Projects Day 2017
Celebrating 54 Years of Excellence

Tuesday, May 2
10:30 a.m.–6 p.m.

Clinic Program
Projects Day is dedicated to Jack Alford and Mack Gilkeson for their foresight and wisdom in the creation of the Harvey Mudd College Clinic Program.

Mission Statement:

Harvey Mudd College seeks to educate engineers, scientists, and mathematicians well versed in all of these areas and in the humanities and the social sciences so that they may assume leadership in their fields with a clear understanding of the impact of their work on society.

Harvey Mudd’s annual celebration of student achievement includes Presentation Days (May 1 & 3, 2017), showcasing senior thesis research and class projects, as well as Projects Day (May 2, 2017), showcasing projects in the Clinic program.

Acknowledgments:

To all of the many Alumni and Parents who assist in the recruitment, formulation and conduct of Clinic projects year to year, and to the Clinic Advisory Committee who provide valuable industry perspective and advice. Your continued support is greatly appreciated.

&

To all Harvey Mudd College Faculty & Staff involved in the preparation of Projects Day.
47th Annual
Projects Day

The Computer Science, Engineering, Global, Mathematics, and Physics Clinics of Harvey Mudd College are pleased to present the work of our students.

Geoff Kuenning, Director
Computer Science Clinic

Kash Gokli, Director
Engineering Clinic

Qimin Yang, Associate Director
Engineering Clinic

Susan Martonosi, Director
Global Clinic

Weiqing Gu, Director
Mathematics Clinic

Richard Haskell, Director
Physics Clinic
Harvey Mudd College
PROJECTS DAY
May 2, 2017

Program

10:30 a.m   Registration and Poster Viewing   Platt Campus Center

1:00 p.m.   General Session   Shanahan Center 1430

   Welcome - Maria Klawe, President

   Remarks - Geoff Kuenning, Director, Computer Science Clinic

   Milestone Awards - Jeffrey Groves, Dean of the Faculty

   Recipients:
   Amazon.com, Inc.
   HRL Laboratories, LLC
   Microsoft Corporation
   The MITRE Corporation
   Northrop Grumman Corporation

1:30 - 3:00 p.m.   Project Presentations   See Schedule

3:00 - 3:30 p.m.   Break   Shanahan Center:

                     1st Floor North Terrace &
                     Thomas Garrett Plaza

3:30 - 5:00 p.m.   Project Presentations   See Schedule

5:15 - 6:00 p.m.   Poster Reception   Guests, Faculty, and Students

   Platt Campus Center
<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Project Name</th>
<th>Notes</th>
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<tr>
<td>1:30</td>
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<td>BIOLOGY/COMPUTER SCIENCE/MATHEMATICS CLINIC</td>
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<td>Dart NeuroScience</td>
<td>Creation and Analysis of Experiment Driven Biological Networks for Understanding Memory Processes</td>
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<td>American Express</td>
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<td>Big Fish Games, Inc.</td>
<td>Measuring User Engagement in Fairway Solitaire</td>
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<td>Using Latent Topics Models to Detect Rare Behaviors</td>
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<td>GoDaddy</td>
<td>Dynamic Website Updates</td>
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<td>Google, Inc.</td>
<td>Serializing Chromium Tab State</td>
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<td>International Business Machines Corporation (IBM)</td>
<td>Cognitive Note Taking</td>
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<td>Laserfiche</td>
<td>Fast Detection of Problems in Scanned Documents</td>
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<td>Lawrence Livermore National Laboratory</td>
<td>High Performance Portability</td>
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<td>MITRE</td>
<td>Image De-Identification</td>
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<td>Proofpoint</td>
<td>Predicting Malicious URLs</td>
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<td>Reddit</td>
<td>Detecting Evil Through Machine Learning</td>
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<td>Webroot</td>
<td>Real-Time Visualization and Machine Learning On Network Streams</td>
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<td>COMPUTER SCIENCE CLINIC</td>
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<td>COMPUTER SCIENCE/ENGINEERING CLINIC</td>
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<td>ZAM Helmets, Inc.</td>
<td>Hockey Helmet Impact Monitoring System</td>
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**Notes:**

**Building Codes:**

SHAN = Shanahan Center for Teaching and Learning

**Note:** The “B” in room numbers indicates “Basement Level.”
<table>
<thead>
<tr>
<th>Project</th>
<th>Time</th>
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<tr>
<td>The Aerospace Corporation</td>
<td>1:30</td>
<td>2450</td>
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<tr>
<td>1 TFLOP/s GPU on an Aerocube Picosatellite</td>
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<td>Amazon Lab126</td>
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<td>Configurable Microphone Harness Array</td>
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<td>Arconic</td>
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<tr>
<td>Create a Visual Production Scheduling System</td>
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<td>AT&amp;T</td>
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<td>RF Drones for Automated Signal Analysis</td>
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<td>BD Biosciences</td>
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<tr>
<td>Improving Ease and Efficiency of Blood Sample Manipulation for Flow Cytometry Verification</td>
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<tr>
<td>City of Hope</td>
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<tr>
<td>Redesigning the Lighting and Optics for Laparoscopic Surgery</td>
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<td>City of Hope</td>
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<td>A Raman Spectrometer for in vivo Cancer Assessment</td>
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<td>Dolby Laboratories, Inc.</td>
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<td>FPGA Implementation of HEVC Decoder</td>
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<td>HP, Inc.</td>
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<td>Clear Fluid Detection on Media</td>
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<td>Intuitive Surgical, Inc.</td>
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<td>Providing Aerial Views During Minimally Invasive Surgery</td>
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<td>Microsoft Surface</td>
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<td>RF Propagation in Buildings</td>
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<td>Mission Rubber Company</td>
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<td>Energy Monitoring System for Industrial Rubber Molding</td>
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<td>MIT Lincoln Laboratory</td>
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<td>Adaptive Wireless Sensing</td>
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<td>Motiv Power Systems</td>
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<td>Heat Pump for Heavy Electric Vehicles</td>
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<td>Niagara Bottling, LLC</td>
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<td>Rotation Speed of Blow Molding Equipment</td>
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<td>Northrop Grumman Corporation</td>
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<td>Secure State Estimation</td>
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<td>Regenesis Biomedical</td>
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<td>New Form Factor and User Interface</td>
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<td>Technnation</td>
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<td>Project Beluga: Trajectory-Tracking Controller for Autonomous Underwater Vehicles</td>
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<td>Toyota</td>
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<td>Energy Usage and Efficiency in a Fuel Cell Electric Semi-Trailer Truck</td>
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<td>Triple Ring Technologies</td>
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<td>IoT Mobile Health Monitoring</td>
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<td>United Launch Alliance</td>
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<td>Improved Cryogenic Insulation System</td>
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<td><strong>ENGINEERING/MATHEMATICS</strong></td>
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<td>Genentech</td>
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<td>Optimized Emergency Power Management Planning</td>
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<td>Niagara Bottling, LLC</td>
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<td>Capping Accuracy of Highspeed Lightweight Bottling Lines</td>
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<td><strong>ENGINEERING/PHYSICS CLINIC</strong></td>
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<td>Sandia National Laboratories</td>
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<tr>
<td>Measuring the Permittivity of Ferroelectric Nanoparticles in an Epoxy Composite</td>
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<td><strong>GLOBAL CLINIC</strong></td>
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<td>Kaim Corporation</td>
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<td>High Throughput Laser Diode Burn-in Systems</td>
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<td>EDR, Inc.</td>
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<td>Document Mining and Analysis on Environmental Reports</td>
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<td>Saracen Energy</td>
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<td>Reverse-Engineering Power Flows on the Eastern Interconnect from Real-Time Price Data</td>
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<td>SoCalGas</td>
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<td>Evaluation and Optimization of SoCalGas Routing Planning and Algorithms</td>
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<td><strong>PHYSICS CLINIC</strong></td>
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<td>HRL Laboratories, LLC</td>
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<tr>
<td>Automated Tuning of Electrostatically Defined Quantum Dots: Navigating Through High-Dimensional Potential Energy Landscapes</td>
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CLINIC ADVISORY COMMITTEE OF HARVEY MUDD COLLEGE

Industry Members:
Paul Anderson, The Aerospace Corporation
Michael Bell, Beckman Coulter, Inc.
Joseph Betser, The Aerospace Corporation
Daniel A. Borton '90, Amgen Inc.
Bob Butterfield, BD
Carl Carrera, '75/76, The Boeing Company
Frances Ferris '80, The Boeing Company
David Lesyna, Optivus Proton Therapy, Inc.
John Livingston, Tandem Diabetes Care
Hal Lonas, Webroot, Inc.
Elly Schofield '13, Harvey Mudd College
Craig Snow, Raytheon Missile Systems

College Members:
Maria Klawe, President
Dan Macaluso, Vice President, College Advancement
Jeffrey Groves, Vice President, Dean of the Faculty
Andrew Dorantes, VP for Administration & Finance/Treasurer
Scott Martin, Assistant VP for Business Affairs & Assistant Treasurer
Barry Olsan, Director, Corporate Relations
Geoff Kuenning, Director, Computer Science Clinic
Kash Gokli, Director, Engineering Clinic
Qimin Yang, Associate Director, Engineering Clinic
Susan Martonosi, Director, Global Clinic
Weiqing Gu, Director, Mathematics Clinic
Richard Haskell, Director, Physics Clinic
# Personalized Projects Day Schedule

Please fill in the empty slots below with the presentations you would like to attend.

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<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>10:30 a.m.</td>
<td><strong>Registration and Poster Viewing</strong></td>
<td>Platt Campus Center</td>
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<tr>
<td>1:00 p.m.</td>
<td><strong>General Session</strong></td>
<td>Shanahan Center 1430</td>
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<tr>
<td>3:00 p.m. -</td>
<td><strong>Break</strong></td>
<td>Shanahan Center Thomas Garrett Plaza</td>
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<td>5:15 p.m. -</td>
<td><strong>Poster Reception</strong></td>
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The EDR clinic team was asked to work on a solution for EDR which would enable them to tag key pieces of information that appear in State and Federal Government environmental documents. As a major holder and distributor of environmental data, EDR desires to have a more effective method for finding desired information in these documents than their current methods allow. Since an environmental professional might be interested in multiple aspects of any given the document, the EDR team has explored classification and search techniques for both images and text in order to analyze and tag documents. The team's work will be formatted as per EDR's request, for adoption by EDR, and merging into their current systems.

SoCalGas

Evaluation and Optimization of SoCalGas Routing Planning and Algorithms

Liaisons: Virginia Balbo, Ludivina Michel
Advisor: Susan Martinoski
Students: Stetson Bost (PM-S), Max Howard, Yichen Lu (PM-F), Noah Marcus

SoCalGas provides natural gas services to over 20 million residents of the Southern California region. Each day, SoCalGas must generate routes to service up to 14,000 individual customer orders. The SoCalGas Clinic team worked to improve the vehicle routing process and route quality through district design and parameter optimization.

PHYSICS CLINIC

HRL Laboratories, LLC

Automated Tuning of Electrostatically Defined Quantum Dots: Navigating Through High-Dimensional Potential Energy Landscapes

Liaisons: Matt Reed ’07, Mark Gyure, Emily Pritchett, Richard Ross
Advisor: Gregory Lyzenga
Students: Kathleen Kohl (TL-S), Amy Brown (TL-F), Brynn Arborico, Max Byers

HRL Laboratories is a cutting-edge physical science and engineering research laboratory. The HRL clinic project aims to create a computational model which navigates through the high-dimensional potential energy landscape of a triple quantum dot system in order to automate the process of placing one electron into each quantum dot. HRL is developing these quantum dot-based devices for eventual use in quantum information processing technologies.
Dart NeuroScience, LLC  
**Creation and Analysis of Experiment**  
**Driven Biological Networks for Understanding Memory Processes**  
Liaisons: Philip Cheung ’96, Amir Fayyazuddin, Qingying Meng, Douglas Fenger  
Advisors: Lisette de Pillis, Eliot Bush  
Students: Loring Thomas (PM-S), Lisa Goeller, Ellen Seidel, Rohan Shankar (PM-F)

Dart Neuroscience (DNS) is a pharmaceutical company that focuses on developing treatments for memory disorders. The goal of the clinic project was to build biological networks based on DNS experimental data and to create accompanying network analysis tools. The networks and tools will help DNS better understand memory processes and find drug targets, with the goal of improving long term memory.

Big Fish Games  
**Measuring User Engagement in Fairway Solitaire**  
Liaisons: Brad Bulkley, Chris Chatburn, Sam Prud’homme, Michael Tapley  
Advisor: Colleen Lewis  
Students: Justin Allen, Michael Diamond (PM), Adam Dunlap, Aaron Stringer-Ussdan

Big Fish Games, Inc. develops the game Fairway Solitaire and cares deeply about the player experience. The goal of our project was to use machine learning on existing user data to better understand how player interaction with the game’s features affects player engagement. Better understanding what makes users engage with the game would allow Big Fish Games, Inc. to make more informed design decisions.

FICO  
**Using Latent Topics Models to Detect Rare Behaviors**  
Liaisons: Scott Zoldi, Joe Murray  
Advisor: Robert Keller  
Students: Savannah Baron, Sneha Deo (PM-S), Emily First (PM-F), Hope Yu

Our project’s goal was to investigate the detection of rare customer behaviors in transactional data using latent topic models, a form of unsupervised machine learning typically used to detect topics in examples of natural language. Our team has developed techniques to apply these models to time series data and has assessed their viability in the detection of anomalous behaviors.

American Express  
**Hotel Recommendation System**  
Liaisons: Dawn Thomas, Di Xu  
Advisor: Zachary Dodds  
Students: Christine Chen (PM), Yacht Kitimoon, Alyssa Kubota, Jon Ueki

American Express and its partners seek to make travel planning easier, quicker, and more personalized. To that end, the objective of our clinic team was to explore and extend American Express’s current machine-learning based hotel recommendation algorithms with the goal of improving their performance.

Genentech  
**Optimized Emergency Power Management Planning**  
Liaisons: Jerry Meek, Chris Wimmer  
Advisors: Tanja Srebrotnjak, Ruve Wang (F)  
Students: Joseph Sinopoli (TL), Eric Mueller, Dan McCabe, Ahhyun Ahn, Andrea Vasquez (F)

Genentech is a biotechnology company researching and producing medicines for serious illnesses. Genentech is headquartered in South San Francisco, CA and is vulnerable to power outages during earthquakes. The Genentech clinic team is tasked with developing a emergency power management plan. Using operations research techniques, generator refueling and shutdown schedules for each building are generated. Displayed within Genentech systems, the plan helps facilities protect price-less research, upkeep production, and prevent inventory spoilage.

Niagara Bottling, LLC  
**Capping Accuracy of Highspeed Lightweight Bottling Lines**  
Liaisons: Clemente Sanchez, Tony Peterson, Miles Moyer, Jim Brady, Damon Choate, Danny Weckstein, Jim Utley, Alan Bunteman  
Advisors: Kash Godik, Talithia Williams  
Students: Jonathan Lum (TL-S), Alex Le (TL-F), Lakshay Akula, Zachary Friedlander, Michaela Yaman (F)

Niagara Bottling, LLC is the largest family owned bottled water company in the United States, and is the largest producer of bottled water by volume. The Niagara Bottling - Capping clinic project is to understand the causes of bottle cap misapplication and reduce the misapplication frequency through conducting a Design of Experiments.

Kaiam Corp. is an industry leader in the field of optical communications for data centers, and rising demand has stretched its manufacturing capability. One manufacturing bottleneck is the diode burn-in process, which tests the micron scale laser diodes at high power and temperature. The Kaiam clinic project is to design a new burn-in system using micromechanical chips to make contact with the diodes and test them more quickly.

Sandia National Laboratories  
**Measuring the Permittivity of Ferroelectric Nanoparticles in an Epoxy Composite**  
Liaison: Todd Monson  
Advisors: Richard Haskell, Albert Dato  
Students: Marisol Beck (TL-S), Carmel Zhao (TL-F), Jonas Kaufman, Cesar Orellana, Robin Bendik (F), Isabel Martos-Repah (S)

Barium titanate (BTO) is a ferroelectric material commonly used in capacitors because of its high bulk dielectric constant, which may be even higher in nanoparticle form. The Sandia team is determining the dielectric constant of BTO nanoparticles as a function of particle size by measuring composites of BTO nanoparticles in epoxy. We are improving our composite fabrication procedure to reduce the agglomeration of BTO nanoparticles and using finite element analysis to extract the dielectric constant of the nanoparticles.
## Techmation

**Project Beluga: Trajectory-Tracking Controller for Autonomous Underwater Vehicles**

- **Liaisons:** Jerry Hsiung ’16, Ben Chasnov ’16, Cyrus Huang ’16, Yu Yang
- **Advisor:** Anthony Bright
- **Students:** Vaibhav Visswanathan (TL-S), Jessica de la Fuente (TL-W), Cheryln Chan (TL-F), Kyle Lund, Elijah Carbanaro (F), Jessica Lupanow (S), Chris Kotcherha (S)

The HMC Techmation Clinic team will modify and build a new version of the current Beluga AUV, develop an underwater trajectory-tracking controller and demonstrate the working controller on the Beluga 2.0 in field trials.

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## Triple Ring Technologies

**IoT Mobile Health Monitoring**

- **Liaison:** Jen Keating, Dickshitha Thyagarajan
- **Advisor:** Brian Bryce
- **Students:** Deval Gupta (TL-S), Erin Paeng (TL-F), Senghor Joseph, Zane Bodenbender, Connie Wang

**Goal of specifying vehicle component capacities.**

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**United Launch Alliance**

**Improved Cryogenic Insulation System**

- **Liaison:** Tucker Gritton
- **Advisor:** Gordon Krauss
- **Students:** Rachel O’Neill (TL-S), Elizabeth Lee (TL-F), Michael Muzio, Bailey Meyer (S), Jasmine Yang (S), Isabel King (F), Richard Ni (F)

United Launch Alliance is America’s ride to space and is interested in developing new technologies for space travel. The ULA clinic team seeks to identify and test potential materials for a cryogenic insulation system. The team will also create a model to predict heat transfer properties and thermal degradation of such a system.

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**GoDaddy**

**Dynamic Website Updates**

- **Liaisons:** Heidi Gibson, Jacob Page, Dan Gwozdz
- **Advisor:** Ben Wiedermann
- **Students:** Keighley Overbay (PM-S), Maureen Naval (PM-F), Terrence Diaz, Linnea Nelson, Connie Wang

GoDaddy provides small business owners with the tools they need to easily host and create their own personalized websites. The goal of our project is to extend GoDaddy’s website builder to allow small business owners to automatically display announcements on their websites at a predetermined time, as well as directly post these announcements to their social media accounts.

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**International Business Machines Corporation (IBM)**

**Cognitive Note Taking**

- **Liaisons:** Maria Ebling ’88, John Vergo, Michael Tanenblatt
- **Advisor:** Lisa Kaczmarezyk
- **Students:** Scott Chow, Harry Cooke (PM), Wyatt Cooper, Julia Cosma, Emilia Reed

This project aims to develop a note-taking mobile application and service that acts as a personal cognitive assistant to help IBM employees extract company-specific information from their notes. The application accepts collections of documents (such as PDF files or images) and directs input to the application (such as text or handwriting). It utilizes IBM Watson cognitive services to analyze the documents and extract specific information about companies, which is then verified by the user.

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**Toyota**

**Energy Usage and Efficiency in a Fuel Cell Electric Semi-Trailer Truck**

- **Liaison:** Mr. Takehito Yokoo
- **Advisor:** Okisugu Furuya
- **Students:** Elyse Pennington (TL-S), Cassie Burgess (TL-F), Daniel Nguyen, Aurora Leeson (S), Luis Viorner (S), Lillian Liang (F), Sarah Silcox (F)

Toyota has long maintained that hydrogen fuel cell technology could be a zero emission solution across a broad spectrum of vehicle types. The scalability of this technology is enabling the automaker to explore a semi-trailer truck application for a California-based feasibility study. The Toyota clinic project models energy usage and efficiency in the vehicle’s four main subsystems, with the goal of specifying vehicle component capacities.

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**Laserfiche**

**Fast Detection of Problems in Scanned Documents**

- **Liaisons:** Tessa Adair ’14, Karl Chan ’89 P19, Carl Sykes
- **Advisors:** Yekaterina Kharitonova, Melissa O’Neill
- **Students:** Tiffany Sun (PM), Kharisma Calderon, Carmen Mejia, Andrew Scott

Laserfiche builds software that helps organizations digitize content and automate processes. To ensure that data from scanned paper documents can be accurately extracted, Laserfiche has tools to fix image quality problems such as skew and speckles. The goal of our project was to automatically and quickly detect problems in scanned documents. By detecting these problems, the software can reduce the time and processing required for image correction. Our team extracted features from a collection of scanned images and used machine learning classifiers to predict if a newly scanned document has problems.
Lawrence Livermore National Laboratory
High Performance Portability
Liaisons: Holger Jones, David Beckingsale, David Poliakoff
Advisor: Chris Stone
Students: Nick Gonzalez (PM-F), Aaron Lobb (PM-S), Dan Obermiller

Lawrence Livermore National Lab (LLNL) uses supercomputers to perform complex physics simulations. Maintaining parallel code is difficult when faster computers with different architectures are installed every few years. Portability layers can simplify this code by hiding details of computer architecture and parallelism. The goal of the clinic team was to improve RAJA, a portability layer created and used by LLNL. The team also compared RAJA to other portability layers with respect to usability and performance.

The MITRE Corporation
Image De-identification
Liaisons: Sarah Doyle, Nick Orlands, Jay Doyle
Advisor: Lisa Kaczmarczyk
Students: Madi Pignetti (PM), Nava Dallal, Michael Sheely, Veronica Rivera

The MITRE Corporation is a not-for-profit research company that applies new technologies to problems in an array of areas. The goal of the MITRE clinic team’s project is to produce an algorithm that transforms an image to preserve apparent similarity to a human, but leads to a decreased accuracy for a number of specified recognition algorithms. This algorithm makes it significantly more difficult for certain facial recognition algorithms to detect individuals, leading to increased security and privacy.

New Relic, Inc.
New Relic Churn Prediction & Prevention — Micro-Segmentation and Predictive Analytics
Liaisons: Kira Chuchum, Tarun Arora
Advisor: Ran Libeskind-Hadas
Students: Felis Perez, Rose Choi, William Chen (PM-S), Yiqing Cui (PM-F)

The goal of the New Relic Clinic project is to develop a data-driven approach to predicting potential churn. New Relic has collected substantial data. The types of data that has been collected have varied over time, leading to a heterogeneous dataset that is difficult to analyze. To address this issue, the New Relic Clinic project aims to first restructure the data to be consistent and then apply machine learning techniques to identify features capable of predicting churn.

Proofpoint
Predicting Malicious URLs
Liaisons: Thomas Lynam, Mike Morris ’97
Advisor: Elizabeth Sweedyk
Students: Vidushi Ojha (PM), Aidan Cheng, Kevin Herrera, Carli Lessard

As part of their security solutions, Proofpoint provides a service to scan URLs embedded in clients’ emails, and determine whether they lead to sites containing malware. Suspicious URLs are redirected to a virtual environment, or sandbox, where they are tested for maliciousness. The goal of our project is to create a machine learning classifier which can better detect malicious URLs, so that fewer URLs need to be sandboxed. We investigated various models and features to create a number of options for such a classifier.

Motiv Power Systems
Heat Pump for Heavy Electric Vehicles
Liaisons: Jim Castelaz ’06, Edmond Kwok, Megan Peekema
Advisor: Anthony Bright
Students: Emily Beese (TL-S), Joshua Sealand (TL-F), Jacob Knego (S), Kamau Waller (S), Sean Mahre (S), Kyla Scott (F), Bryce Murley (F), Jacey Coniff (F)

Motiv Power Systems is a provider of all-electric drivetrains for medium and heavy-duty vehicles. The goal of the Motiv Clinic project is to design and test a new, more efficient thermal management system for Motiv’s electric powertrains that incorporates battery heating and cooling into the current cabin AC system. This would facilitate the use of cheaper, higher performance lithium ion batteries in their electric vehicles.

Niagara Bottling, LLC
Rotation Speed of Blow Molding Equipment
Liaisons: Alexander Mouschovias, Alberto Giron
Advisor: Hesam Moghaddam
Students: Ian Song (TL-S), Michael Chaffee (TL-F), Phuong Nguyen, Ryan Gibbs (S), Kristin Lie (S), Jose Godinez (F), Kim Tran (F)

Niagara Bottling, LLC is the largest private bottled water manufacturer in the U.S. that is currently undergoing double digit annual growth. The HMC Niagara Blowmolding clinic project is to develop tools and processes to evaluate the electrical, mechanical, and thermal limitations of the blowmolding machines.

Northrop Grumman
Secure State Estimation
Liaisons: Stephanie Tsuei, Ron P. Smith ’83, Ken Dreshfield ’80, Ian Jimenez ’11
Advisor: Christopher Clark
Students: Aishwarya Korde (TL-F), Paige Rimmert (TL-F), Robert Cyprus, Zayra Lobo (F), Austin Chun (S), Jesus Villegas (S)

Autonomous vehicle control requires estimating vehicle states from on-board sensor readings. In the case that some of the sensors are compromised, the state of the vehicle may not be accurately estimated. The goal of this Clinic project is to implement a secure state estimator (SSE) in simulation and then validate it in hardware on a low-cost quadrator. The team will demonstrate that the addition of the SSE to the control loop reduces the real-time tracking error of a quadrator when using measurements from compromised onboard sensors.

Regenesis Biomedical
New Form Factor and User Interface
Liaisons: Martin Kirk, Joseph Bright
Advisor: Elizabeth Orwin
Students: Benjamin Kunst (TL), Coco Coyle (TL), Owen Morrison (S), Justin Lauw (S), Wenkai Qin (S), Hesam Moghaddam, Alberto Giron

The 2016-17 Regenesis Biomedical Clinic project is to design, build, and test circuitry to generate radio frequency signals in four applicator pads for the next generation Provenant Therapy System. The team will design a user interface to support this function and maintain EMC compliance.
**Microsoft Surface**

*RF Propagation in Buildings*

Liaisons: Dave Neff ’79
Advisor: Nassibeh Hosseini
Students: Cherie Ho (TL-S), Marisa Kager (TL-W), Olivia Schneble (TL-F), Duncan Crowley (S), Ragini Kothari (F), Patrick Scalise (F)

Microsoft Corporation builds many wireless devices, including the Surface tablet. These devices connect to a variety of wireless networks and often operate in an indoor environment where building structures (e.g. walls, floors) interfere with signal propagation. The Microsoft Surface Clinic team is characterizing the impact of interior environments (e.g. hallways, walls, floors) on RF propagation at characterizing the impact of interior environments. The team is investigating how structures (e.g. walls, floors) interfere with signal propagation. The team is investigating how the casing containing both of the previous components might influence signal properties such as carrier frequency and modulation type. Algorithms will be tested in simulation and on software-defined radios.

**Mission Rubber Company**

*Energy Monitoring System for Industrial Rubber Molding*

Liaisons: Richard Getze, Luciana Ramirez, Jay Clark, Don Wrixon
Advisor: Matthew Spencer
Students: Mark Lozano (TL-S), Hannah Zosman (TL-F), Huting Lin, Fernando Salad, Viviana Bermudez (F)

The Mission Rubber Company (MRC) clinic team designed an energy diagnostic and monitoring (EDM) system that measures, records, and graphically displays power used by industrial rubber presses. A prototype version of the EDM system was installed at the MRC manufacturing facility in Corona, whose annual energy use (10 GWh) could power nearly 1,000 homes. The EDM will be used to compare the operating power of different machines, recognize power inefficiencies and quantify the effects of energy reduction programs.

**MIT Lincoln Laboratory**

*Adaptive Wireless Sensing*

Liaisons: Masato Kocberber ’10, Eric Storm ’15
Advisor: Philip Cha
Students: Sam Dietrich (TL-S), Orheas Petroulas (TL-F), Jacob Nguyen, Enoch Yeo (S), Manu Kondapi (S), James Palmer (F), David Kwan (F)

MIT Lincoln Laboratory is a federally funded research and development center and leader in wireless technology research. The MIT Lincoln Laboratory Clinic project is to design and prototype a reconfigurable signal classification system with applications including intelligent Wi-Fi channel allocation. The team will research, develop, and characterize algorithms to discriminate between several simultaneous RF emitters and determine signal properties including carrier frequency and modulation type. Algorithms will be tested in simulation and on software-defined radios.

**Reddit**

*Detecting Evil Through Machine Learning*

Liaison: N/A
Advisor: Yi-Chieh Wu
Students: Jonathan Chang (PM-S), Rachel Lee, Anna Ma, Kent Shikama (PM-F), Lisa Yin

Reddit is an online discussion platform where users can form communities centered around a variety of topics. Like any discussion website, Reddit has experienced instances of spam, trolling, cyberbullying, and general aggressive behaviors from users, which can alienate other users or discourage people from joining Reddit. To help Reddit combat such behavior, we created an extensible machine learning pipeline for predicting whether a comment will be perceived as aggressive.

**Webroot, Inc.**

*Real-Time Visualization and Machine Learning On Network Streams*

Liaisons: Hal Lona, Trung Tran
Advisor: Geoff Kuenning
Students: Nick Bailey (PM), Rohin Lohe, Jeff Milling, Norwood Square

Webroot specializes in cloud-based Internet security for consumers and businesses. The goal of our project was to perform real-time machine learning on local network streams and provide insight about anomalous and malicious behavior. Our team developed an infrastructure that uses machine learning to capture and analyze network traffic and display information about it, offering clients a better understanding of malicious activity on their networks and a new way to protect against malware.

**COMPUTER SCIENCE/ENGINEERING CLINIC**

**ZAM Helmets, Inc.**

*Hockey Helmet Impact-Monitoring System*

Liaison: Whitman Kwok ’07
Advisor: David Money Harris
Students: Lydia Scharff (TL-S), David Tenorio (TL-F), Erin McCarthy, Matthew Williams, Zunyan Wang (S), Kim Joly (F)

ZAM Helmets Inc. is a startup creating better hockey helmets to reduce concussions among youth players. The ZAM clinic team is building an Internet of Things impact-monitoring system for use in these helmets. The system consists of an in-helmet impact sensor array, an iPhone app for displaying data about potential concussion risk, and cloud data storage for future analysis to aid concussion research.

**ENGINEERING CLINIC**

**The Aerospace Corporation**

*One TFLOP/s GPU on an Aerocube Picosatellite*

Liaisons: Tim Smith ’05, Alex Utter ’05, Darren Rowen, Dr. Joseph Betser
Advisor: Brian Bryce
Students: Aaron Wang (TL-F), Men Cheol Jeong (TL-S), Lauren Hu (S), Alex Echeverria (S), Teresa Despres (F), Nancy Wei (F), Nicholas Sakowski (F)

The Picosat program at The Aerospace Corporation designs, constructs, launches and operates small cube-like satellites for various mission concepts. The Aerospace Corporation clinic project is to build and demonstrate a picosatellite payload using the NVIDIA Jetson TX1 supercomputer-on-module. This payload will measure the functional ability of the Jetson TX1 in a low earth orbit radiation environment. Successful demonstration of the Jetson will raise the space readiness level of this cutting-edge technology and will enable exciting future mission capabilities.
At&T
RF Drones for Automated Signal Analysis
Liaisons: Terence Wu, Chuck Palaganas
Advisors: Albert Dato (S), Ruye Wang (F)
Students: Patrick McKeen (TL - S), Siyi Hu (TL-F), Jesse Joseph, Ramy Elinyawi (F), Austin Shin (S), Charles Van Eijk (F)

The AT&T Clinic project is to develop a drone-based system to collect data on over-the-air digital television signals, particularly signal strength, clarity, and orientation across location and altitude. The system will include an operating procedure, easy-to-use operation and visualization software, drone selection, and onboard hardware, as well as the reasoning behind design choices and recommendations for future improvements.

Bd Biosciences
Improving Ease and Efficiency of Blood Sample Manipulation for Flow Cytometry Verification
Liaisons: Christine Paulson ’02, Josh Zollett
Advisor: Gordon Krauss
Students: Lani Chapko (TL-F), Andrew Marino, Kelly McConnell, Ruth Sung (TL-S), Ramita Kondepudi (S), Thomas Morgan-Witts (F)

BD Biosciences’ flow cytometers are crucial research and clinical instruments used in studying, diagnosing, and finding cures for today’s diseases such as HIV and leukemia. Harvey Mudd College has been enlisted to help BD Biosciences’ systems development team in making verification testing of their products more efficient. Our Clinic Team is focused on reducing the skill and tedious nature of whole blood specimen manipulation techniques, by providing tools to make these procedures easier, faster, and less error-prone.

City of Hope
Redesigning the Lighting and Optics for Laparoscopic Surgery
Liaisons: Dr. Kurt Melstrom, Dr. Yanghee Woo, Dr. Yuman Fong, Dr. Mustafa Raoof
Advisor: Qimin Yang
Students: Kathryn Jones (TL-S), Erica Martelly (TL-F), Leonardo Huerta, Richard Liu (F), Sean Nguyen (F), Arthur Reyes (S), Robin Bendiak (S)

Minimally-invasive (laparoscopic) surgeries currently utilize a tethered, expensive system that relies on a single hot, limited-range incandescent light attached to a lone camera. This year the team focused on designing a set of cost-effective, self-sufficient systems using modern lighting and camera systems that will provide improved visibility for surgeons.

City of Hope
A Raman Spectrometer for in vivo Cancer Assessment
Liaisons: Dr. Veronica Jones, Dr. Yuman Fong, Dr. Dan Schmolze, Dr. Lily Lai, Dr. Bertrum Yuh
Advisor: Philip Cha
Students: Sarah Anderson (TL-S), Connor Stashko, (TL-F), Nathan Miller, Alex Echevarria, Willie Zuniga

The City of Hope-Spectrometer clinic team is laying the groundwork for a Raman system to assess cancer margins in vivo and in real time. The final device will be placed into the breast, liver, or prostate and, upon recognition of cancer, ablate the malignant tissue. The team’s focus has been to collect and analyze spectra of human tissue to extract features that indicate if the tissue is malignant.

Dolby Laboratories, Inc
FPGA Implementation of HEVC Decoder
Liaison: Olivier Lambert
Advisor: David Money Harris
Students: Michael Reeve (TL-S), Achintaya Bansal, Bonny Chen, Joanna Ho (TL-F), Charlotte Robinson

The purpose of this project is to develop a prototype implementation of an HEVC decoder in FPGA based on a Dolby’s internal “IMPACT” HEVC decoder implementation written in C-code for multi-core CPUs. The project will involve performance evaluation of the existing C-code to identify the most compute-intensive modules, and an RTL implementation of these modules.

Arconic, Inc.
Create a Visual Production Scheduling System
Liaisons: Christopher Dinsley, Paul Rogers
Advisors: Patrick Little, Werner Zorman
Students: Shaa Guareeb (TL-S), Katherine Yoo, Jeong Shin (TL-F), Camille Croll (S), Anjaneya Malpani (S), Lam Huynh (F), Marissa Lee (F), Angelica Virrueta (F)

Arconic’s Rancho Cucamonga facility produces aerospace parts in (Nickel, Titanium, Aluminum) and makes monthly shipments to companies across the globe. Arconic Rancho’s revenue growth is being constrained by forge capacity, which prompted Rancho to engage the Harvey Mudd clinic team to develop a production scheduling system that will assist the scheduler to optimize the forge units to increase efficiency and throughput, enabling future revenue growth.

HP, Inc.
Clear Fluid Detection on Media
Liaisons: Alyssa Siegman ’13, Aaron Rosen ’16
Advisor: Nancy Lape
Students: Lucia Kaye (TL-S), Tae Ha ’Jeff’ Park (TL-F), Michelle Niu, Ramonda Giddings, Jose Orozco, Kana Hatori, (KU-S), Florence Walsh (F)

HP Inc is the worldwide leader of home, office, commercial, and industrial printing. The goal of the HP Clinic project is to detect clear fluids, which are crucial in providing durability and improving quality of printed products. By detecting the location and quantity of clear fluids in real time and in situ, the team will help reduce waste and provide more consistent printing quality.

Amazon Lab126
Configurable Microphone Harness Array
Liaison: Ken Hild
Advisor: TJ Tsai
Students: Paul Slaats (TL-S), Samantha Hoang (TL-F), Rosh Lam, Eyasu Shimelis (S), Gabe Rubin (F), Jonathan Kupfer (F)

Amazon Lab126 is a subsidiary of Amazon.com focused on development of consumer electronic products. The Amazon Lab126 Clinic team will design a configurable microphone-speaker system. It must fit into arbitrary product enclosures while supporting 16 location-adjustable microphones and computer interfacing for automated testing. The system will support stereo, mono, and 5.1-surround sound speaker outputs. This project will expedite the testing process for future prototypes in the Amazon Echo family of products with varying microphone and speaker configurations.

“(TL)” Indicates Team Leader
“(F)” Fall Semester
“(S)” Spring Semester
“(PM)” Indicates Project Manager
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The Intuitive Surgical, Inc. Team will design, build, and test a device that works with the da Vinci Surgical System to provide a wide angle view of the patient’s entire body cavity for surgeons and operating room staff during minimally invasive surgery to augment the close-up view provided by the existing endoscope. This project has three main parts: the camera, the lighting, and the casing containing both of the previous components. The main areas of work are in minimizing the device size and providing as much lighting as possible.

Microsoft Surface
*RF Propagation in Buildings*

Liaisons: Dave Neff ’79
Advisor: Nassibeh Hosseini
Students: Cherie Ho (TL-S), Marisa Kager (TL-W), Olivia Schneble (TL-F), Duncan Crowley (S), Ragini Kothari (F), Patrick Scalise (F), Manu Kondapi (S), James Palmer (F), David Kwan (F)

Microsoft Corporation builds many wireless devices, including the Surface tablet. These devices connect to a variety of wireless networks and often operate in an interior environment where building structures (e.g. walls, floors) interfere with signal propagation. The Microsoft Surface Clinic team is characterizing the impact of interior environments (e.g. hallways, walls, floors) on RF propagation at different locations. The team will develop a revised model for predicting path loss in a variety of indoor environments.

Mission Rubber Company
*Energy Monitoring System for Industrial Rubber Molding*

Liaisons: Richard Getze, Luciana Ramirez, Jay Clark, Don Wrixon
Advisor: Matthew Spencer
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Reddit
*Detecting Evil Through Machine Learning*

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COMPUTER SCIENCE/ ENGINEERING CLINIC

**ZAM Helmets, Inc.**
*Hockey Helmet Impact-Monitoring System*

Liaison: Whitman Kwok ’97
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Advisor: Brian Bryce
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Heat Pump for Heavy Electric Vehicles

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Northrop Grumman

Secure State Estimation

Liaisons: Stephanie Tsuei, Ron P. Smith ’83, Ken Dreshfield ’80, Ian Jimenez ’11
Advisor: Christopher Clark
Students: Aishwarya Korde (TL-F), Paige Rimmett (TL-F), Robert Cyprus, Zayra Lobo (F), Austin Chun (S), Jesus Villegas (S)

Autonomous vehicle control requires estimating vehicle states from on-board sensor readings. In the case that some of the sensors are compromised, the state of the vehicle may not be accurately estimated. The goal of this Clinic project is to implement a secure state estimator (SSE) in simulation and then validate it in hardware on a low-cost quadrotor. The team will demonstrate that the addition of the SSE to the control loop reduces the real-time tracking error of a quadrotor when using measurements from compromised on-board sensors.

Lawrence Livermore National Laboratory

High Performance Portability

Liaisons: Holger Jones, David Beckingsale, David Poliakoff
Advisor: Chris Stone
Students: Nick Gonzalez (PM-F), Aaron Lobb (PM-S), Dan Obermiller

Lawrence Livermore National Lab (LLNL) uses supercomputers to perform complex physics simulations. Maintaining parallel code is difficult when faster computers with different architectures are installed every few years. Portability layers can simplify this code by hiding details of computer architecture and parallelism. The goal of the clinic team was to improve RAJA, a portability layer created and used by LLNL. The team also compared RAJA to other portability layers with respect to usability and performance.

The MITRE Corporation

Image De-identification

Liaisons: Sarah Doyle, Nick Orlands, Jay Doyle
Advisor: Lisa Kaczmarczyk
Students: Madi Pignetti (PM), Nava Dallas, Michael Sheely, Veronica Rivera

The MITRE Corporation is a not-for-profit research company that applies new technologies to problems in an array of areas. The goal of the MITRE clinic team’s project is to produce an algorithm that transforms an image to preserve apparent similarity to a human, but leads to a decreased accuracy for a number of specified recognition algorithms. This algorithm makes it significantly more difficult for certain facial recognition algorithms to detect individuals, leading to increased security and privacy.

Proofpoint

Predicting Malicious URLs

Liaisons: Thomas Lynam, Mike Morris ’97
Advisor: Elizabeth Sweedyk
Students: Vidushi Ojha (PM), Aidan Cheng, Kevin Herrera, Carli Lessard

As part of their security solutions, Proofpoint provides a service to scan URLs embedded in clients’ emails, and determine whether they lead to sites containing malware. Suspicous URLs are redirected to a virtual environment, or sandbox, where they are tested for maliciousness. The goal of our project is to create a machine learning classifier which can better detect malicious URLs, so that fewer URLs need to be sandboxed. We investigated various models and features to create a number of options for such a classifier.

Niagara Bottling, LLC

Rotation Speed of Blow Molding Equipment

Liaisons: Alexander Mouschovias, Alberto Giron
Advisor: Hesam Moghaddam
Students: Ian Song (TL-S), Michael Chaffee (TL-F), Phuong Nguyen, Ryan Gibbs (S), Kristin Lie (S), Jose Godinez (F), Kim Tran (F)

Niagara Bottling, LLC is the largest private bottled water manufacturer in the U.S. that is currently undergoing double digit annual growth. The HMC Niagara Blowmolding clinic project is to develop tools and processes to evaluate the electrical, mechanical, and thermal limitations of the blowmolding machines.

Regenesis Biomedical

New Form Factor and User Interface

Liaisons: Martin Kirk, Joseph Bright
Advisor: Elizabeth Orwin
Students: Benjamin Kunst (TL), Coco Coyle (TL), Owen Morrison (S), Justin Lauw (S), Wenkai Qin (S), Martin Kirk, Joseph Bright

The 2016-17 Regenesis Biomedical Clinic project is to design, build, and test circuitry to generate radio frequency signals in four applicator pads for the next generation Provant Therapy System. The team will design a user interface to support this function and maintain EMC compliance.

“(TL)” Indicates Team Leader
“(PM)” Indicates Project Manager
“(S)” Spring Semester
“(F)” Fall Semester
Techmation

Project Beluga: Trajectory-Tracking Controller for Autonomous Underwater Vehicles
Liaisons: Jerry Hsiung '16, Ben Chasnov '16, Cyrus Huang '16, Yu Yang
Advisor: Anthony Bright
Students: Vaibhav Viswanathan (TL-S), Jessica de la Fuente (TL-W), Cherylyn Chan (TL-F), Kyle Lund, Elijah Carbanaro (F), Jessica Lupanow (S), Chris Kotcherha (S)

The HMC Techmation Clinic team will modify and build a new version of the current Beluga AUV, develop an underwater trajectory-tracking controller and demonstrate the working controller on the Beluga 2.0 in field trials.

Toyota

Energy Usage and Efficiency in a Fuel Cell Electric Semi-Trailer Truck
Liaison: Mr. Takehito Yokoo
Advisor: Okitsugu Furuya
Students: Elyse Pennington (TL-S), Cassie Burgess (TL-F), Daniel Nguyen, Aurora Leeson (S), Luis Viornery (S), Lillian Liang (F), Sarah Silcox (F)

Toyota has long maintained that hydrogen fuel cell technology could be a zero emission solution across a broad spectrum of vehicle types. The scalability of this technology is enabling the automaker to explore a semi-trailer truck application for a California-based feasibility study. The Toyota clinic project models energy usage and efficiency in the vehicle’s four main subsystems, with the goal of specifying vehicle component capacities.

Triple Ring Technologies

IoT Mobile Health Monitoring
Liaisons: Jen Keating, Dickshitha Thyagarajon
Advisor: Brian Bryce
Students: Deval Gupta (TL-S), Erin Paeng (TL-F), Senghor Joseph, Zane Bodenbender, Sarah Wang

Triple Ring Technologies (TRT) is an engineering consulting firm dedicated to bringing deep scientific knowledge to design of innovative medical technologies. The TRT Clinic project aims to develop a mobile health monitoring platform that can readily accommodate emerging medical sensor technologies. The platform includes data acquisition on a wearable device, data visualization and storage on an Android application, and a cloud interface. As a proof-of-concept, the platform is configured to measure heart rate via photoplethysmography.

Google, Inc.

Serializing Chromium Tab State
Liaisons: Heidi Gibson, Jacob Page, Dan Gwozdz
Advisor: Ben Wiedermann
Students: Keighley Overbay (PM-S), Maureen Naval (PM-F), Terrence Diaz, Linnea Nelson, Connie Wang

GoDaddy provides small business owners with the tools they need to easily host and create their own personalized websites. The goal of our project is to extend GoDaddy's website builder to allow small business owners to automatically display announcements on their websites at a predetermined time, as well as directly post these announcements to their social media accounts.

International Business Machines Corporation (IBM)

Cognitive Note Taking
Liaisons: Maria Ebling '88, John Vergo, Michael Tanenblatt
Advisor: Lisa Kaczmarezyk
Students: Scott Chow, Harry Cooke (PM), Wyatt Cooper, Julia Cosma, Emilia Reed

This project aims to develop a note-taking mobile application and service that acts as a personal cognitive assistant to help IBM employees extract company-specific information from their notes. The application accepts collections of documents (such as PDF files or images) and direct input to the application (such as text or handwriting). It utilizes IBM Watson cognitive services to analyze the documents and extract specific information about companies, which is then verified by the user.

United Launch Alliance

Improved Cryogenic Insulation System
Liaison: Tucker Gritton
Advisor: Gordon Krauss
Students: Rachel O'Neill (TL-S), Elizabeth Lee (TL-F), Michael Muzio, Bailey Meyer (S), Jasmine Yang (S), Isabel King (F), Richard Ni (F)

United Launch Alliance is America's ride to space and is interested in developing new technologies for space travel. The ULA clinic team seeks to identify and test potential materials for a cryogenic insulation system. The team will also create a model to predict heat transfer properties and thermal degradation of such a system.

Laserfiche

Fast Detection of Problems in Scanned Documents
Liaisons: Tessa Adair '14, Karl Chan '89 P19, Carl Sykes
Advisors: Yekaterina Kharitonova, Melissa O'Neill
Students: Tiffany Sun (PM), Kharisma Calderon, Thomas Le, Yi Yang

Laserfiche builds software that helps organizations digitize content and automate processes. To ensure that data from scanned paper documents can be accurately extracted, Laserfiche has tools to fix image quality problems such as skew and speckles. The goal of our project was to automatically and quickly detect problems in scanned documents. By detecting these problems, the software can reduce the time and processing required for image correction. Our team extracted features from a collection of scanned images and used machine learning classifiers to predict if a newly scanned document has problems.
Dart NeuroScience, LLC

**Creation and Analysis of Experiment Driven Biological Networks for Understanding Memory Processes**

Liaisons: Philip Cheung ’96, Amir Fayyazuddin, Qingying Meng, Douglas Fenger

Advisors: Lisette de Pillis, Eliot Bush

Students: Loring Thomas (PM-S), Lisa Goeller, Ellen Seidel, Rohan Shankar (PM-F)

Dart Neuroscience (DNS) is a pharmaceutical company that focuses on developing treatments for memory disorders. The goal of the clinic project was to build biological networks based on DNS experimental data and to create accompanying network analysis tools. The networks and tools will help DNS better understand memory processes and find drug targets, with the goal of improving long term memory.

**COMPUTER SCIENCE CLINIC**

**American Express**

**Hotel Recommendation System**

Liaisons: Dawn Thomas, Di Xu

Advisor: Zachary Dodds

Students: Christine Chen (PM), Yacht Kitimoon, Alyssa Kubota, Jon Ueki

American Express and its partners seek to make travel planning easier, quicker, and more personalized. To that end, the objective of our clinic team was to explore and improve American Express’s current machine-learning based hotel recommendation algorithms with the goal of improving their performance.

**Big Fish Games**

**Measuring User Engagement in Fairway Solitaire**

Liaisons: Brad Bulkeley, Chris Chatburn, Sam Prud'homme, Michael Tapley

Advisor: Colleen Lewis

Students: Justin Allen, Michael Diamond (PM), Adam Dunlap, Aaron Stringer-Usdan

Big Fish Games, Inc. develops the game Fairway Solitaire and cares deeply about the player experience. The goal of our project was to use machine learning on existing user data to better understand how player interaction with the game’s features affects player engagement. Better understanding what makes users engage with the game would allow Big Fish Games, Inc. to make more informed design decisions.

**FICO**

**Using Latent Topics Models to Detect Rare Behaviors**

Liaisons: Scott Zoldi, Joe Murray

Advisor: Robert Keller

Students: Savannah Baron, Sneha Deo (PM-S), Emily First (PM-F), Hope Yu

Our project’s goal was to investigate the detection of rare customer behaviors in transactional data using latent topic models, a form of unsupervised machine learning typically used to detect topics in examples of natural language. Our team has developed techniques to apply these models to time series data and has assessed their viability in the detection of anomalous behaviors.

**ENGINEERING/MATHEMATICS CLINIC**

**Genentech**

**Optimized Emergency Power Management Planning**

Liaisons: Jerry Meek, Chris Wimmer

Advisors: Tanja Srebotnjak, Ruve Wang (F)

Students: Joseph Sinopoli (TL), Eric Mueller, Dan McCabe, Ahhyun Ahn, Andrea Vasquez (F)

Genentech is a biotechnology company researching and producing medicines for serious illnesses. Genentech is headquartered in South San Francisco, CA and is vulnerable to power outages during earthquakes. The Genentech clinic team is tasked with developing a emergency power management plan. Using operations research techniques, generator refueling and shutdown schedules for each building are generated. Displayed within Genentech systems, the plan helps facilities protect priceless research, upkeep production, and prevent inventory spoilage.

**Niagara Bottling, LLC**

**Capping Accuracy of Highspeed Lightweight Bottling Lines**

Liaisons: Clemente Sanchez, Tony Peterson, Miles Moyers, Jim Brady, Damon Choate, Danny Weckstein, Jim Utley, Alan Bunteeman

Advisors: Kash Godle, Talithia Williams

Students: Jonathan Lum (TL-S), Alex Le (TL-F), Lakshay Akula, Zachary Friedlander, Michaela Yaman (F)

Niagara Bottling, LLC is the largest family owned bottled water company in the United States, and is the largest producer of bottled water by volume. The Niagara Bottling - Capping clinic project is to understand the causes of bottle cap misapplication and reduce the misapplication frequency through conducting a Design of Experiments.

**ENGINEERING/PHYSICS CLINIC**

**Kaiam Corporation**

**High Throughput Laser Diode Burn-in Systems**

Liaisons: Dr. Bardia Pezeshki ’87, Christopher Stonier, Jacinto Dominguez, Dr. Dinh Ton, Dr. Mike Jubber, Jay Kubicky, Derek Keir

Advisor: Matthew Spencer

Students: Jeevan Naik (TL-S), Emily Schooley (TL-F), Tommy Berruet, Evan Kahn, Yashas Hegde (S), Hamza Khan (F)

Kaiam Corp. is an industry leader in the field of optical communications for data centers, and rising demand has stretched its manufacturing capability. One manufacturing bottleneck is the diode burn-in process, which tests the micron scale laser diodes at high power and temperature. The Kaiam clinic project is to design a new burn-in system using micromechanical chips to make contact with the diodes and test them more quickly.

**Sandia National Laboratories**

**Measuring the Permittivity of Ferroelectric Nanoparticles in an Epoxy Composite**

Liaison: Todd Monson

Advisors: Richard Haskell, Albert Dato

Students: Marisol Beck (TL-S), Carmel Zhao (TL-F), Jonas Kaufman, Cesar Orellana, Robin Bendia (F), Isabel Martos-Repah (S)

Barium titanate (BTO) is a ferroelectric material commonly used in capacitors because of its high bulk dielectric constant, which may be even higher in nanoparticle form. The Sandia team is determining the dielectric constant of BTO nanoparticles as a function of particle size by measuring composites of BTO nanoparticles in epoxy. We are improving our composite fabrication procedure to reduce the agglomeration of BTO nanoparticles and using finite element analysis to extract the dielectric constant of the nanoparticles.

**GLOBAL CLINIC**

**Kaiam Corporation**

**Capping Accuracy of Highspeed Lightweight Bottling Lines**

Liaisons: Dr. Bardia Pezeshki ’87, Christopher Stonier, Jacinto Dominguez, Dr. Dinh Ton, Dr. Mike Jubber, Jay Kubicky, Derek Keir

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Saracen Energy
Reverse-Engineering Power Flows on the Eastern Interconnect from Real-Time Price Data
Liaisons: Dr. Brian Maurizi, CMC '03, Ross Sclafani, HMC '08
Advisor: Weiqing Gu
Students: Rohan Nagpal, Ricky Pan, Michael Rees (PM), Jincheng Wang

Independent organizations called Independent System Operators are constantly calculating how to most efficiently meet the country’s demand for power. They communicate this information by publishing prices. Our team developed methods for using these prices to estimate power flows through large subsets of the U.S. power grid to better inform Saracen of the state of various lines. Knowledge of these flows will ultimately help Saracen, which trades in a market of buying and selling power, make better trading decisions.

SoCalGas
Evaluation and Optimization of SoCalGas Routing Planning and Algorithms
Liaisons: Virginia Balbo, Ludivina Michel
Advisor: Susan Martonosi
Students: Stetson Bost (PM-S), Max Howard, Yichen Lu (PM-F), Noah Marcus

SoCalGas provides natural gas services to over 20 million residents of the Southern California region. Each day, SoCalGas must generate routes to service up to 14,000 individual customer orders. The SoCalGas Clinic team worked to improve the vehicle routing process and route quality through district design and parameter optimization.

PHYSICS CLINIC

HRL Laboratories, LLC
Automated Tuning of Electrostatically Defined Quantum Dots: Navigating Through High-Dimensional Potential Energy Landscapes
Liaisons: Matt Reed ’07, Mark Gyure, Emily Pritchett, Richard Ross
Advisor: Gregory Lyzenga
Students: Kathleen Kohl (TL-S), Amy Brown (TL-F), Brynn Arborico, Max Byers

HRL Laboratories is a cutting-edge physical science and engineering research laboratory. The HRL clinic project aims to create a computational model which navigates through the high-dimensional potential energy landscape of a triple quantum dot system in order to automate the process of placing one electron into each quantum dot. HRL is developing these quantum dot-based devices for eventual use in quantum information processing technologies.

Key to Poster Session Layout
1. The Aerospace Corporation
2. Amazon Lab126
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5. AT&T
6. BD Biosciences
7. Big Fish Games
8. City of Hope-Optics
9. City of Hope-Spectrometer
10. Dart NeuroScience, LLC
11. Dolby Laboratories, Inc.
12. EDR
13. FICO
14. Genentech
15. GoDaddy
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18. HRL Laboratories
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20. Intuitive Surgical
21. Kaiam Corporation
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24. Microsoft Surface
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28. Motiv Power Systems
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31. Niagara Bottling-Blowmolding
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41. Triple Ring Technology
42. United Launch Alliance
43. Webroot, Inc.
44. ZAM Helmets, Inc.
Personalized Projects Day Schedule

Please fill in the empty slots below with the presentations you would like to attend.

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<td>10:30 a.m.</td>
<td>Registration and Poster Viewing</td>
<td>Platt Campus Center</td>
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<tr>
<td>1:00 p.m.</td>
<td>General Session</td>
<td>Shanahan Center 1430</td>
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<td>3:00 p.m. -</td>
<td>Break</td>
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<td>5:15 p.m. -</td>
<td>Poster Reception</td>
<td>Platt Campus Center</td>
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CLINIC ADVISORY COMMITTEE OF
HARVEY MUDD COLLEGE

Industry Members:
Paul Anderson, The Aerospace Corporation
Michel Bell, Beckman Coulter, Inc.
Joseph Betser, The Aerospace Corporation
Daniel A. Borton ’90, Amgen Inc.
Bob Butterfield, BD
Carl Carrera, ’75/76, The Boeing Company
Frances Ferris ’80, The Boeing Company
David Lesyna, Optivus Proton Therapy, Inc.
John Livingston, Tandem Diabetes Care
Hal Lonas, Webroot, Inc.
Elly Schofield ’13, Harvey Mudd College
Craig Snow, Raytheon Missile Systems

College Members:
Maria Klawe, President
Dan Macaluso, Vice President, College Advancement
Jeffrey Groves, Vice President, Dean of the Faculty
Andrew Dorantes, VP for Administration & Finance/Treasurer
Scott Martin, Assistant VP for Business Affairs & Assistant Treasurer
Barry Olsan, Director, Corporate Relations
Geoff Kuenning, Director, Computer Science Clinic
Kash Gokli, Director, Engineering Clinic
Qimin Yang, Associate Director, Engineering Clinic
Susan Martonosi, Director, Global Clinic
Weiqing Gu, Director, Mathematics Clinic
Richard Haskell, Director, Physics Clinic
Shanahan Center for Teaching and Learning
Second Floor
Projects Day 2017

May 2, 2017

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### ENGINEERING/MATHEMATICS
- **Genentech**
  - Optimized Emergency Power Management Planning
- **Niagara Bottling, LLC**
  - Capping Accuracy of Highspeed Lightweight Bottling Lines

### ENGINEERING/PHYSICS CLINIC
- **Sandia National Laboratories**
  - Measuring the Permittivity of Ferroelectric Nanoparticles in an Epoxy Composite

### GLOBAL CLINIC
- **Kaiam Corporation**
  - High Throughput Laser Diode Burn-in Systems

### MATHEMATICS CLINIC
- **EDR, Inc.**
  - Document Mining and Analysis on Environmental Reports
- **Saracen Energy**
  - Reverse-Engineering Power Flows on the Eastern Interconnect from Real-Time Price Data
- **SoCalGas**
  - Evaluation and Optimization of SoCalGas Routing Planning and Algorithms

### PHYSICS CLINIC
- **HRL Laboratories, LLC**
  - Automated Tuning of Electrostatically Defined Quantum Dots: Navigating Through High-Dimensional Potential Energy Landscapes

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<th>Project</th>
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<td>GENENTECH</td>
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<td>One TFLOP/s GPU on an Aerocube Picosatellite</td>
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<td>Create a Visual Production Scheduling System</td>
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<td>RF Drones for Automated Signal Analysis</td>
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<td>Improving Ease and Efficiency of Blood Sample</td>
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<td>Manipulation for Flow Cytometry Verification</td>
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<td>Redesigning the Lighting and Optics for Laparoscopic Surgery</td>
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<td>City of Hope</td>
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<td>A Raman Spectrometer for in vivo Cancer Assessment</td>
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<td>FPGA Implementation of HEVC Decoder</td>
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<td>Providing Aerial Views During Minimally Invasive Surgery</td>
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<td>Microsoft Surface</td>
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<td>RF Propagation in Buildings</td>
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<td>Mission Rubber Company</td>
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<td>Energy Monitoring System for Industrial Rubber Molding</td>
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<td>Adaptive Wireless Sensing</td>
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<td>Motiv Power Systems</td>
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<td>Heat Pump for Heavy Electric Vehicles</td>
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<td><strong>COMPUTER SCIENCE CLINIC</strong></td>
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<td><em>Fast Detection of Problems in Scanned Documents</em></td>
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<td><em>Predicting Malicious URLs</em></td>
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<td><em>Detecting Evil Through Machine Learning</em></td>
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**Building Codes:**
- **SHAN** = Shanahan Center for Teaching and Learning

**Note:** The “B” in room numbers indicates “Basement Level.”
Projects Day is dedicated to
Jack Alford and Mack Gilkeson
for their foresight and
wisdom in the creation of the
Harvey Mudd College Clinic Program

Harvey Mudd’s annual celebration of student achievement includes
Presentation Days (May 1 & 3, 2017),
showcasing senior thesis research and class projects, as well as
Projects Day (May 2, 2017),
showcasing projects in the Clinic program.

Mission Statement:

Harvey Mudd College seeks to educate engineers, scientists, and mathematicians well versed in all of these areas and in the humanities and the social sciences so that they may assume leadership in their fields with a clear understanding of the impact of their work on society.

Acknowledgments:

To all of the many Alumni and Parents who assist in the recruitment, formulation and conduct of Clinic projects year to year, and to the Clinic Advisory Committee who provide valuable industry perspective and advice. Your continued support is greatly appreciated.

To all Harvey Mudd College Faculty & Staff involved in the preparation of Projects Day.
Projects Day 2017
Celebrating 54 Years of Excellence

Tuesday, May 2
10:30 a.m.–6 p.m.

Clinic Program