

# The Harvey Mudd College Clinic Program



*R. Michael Shanahan Center  
for Teaching and Learning  
Claremont, California*

Celebrating more than 50 years of Clinic



# 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).



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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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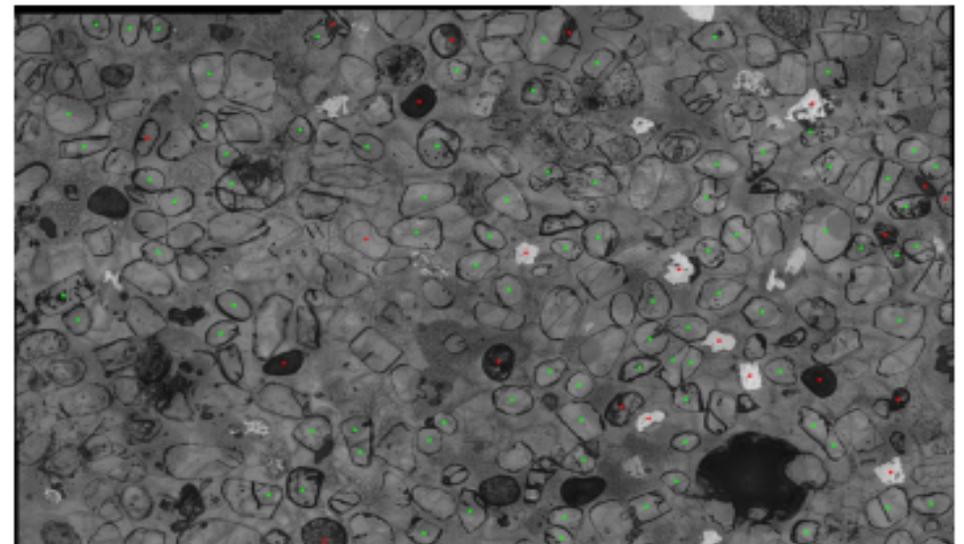
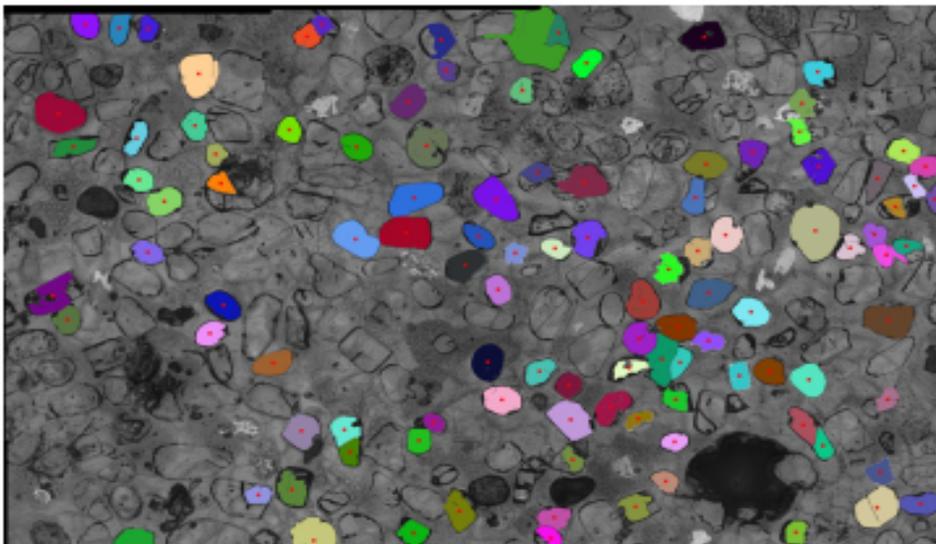
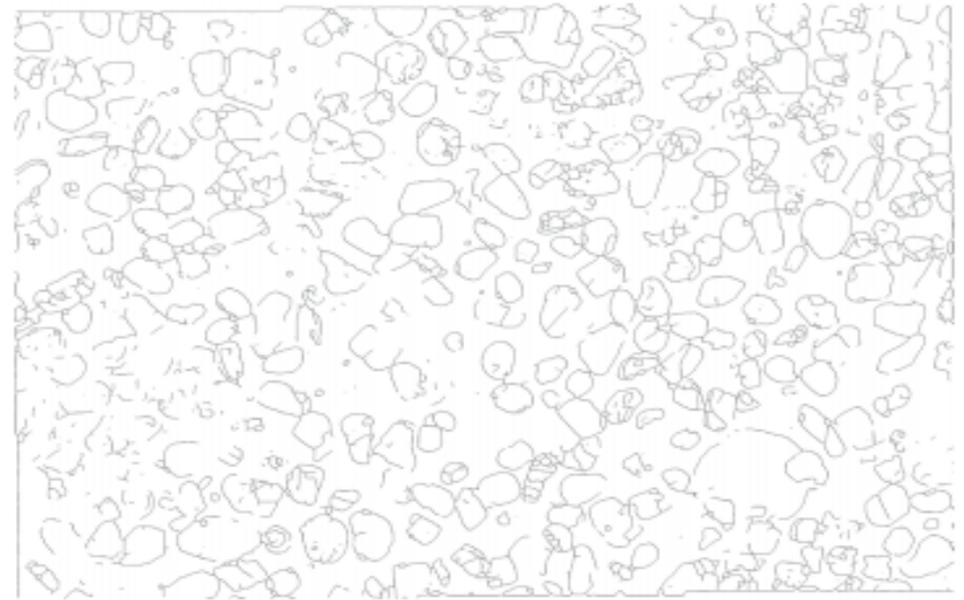
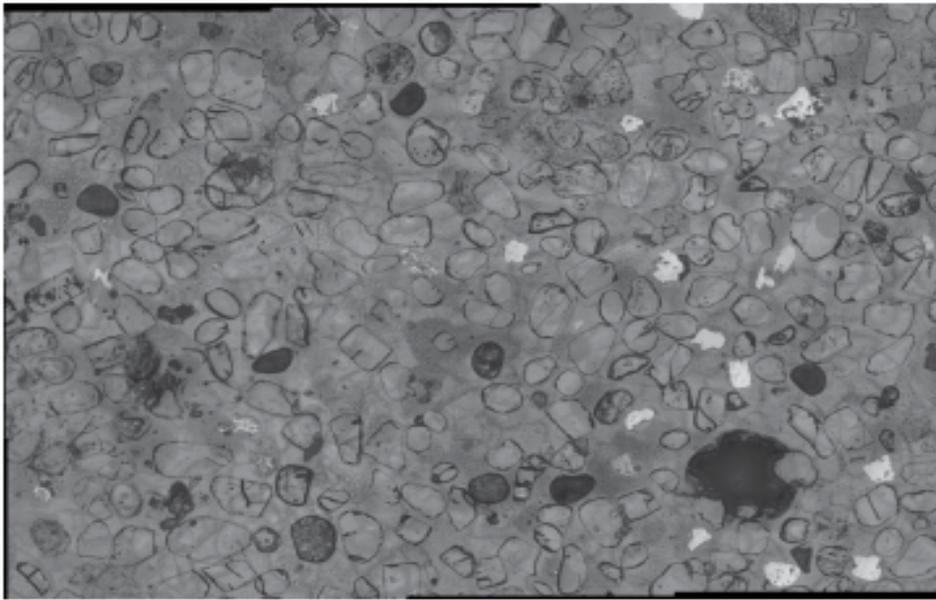


Microsoft: confident reading, by everyone



Verkada: live-stream computer vision + ML

# Example: Computer Vision



An energy- and geology-motivated application: finding  $^{235}\text{U}$  fission tracks in apatite crystals

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Pure Storage: file-system capabilities



Jones Parking: targeted start-up-teaming

# Clinic Sponsor Commitment

Project Statement	<i>1-2 pages ~ sponsor, <u>vision</u>, problem, deliverables</i>
Business Agreement	<i>~3 pages, responsive, confidentiality as desired</i>
Fee	<i>\$52,000 (divided into three payments)</i>
Feedback	<i>Throughout. Externally, at the project's end</i>
Liaison(s)	<i>Approximately 1-2 hours per week ~ "Aligner"</i>

# Clinic Timeline

Key Dates: 2019-2020

Winter ~  
Spring  
Project  
Statement  
developed

Aug 1, 2019  
Projects  
opened to  
students

May 5,  
2020  
Projects  
Day @ HMC

May 2019  
Business  
Agreement  
Signed

Sep 5, 2019  
Launch Day  
@ HMC



# Value to Sponsors

- **80%** of 2017-18 clinic sponsors said that their project was **“a success”**
- In 2018, **5 patent disclosures** were reported by Clinic sponsors
- More than 60% of 2017-18 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



$\frac{3}{4}$  of AmEx's  
team @ NYC  
site visit

***Experience +  
Engagement***

**HARVEY  
MUDD  
COLLEGE**

# 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



Harvey S. Mudd  
mining engineer



# 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 lo ... [more](#)

**\$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 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
- 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

# 2017-2018 Sponsors



# Projects ... Possible Paths

- Speculative *unerased-whiteboard* opportunities
  - "If we had one more FTE... or team" (to manage)
- 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?

# 2017-2018 Sponsors



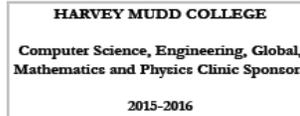
# 2016-2017 Sponsors



Computer Science, Engineering, Global,  
Mathematics and Physics Clinic Sponsors  
2016 - 2017



# 2015-2016 Sponsors





# More information

[hmc.edu/clinic](http://hmc.edu/clinic)  
[clinic@hmc.edu](mailto:clinic@hmc.edu)

[ relationships matter ]



The remaining slides provide additional context – they're not part of our in-person presentations, unless they turn out to help...

[ relationships matter ]

# 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

**HARVEY  
MUDD  
COLLEGE**

# 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

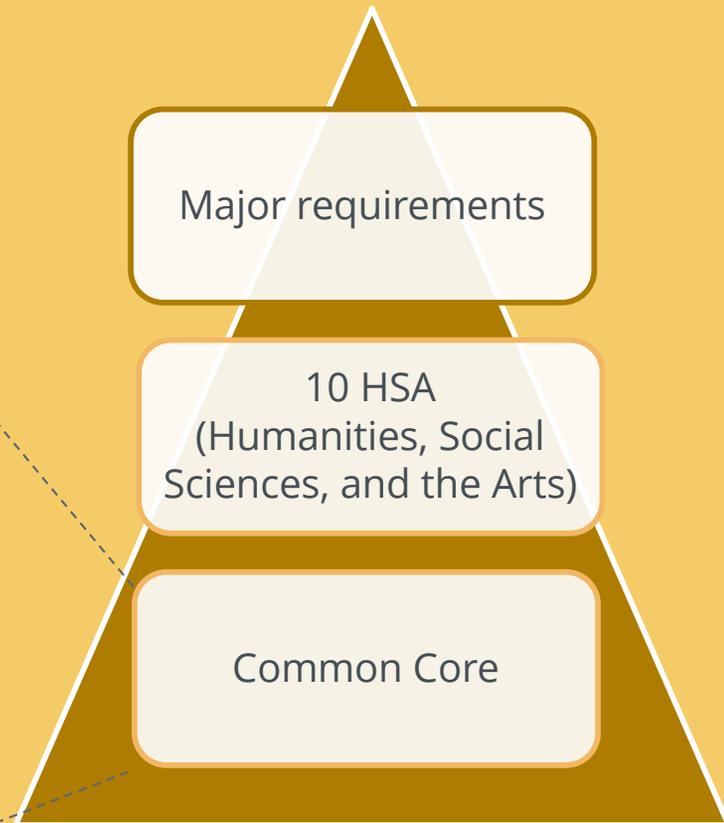


MIT LL Imaging team

# 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



# 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