- Increased demand on our programs
- Decreasing state support
- Decreasing or flat federal funding

Undergraduate Enrollment

[Graph showing CS undergraduate enrollment from Fall 2011 to Spring 2017 with different categories: CSE CSCI Major, CLA CSCI Major, Majors Total, Major+Pre Major.]
Undergraduate Graduation

![Undergraduate Graduation Graph]

Graduate Program

![Graduate Program Enrollment Graph]
Credit Hours

More Credit Hours

Note: CS&E Numbers do not include SEng and SciC

Dr. Mats Heimdahl
Who Are We In CS&E

Questions
Are We Graduating The Right Students?

Trends: Good or Bad?

- Increased demand for employees
- Increased demand on our programs
- Decreasing state support
- Decreasing or flat federal funding
U of Minnesota Budget

A Lot of Student Debt

Where do students graduate with the most debt?

Average Debt Per College...

7,627 26,740
Not Enough Resources to Grow

• CS&E Needs
  – More tenure track faculty
  – More teaching faculty
  – More space
  – More staff

Questions
Trends: Good or Bad?

- Increased demand for employees
- Increased demand on our programs
- Decreasing state support
- Decreasing or flat federal funding

Source: Budget of the U.S. Government FY 2017/Historical Tables, FY 2017 is the request. © 2016 AARP
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National Science Foundation Budget

Budget Authority in billions of constant FY 2016 dollars

- New Mand.
- NSF ARRA
- All Other
- EHR
- MREFC
- Other RBRA
- SBE
- CISE
- BIO
- ENG
- GEO
- MPS

Source: NSF budget requests and AAAS/AAU report series. FY 2016 figures are estimates. FY 2017 is the request. © 2016 AAAS

National Institutes of Health Budget, 1998-2017

Budget Authority in billions of constant FY 2016 dollars

- New Mandatory (FY17)
- ARRA Funding
- General Med Sci
- Cancer
- NAID
- Heart Lung Blood
- NDDK
- Mental Health
- All Other

Source: AAAS data, agency budget documents, and appropriations. Adjusted for inflation (medical R&D in Consumer Price Index, excluding supplemental FY 2017 & a September end FY 2012. © 2016 AAAS
Questions

Trends: Conspiring To Hurt Us

- Increased demand for employees
  - Students work instead of going to graduate school
  - Salaries driven up
  - Shortages lead to hiring of unskilled workers
  - New graduates not properly prepared
- Increased demand on our programs
  - Workload for faculty unsustainable
  - Research suffers and reputation damaged
  - Increased need for PhD students
- Decreasing state support
  - Debt load drives students to industry
  - No resources to grow the department
    - New hires
    - Retention
    - Space
- Decreasing or flat federal funding
  - Not enough money for the growing research programs
    - The rich will get richer, the rest will starve
We Need To Help You

- Top Grad Students
- Top Faculty
- Top Undergraduates

- Research Results and Continuous Education
- Top Faculty
- Top Interns, Co-ops, and Employees
- “Sexy” Work
- Awareness of Company
- Engaging Environment
- Salary and Benefits

You Need To Invest

- Top Grad Students
- Top Faculty
- Top Undergraduates

- Department Reputation and Environment
- Location
- Salary
- Availability of Top Grad Students
- Prestige
- Start Up

- Top Interns, Co-ops, and Employees
- Research Results and Continuous Education
- Endowed Professorships and Chairs
- Department Ranking
- Tuition Cost
- Scholarships
- Quality of Instruction
- Research Collaboration
- Named Scholarships
- Donations
- Department Ranking
**Industry/University Ecosystem**

- Top Grad Students
- Top Faculty
- Top Undergraduates
- Investment
- Top Interns, Co-ops, and Employees

Research Results and Continuous Education

**Initiatives**

- Data Science BS/BA Program
  - Jointly with ECE, Stats, Math, ISyE
- Software Engineering Bachelors Program
- Connect our undergraduate body to the department
  - Welcome to the major event, CS&E Town-hall,
- Increased focus on minority recruiting and activities
  - Shana Watters to lead these efforts
- Improve graduate student recruiting
  - Our growing department needs more students
- Novel MOOC offerings
Needs

• Investment

Discussion
Questions

Who Are We In CS&E

Faculty Composition

- Asst Total
- Assoc Total
- Full Total

1/4/18

Twin-SPIN
The Space “Plan”

Robotics Space in Shepherd