The Harvey Mudd College Clinic Program

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

Celebrating more than 50 years of Clinic

HARVEY MUDD COLLEGE

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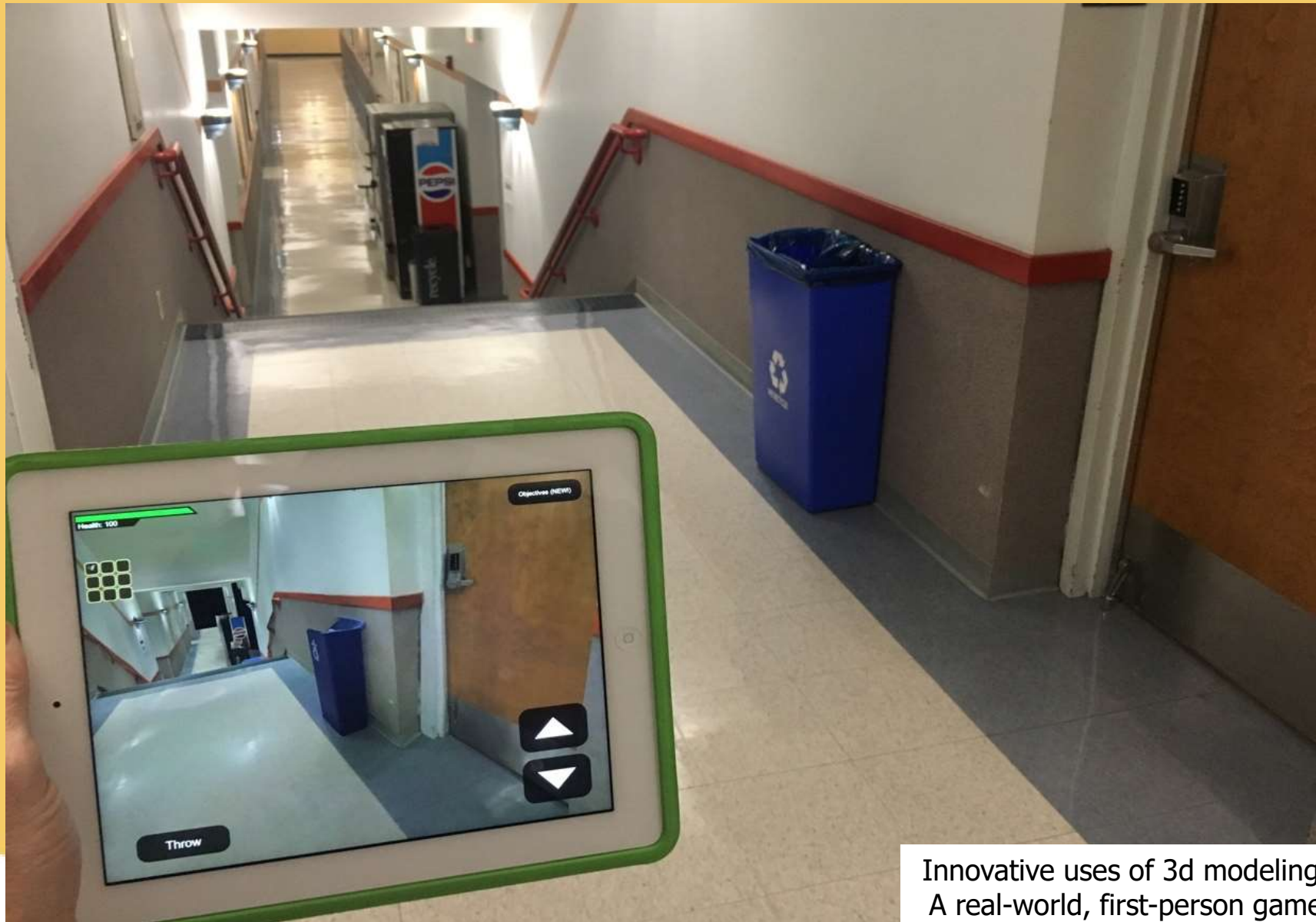Team of 4-5 students, delivering on an open-ended project

Matterport: a custom-designed 3d game

Fluxergy: cellular image-processing

Example: Matterport

Innovative uses of 3d modeling:
A real-world, first-person game

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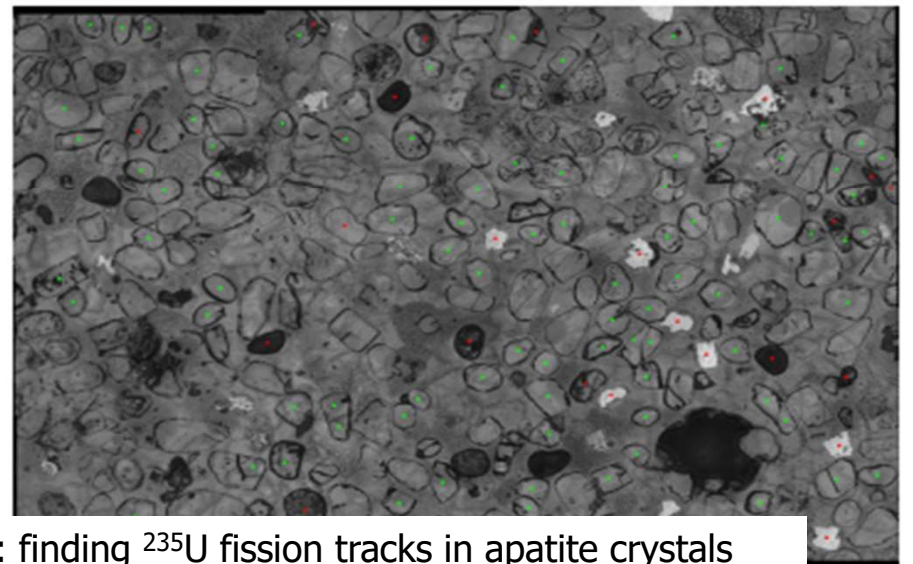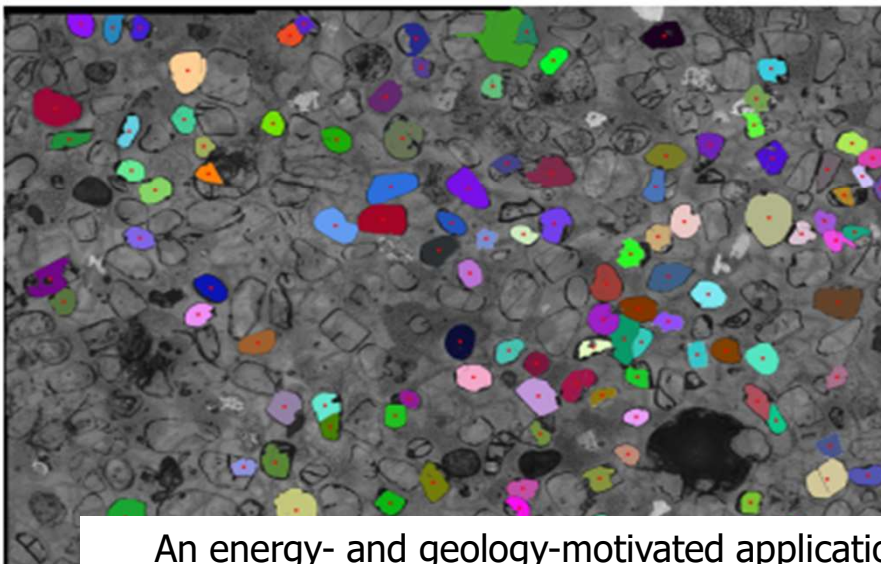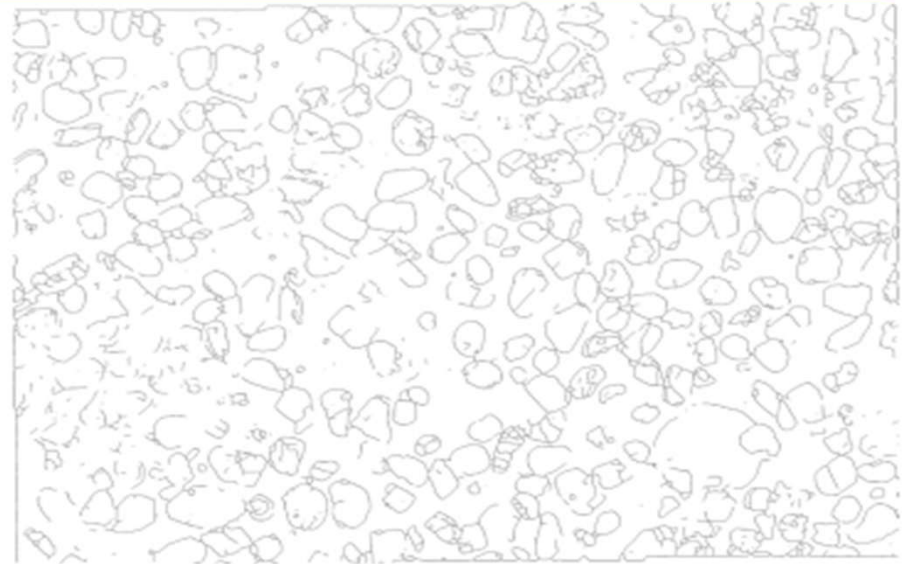
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Microsoft: confident reading, by everyone

Verkada: live-stream computer vision + ML

Example: Computer Vision

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

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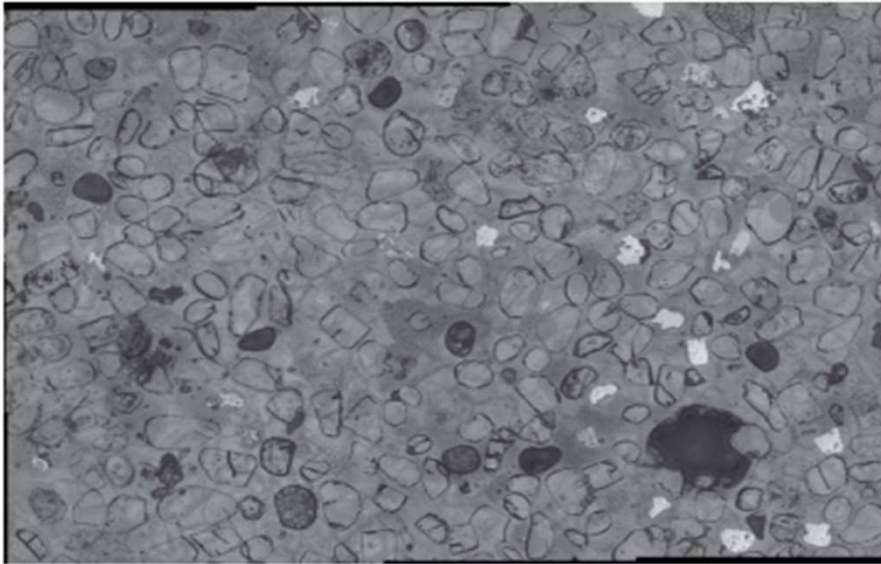
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Pure Storage: file-system capabilities

Jones Parking: targeted start-up-teaming

Clinic Sponsor Commitment

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

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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

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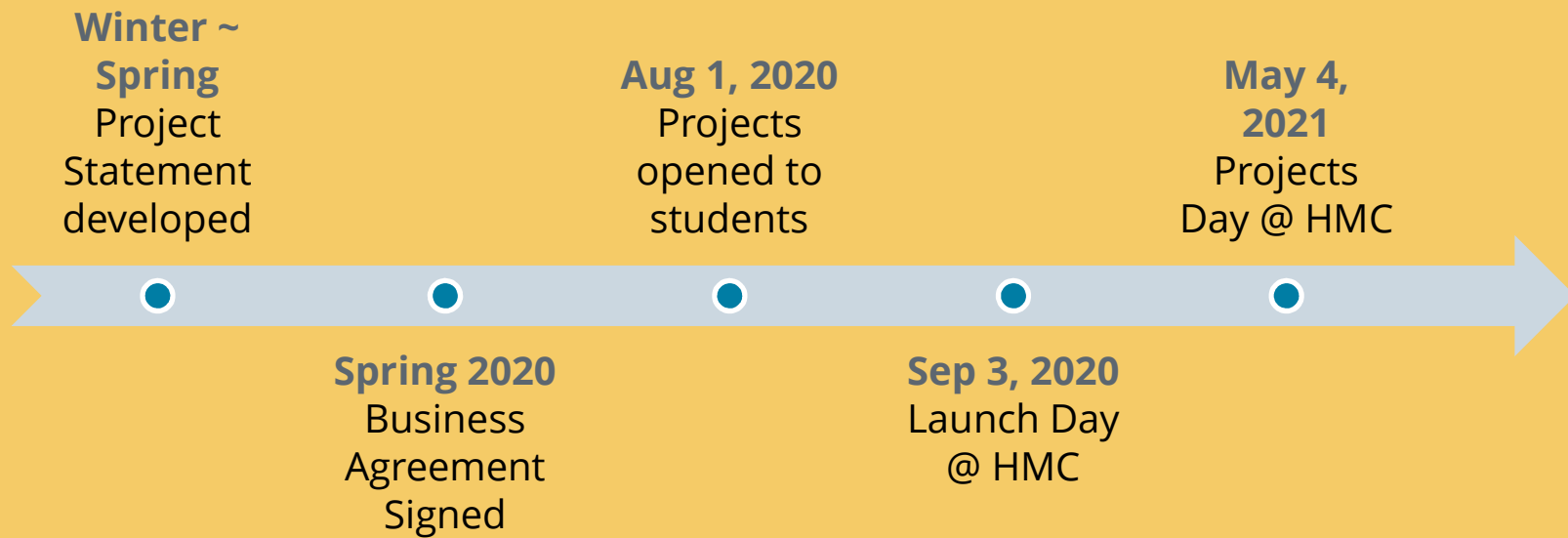
Value to Sponsors

- **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

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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

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

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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

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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.

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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

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2018-2019 Sponsors

Computer Science, Engineering, Global, Mathematics and Physics Clinic Sponsors 2018 - 2019

Projects ...   Possible Paths

- Speculative, *"unerased-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... "*

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Thoughts?

2018-2019 Sponsors

2017-2018 Sponsors

Clinic Sponsors
2017-2018

2016-2017 Sponsors

AEROSPACE
Assuring Mission Success

amazon
Lab126

AMERICAN EXPRESS

ARCONIC
Innovation, engineered.

at&t

BD
Advancing the world of health

BIG FISH

City of Hope

DOLBY

Dart NeuroScience llc
quality of mind

FICO

EDR

Genentech

GoDaddy

HRL LABORATORIES

hp

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IBM

INTUITIVE SURGICAL

KAIAM

Laserfiche

LINCOLN LABORATORY
Massachusetts Institute of Technology

MOTIV

Microsoft

MR

MITRE

Computer Science, Engineering, Global, Mathematics and Physics Clinic Sponsors

2016 – 2017

NORTHROP GRUMMAN

New Relic

niagara
BOTTLING, LLC

MISSION
RUBBER COMPANY
connected, for good

proofpoint

proteus
DIGITAL HEALTH

REGENESIS
BIOMEDICAL

reddit

SoCalGas
A Sempra Energy utility

Sandia National Laboratories

SARACEN

TECHMATION
Innovation in Motion

TRIPLE RING technologies

TOYOTA

ULA
America's Ride to Space

WEBROOT

ZAM Helmets

2015-2016 Sponsors

More information

hmc.edu/clinic
clinic@hmc.edu

[relationships matter]

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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

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and beyond…

AmEx team's visit

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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

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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

Major requirements

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

Common Core

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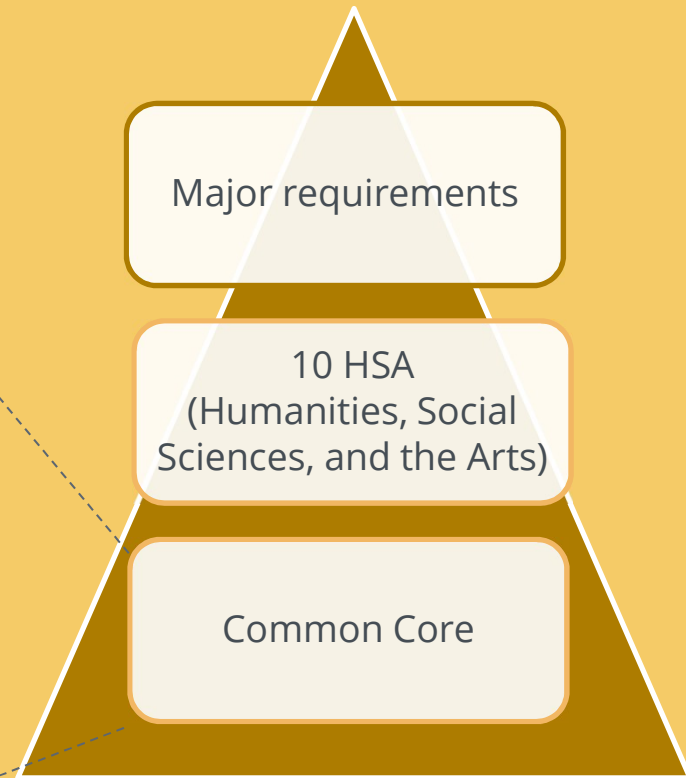
Past clinics: areas of focus

Mathematics

Process analytics

Data science

Neural networks

Pricing modeling and optimization

Data mining

Physics and Biology

Quantum processing

Nanoparticles

Optics

Photovoltaics

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