

Two Models of Apprenticeship: Clinic and REU

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Harvey Mudd College



Our Name is Mudd...



Harvey Mudd



Harvey Mudd sounds like...

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Reply by February 28, 1998

YES!

|||||

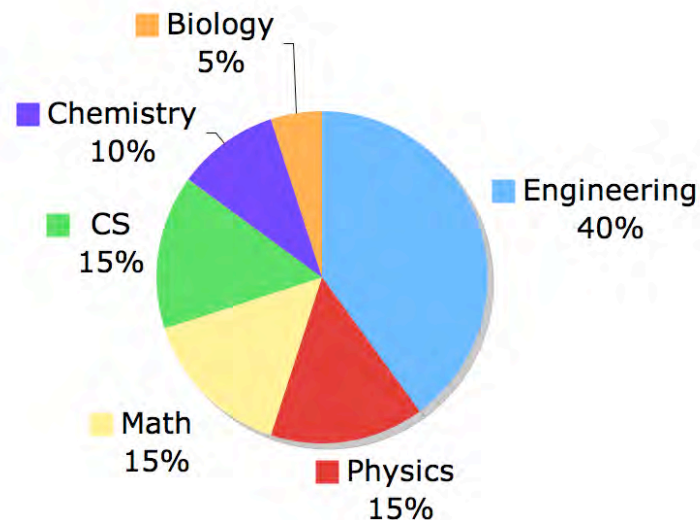


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Harvey Mudd

- Undergraduate only (4-year B.S.)
- Approximately 800 students total
- 200 first-year students
- 1.5 years of “common core”
- Students choose major at end of second year

Majors
chosen
at HMC...



A few observations...

- Many/most undergraduate students don't understand what CS research is all about
- If we want to broaden and diversify the “pipeline” into CS research, we need to...
 - Explain what CS research is *about*
 - Explain why CS research is *exciting*
 - Provide more undergraduate research opportunities

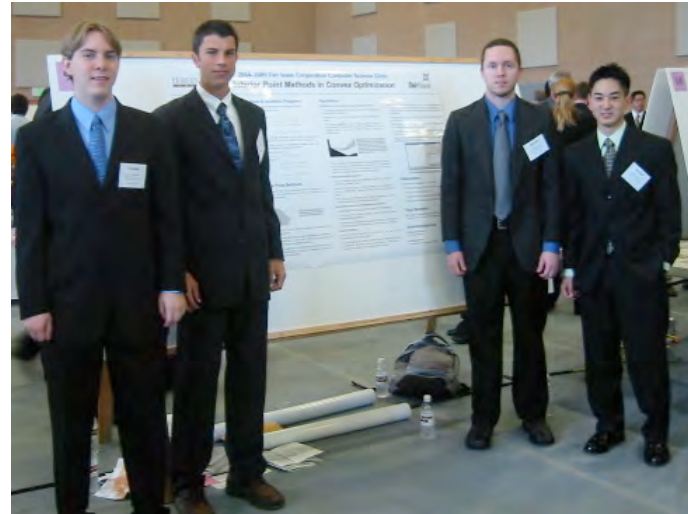


Two programs

- Clinic Program: Applied research during the year
- NSF REU Site: Summer research

The “Clinic” Program

- Four students (typically seniors)
- Two semesters (1 of 5 classes)
- Concept-to-Product
- Faculty supervisor
- Sponsor liaison
- \$50K fee



Unlike...

- Unlike internships
 - Project vetted by faculty
 - Faculty supervision
 - Work done on campus
- Unlike research
 - Always a group project
 - Sponsor owns IP
 - Publications secondary to deployment

Benefits

- For students...
 - Work on a problem that is likely to be deployed
 - Experience with a large-scale project
 - Planning, teamwork, leadership
 - Satisfaction of completing something big and real
- For sponsor...
 - Value
 - Recruiting

Examples of Projects

- SPARQLy: An RDF Store for Regularly Structured Data (Dreamworks Animation)
- Building a Replicated Transaction Log Library (LinkedIn)
- Visualizing Proof Search (FICO)
- Computer Simulation of the GPS Ground Network (Boeing)

NSF REU Site

- 10 undergraduate students per summer
- 5 from home institution, 5 from other schools
- REU provides \$ for stipends, food, housing, travel
- Narrow or broad research scope
- Currently 60 sites nationwide





REU Sites

REU SITES: Computer and Information Science and Engineering

| Site Information | Contact Information | Additional Information |
|--|---|--|
| <p>Auburn University Research Experience for Undergraduate Pervasive and Mobile Computing Center for Innovations in Mobile Pervasive Agile Computing Technologies Auburn, AL 36849</p> | <p>Primary: Dr. Saad Blaz 334-844-6307 biazsaa@auburn.edu Secondary: Dr. Wei-Shinn Ku 334-844-6341 weishinn@auburn.edu</p> | <p>Research Topics/Keywords: Pervasive and mobile computing Abstract of Award</p> |
| <p>Brooklyn College of the City University of New York (CUNY) REU Site: MetroBotics: undergraduate robot research at an urban public college Computer and Information Science Brooklyn, NY 11210</p> | <p>Primary: Elizabeth Sklar 718-951-5657 sklar@sci.brooklyn.cuny.edu Secondary: Simon Parsons 718-951-5657 parsons@sci.brooklyn.cuny.edu</p> | <p>Research Topics/Keywords: robotics, multiagent systems, multi-robot systems, human-robot interaction Abstract of Award</p> |
| <p>Clemson University REU Site: Undergraduate Research in Human-Centered Computing School of Computing Clemson, SC 29634</p> | <p>Primary: Larry F. Hodges, Ph.D. 864-656-7552 lfh@clemson.edu Secondary: Andrew Duchowski, Ph.D. 864-656-7677 andrewd@cs.clemson.edu</p> | <p>Research Topics/Keywords: Virtual Humans, Eye-tracking, Human-Computer Interaction, Multimedia Interfaces Abstract of Award</p> |

HMC REU

- PI oversees program
- Four faculty mentors and projects
 - Garbage collection
 - Computer vision for robotics
 - AI techniques for teaching jazz improv
 - Computational biology
- Enrichment
 - Fun topics lectures
 - Research careers panel
 - Applying to grad school



Time commitment

- Common application and assessment instruments
- Administrator spends ~5 hours/week
- Faculty time
 - Admissions
 - Logistics (first time!)
 - Research supervision



Outcomes



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375

Optimal Virtual Topologies for One-To-Many Communication in WDM Paths and Rings

Jeff R. K. Hartline, Ran Libeskind-Hadas, *Member, IEEE*, Kurt M. Dresner, Ethan W. Drucker, and Katrina J. Ray

Abstract—In this paper we examine the problem of constructing optimal virtual topologies for one-to-many communication in optical networks employing wavelength-division multiplexing. A virtual topology is a collection of optical lightpaths embedded in a physical topology. A packet sent from the source node travels over one or more lightpaths en route to its destination. Within a lightpath, transmission is entirely optical. At the terminus of a lightpath the data is converted into the electronic domain where it may be retransmitted on another lightpath toward its destination. Since the conversion of the packet from the optical to the electronic domain introduces delays and uses limited physical resources, one important objective is to find virtual topologies which minimize either the maximum or average number of lightpaths used from the source to all destination nodes. Although this problem is NP-complete in general, we show that minimizing the maximum or average number of lightpaths in path and ring topologies can be solved optimally by efficient algorithms.

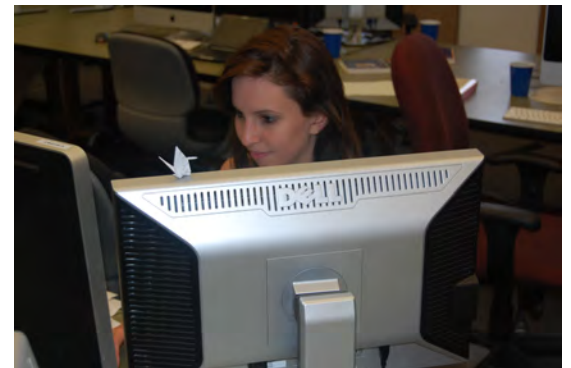
In many applications, a single source node in a network is required to send data to a number of destination nodes. The data sent to the destination nodes may be identical (multicast communication) or may be personalized. Ideally, each message is transmitted from the source to a destination without any optical-to-electronic conversion within the network. Such *all-optical* communication can be realized by using a single wavelength to establish a connection to each destination, but such connections require many dedicated optical paths which may, in general, be difficult or impossible to find [11]. Alternatively, all-optical wavelength converters may be used to convert from one wavelength to another within the network but such converters are likely to be prohibitively expensive for most applications in the foreseeable future [13]. Moreover, in all-optical communication a path is typically dedicated for communication from the source to a specific destination, potentially under-uti-



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Before and After the REU

- Upon entry...
 - Almost all REU students indicate curiosity about research
 - Almost all are unsure if they will pursue a research career
- A few years later... over 90% continue on to Ph.D. programs



Questions and Comments...