The Harvey Mudd College Clinic Program

Celebrating more than 50 years of Clinic

R. Michael Shanahan Center for Teaching and Learning Claremont, California
What is Clinic?

- Sponsored capstone-project course (taken by all senior CS majors)
- Starts in September, ends in May
- 10+ hrs / student / week (1200-1500 hours in total)
- Sponsors own all IP

Team of 4-5 students, delivering on an open-ended project with a faculty advisor, sponsor, and sponsor’s liaison(s).
What is Clinic?

- Sponsored capstone-project course (taken by all senior CS majors)
- Starts in September, ends in May
- 10+ hrs / student / week (1200-1500 hours in total)
- Sponsors own all IP

Team of 4-5 students, delivering on an open-ended project

Matterport: a custom-designed 3d game
Fluxergy: cellular image-processing
Example: Matterport

Innovative uses of 3D modeling:
A real-world, first-person game
What is Clinic?

- Sponsored capstone-project course (taken by all senior CS majors)
- 10+ hrs / student / week (1200-1500 hours in total)
- Starts in September, ends in May
- Sponsors own all IP
- Team of 4-5 students, delivering on an open-ended project

Microsoft: confident reading, by everyone
Verkada: live-stream computer vision + ML
An energy- and geology-motivated application: finding $^{235}$U fission tracks in apatite crystals

Example: Computer Vision
What is Clinic?

- Sponsored capstone-project course (taken by all senior CS majors)
- Starts in September, ends in May
- 10+ hrs / student / week (1200-1500 hours in total)
- Sponsors own all IP

Team of 4-5 students, delivering on an open-ended project

Pure Storage: file-system capabilities
Jones Parking: targeted start-up-teaming
## Clinic Sponsor Commitment

<table>
<thead>
<tr>
<th><strong>Project Statement</strong></th>
<th>1-2 pages ~ sponsor, vision, problem, deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Agreement</strong></td>
<td>~3 pages, responsive, confidentiality as desired</td>
</tr>
<tr>
<td><strong>Fee</strong></td>
<td>$52,000  (divided into three payments)</td>
</tr>
<tr>
<td><strong>Feedback</strong></td>
<td>Throughout. Externally, at the project’s end</td>
</tr>
<tr>
<td><strong>Liaison(s)</strong></td>
<td>Approximately 1-2 hours per week ~ &quot;Aligner&quot;</td>
</tr>
</tbody>
</table>
Clinic Timeline
Key Dates: 2020-2021

Winter ~ Spring
Project Statement developed

Aug 1, 2020
Projects opened to students

May 4, 2021
Projects Day @ HMC

Spring 2020
Business Agreement Signed

Sep 3, 2020
Launch Day @ HMC
Value to Sponsors

- **80%** of 2018-19 clinic sponsors said that their project was “a success”
- In 2019, **4 patent disclosures** were reported by Clinic sponsors
- More than 60% of 2018-19 sponsors estimated the value of their project to their company at $100,000 or more (highest ~ $1.5 m)
Value to Sponsors & Students

MITRE’s team and poster @ Projects Day. **Recruiting / Re-visioning**
Value to Sponsors & Students

Final presentations @ Projects Day. *Collaboration breadth*

then (2006)  now
Value to Sponsors & Students

\[ \frac{3}{4} \text{ of AmEx’s team @ NYC site visit} \]

*Experience + Engagement*
Mudders: bright, inventive, fearless

Highly Selective Liberal Arts College

- 886 students
- 87% of incoming students were top 10%
- Competition: Stanford, MIT, Caltech
- **Siblings**: CMC, Scripps, Pitzer, Pomona

30% of seniors go directly to graduate school

 Ranked #2 for science + engineering Ph.D.s

Source: Office of Institutional Research and Effectiveness, Harvey Mudd College
Mudders: bright, inventive, fearless

**Harvey Mudd College**
Claremont, CA

- #1 in Engineering Programs (no doctorate) (tie)
- 0 user reviews

Harvey Mudd College is a private liberal arts school known for its strong programs in math, science, and engineering. Harvey Mudd is located in Claremont, California. It is known for its innovative and hands-on approach to education. The university is consistently ranked highly by various publications, including U.S. News and World Report, Princeton Review, and Forbes.

**U.S. News and World Report**
- #1 – Engineering ~ undergrad
- #3 – Campus Ethnic Diversity
- #18 – Liberal Arts Colleges

**Princeton Review**
- #3 – “Students Study the Most”
- #3 – “Most Accessible Professors”

**Forbes 2018**
- #3 – Top 25 STEM Colleges
- #5 – Top Liberal Arts Colleges
Engaged in the world

Global Clinic

- 1-2 projects per year
- International partner (corporate/NGO)
- Academic partner

Social Justice Clinics

- New in 2018 + 2019
- Non-profit partners
- Social impact through technology ~ with a clear understanding of the impact of their work on society

The CareFusion Clinic Team designed, built and tested a low-cost, high-performance IV infusion delivery system specifically targeting developing healthcare markets.
### Past clinics ~ areas of focus

#### Computer Science
- Data science, modeling, analysis
- User experience: UI/UX development
- Machine Learning of all sorts
- (Deep) NN and AI / Robotics
- Image processing and Computer vision
- Threat detection, Cybersecurity
- Algorithm development and assessment
- Domain-specific programming languages
- Workflow and work-process
  - + Streamlining, re-engineering
- Investigative software engineering

#### Engineering
- Design & testing
- Mechanical/Structural
- Embedded Processing
- Robotics
- Systems & Signals, Controls
- Biomedical
- Aerospace, automotive
- Manufacturing, process engineering
- Materials
- Chemical
- Energy & Environment

---

Explore, prototype & align new, emerging ideas
2018-2019 Sponsors
Projects ... Possible Paths

• Speculative, "unerasd-whiteboard" opportunities
  • "If we had one more FTE... or team"

• Valuable, not critical-path

• There's no typical Clinic project:
  • "R + D for our R & D"
  • "Optimizing – along a new axis"
  • "Exploring hackathons’ 2-5% ideas"
  • "A start-up – internally incubated..."

Thoughts?
2018-2019 Sponsors
2017-2018 Sponsors
2016-2017 Sponsors
2015-2016 Sponsors
More information

hmc.edu/clinic
clinic@hmc.edu
The remaining slides provide additional context – they’re not part of our in-person presentations, unless they turn out to help...
The Year’s End: Projects Day

GoDaddy team’s presentation
Year’s End: Projects Day

AmEx team’s dinner
and beyond...

AmEx team’s visit
The Year’s Rhythms: Orientation Day

- Liaisons invited to campus
- Meet with Clinic Director
  - Strategies and tips
- Meet with team and faculty advisor
  - Cover problem in detail
  - Discuss confidentiality
- Establish communication routine
  - Email/Slack/other
  - Weekly teleconferences
- Jumpstart the project, face-to-face
- Recruiting / internship opportunity
Example clinic projects

MIT LL Imaging team

https://docs.google.com/presentation/d/1l1w64U9uTULcZ6v0DL5AfDhwAY8-Dph34GpR4KZ3t5/edit#slide=id.g4ab22172e9_0_2
Mudd: depth, rigor, and breadth

HMC’s Common Core
(semesters)

1 Biology (+ associated lab)
1.5 Chemistry (+ associated lab)
1++ Computer Science
1 Engineering
1 Critical Inquiry (Humanities, Social Sciences, and the Arts)
3 Mathematics
2.5 Physics (+ associated lab)
.5 Writing

Major requirements

10 HSA (Humanities, Social Sciences, and the Arts)

Common Core
Past clinics: areas of focus

<table>
<thead>
<tr>
<th>Mathematics</th>
<th>Physics and Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process analytics</td>
<td>Quantum processing</td>
</tr>
<tr>
<td>Data science</td>
<td>Nanoparticles</td>
</tr>
<tr>
<td>Neural networks</td>
<td>Optics</td>
</tr>
<tr>
<td>Pricing modeling and optimization</td>
<td>Photovoltaics</td>
</tr>
<tr>
<td>Data mining</td>
<td></td>
</tr>
</tbody>
</table>