The Harvey Mudd College
Clinic Program

Celebrating Mudd's 57th year of Clinic
What is Clinic?

- Sponsored capstone-project course (taken by all senior Math+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).
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Matterport: a custom-designed 3d game

Fluxergy: cellular image-processing
Example: Matterport

Innovative uses of 3D modeling: A real-world, first-person game
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Microsoft: confident reading, by everyone

Verkada: live-stream computer vision + ML
Example: Computer Vision

An energy- and geology-motivated clinic: finding $^{235}$U fission tracks in apatite-to-zircon crystals
## Clinic Sponsor Commitment

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

Winter ~ Spring '20
project statement developed

Aug 1, 2020
projects opened to students

Spring 2020
business agreement signed

May 4, 2021
Projects Day @ HMC

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
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

¾ of AmEx’s team @ NYC site visit

Experience + Engagement
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 offers a wide range of majors and minors, as well as opportunities for research and entrepreneurship.

$56,876 Tuition and Fees | 844 Undergraduate Enrollment | 4.6 Reputation Score | SAT, GPA and more

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
#3 – Top 25 STEM Colleges
#5 – Top Liberal Arts Colleges
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 in science + engineering Ph.D.s

Source: Office of Institutional Research and Effectiveness, Harvey Mudd College
Engaged: Global + Local Clinics

Global Clinics
- 1-2 projects per year, since '05
- International partner (corporate/NGO)
- Academic partner optional

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.
Clinic ~ Areas of Focus

**Computer Science**

*What's next?* Exploratory toolsets
Re-imagined workflows, inside / out

- 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 + Scenario development
- Domain-specific languages + portals
- Task-process streamlining/"new eyes"
- Investigative software engineering

**Mathematics**

- System modeling + prediction
  - topic modeling
  - approximate +/- exact
  - analysis + accuracy

- Operations research / optimization

- Data analytics (any size!)
  - human-interpretability
  - software interfaces

- Energy & Environment
  - visualizations
  - outreach

Explore, prototype & align new, emerging ideas
2018-2019 Sponsors

accenture

AHMEDABAD UNIVERSITY

Arvind Fashioning Possibilities

ATI

Apache Cassandra

Booz Allen Hamilton

BIOVIA

City of Hope

Claremont CLGP

DOOSAN

EDR

Fluxergy

+GF+

Google

LEIDOS

HRL Laboratories

Intuit

Intel Sports

leidos

Microsoft

Meggitt

smart engineering for extreme environments

MIT Lincoln Laboratory

Mentor

A Siemens Business

Millennium Space Systems

(P) McKay Brothers

Mentor

Pure Storage

Sandia National Laboratories

Proofpoint

Toyota

Virgin Orbit

Verkada

Steelcase

Techimation

innovation in motion

Tradeweb

Toyot

Virgin

Webroot

Secure Anywhere
Projects ... Possible Paths

- Speculative "unerased-whiteboard" ideas
  - "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 our hackathons’ 2-5% ideas"
  - "An internally incubated start-up..."

Thoughts?
2015-2016 Sponsors

Aerospace
BiMBy Power Company, LLC
City of Hope
Lawrence Livermore National Laboratory
Los Alamos National Laboratory
NOAA
Project Spock
Sandia National Laboratories
SpaceX
Steelcase
Time Inc.
Webroot
Whistle
The Wildlands Conservancy
yelp
Zendesk
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

inside a weekly telecon
Example clinic projects

MIT LL Imaging team

https://docs.google.com/presentation/d/1i1w64U8TJ0s7Qx9DL54dShwAYB_Dicb3kGnD4KX3it5/edit#slide=id.g4ab22172e9_0_2
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

Mudd: depth, rigor, and breadth
Past clinics ~ areas of focus

**Computer Science**
- What’s next? Exploratory toolsets
- Re-imagining workflow (inside/out)
- 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 + assessment
- Domain-specific languages + portals
- Work-process streamlining/"new eyes"
- Investigative software engineering

**Engineering**
- Design & testing
- Mechanical/Structural
- Embedded Systems + Robotics
- Systems & Signals, Controls
- Biomedical, Aerospace, Automotive, Manufacturing, Process engineering, Materials
- (Bio)Chemical Engineering
- Energy & Environment

Explore, prototype & align new, emerging ideas
Past clinics: areas of focus

**Mathematics**
- Process analytics
- Data science
- Neural networks
- Pricing modeling and optimization
- Data mining

**Physics and Biology**
- Quantum processing
- Nanoparticles
- Optics
- Photovoltaics