

## ANNUAL REVIEW NEWSLETTER

### Director's Note

Dear Stanford Community,

We are excited to launch the inaugural issue of the H4D Program Newsletter, a new annual newsletter from the Stanford Hacking for Defense (H4D) Program! The H4D Program is housed at Stanford University's Precourt Institute for Energy. Stanford's Hacking for Defense course is run in collaboration between Precourt and the Gordian Knot Center. Precourt's H4D Program aims to solve the nation's most challenging national security issues with emergent technologies by fostering research collaborations between Stanford faculty and students and government personnel. These collaborations have resulted in transitioning university technologies to the commercial and federal markets.



We are excited to share some of 2022's biggest highlights in the following topics:

- [Featured Research Projects](#)
- [H4D Course \(MS&E 297\)](#)
- [Events](#)
- [Publications and Blog](#)

We hope you'll enjoy learning about our 2022!

Best wishes for 2023.

Jeff Decker, PhD  
Managing Director, Hacking for Defense Program  
Precourt Institute for Energy, Stanford University

### Featured Research Projects

The H4D Program office is currently working on transitioning the following technologies into commercially viable and/or defense capabilities.

#### Development of Multi-Functional UAV's for Urban Operations (U.S. Navy)

(PI: Fu-Kuo Chang, Aeronautics and Astronautics)  
Intelligence, surveillance, and reconnaissance (ISR) functions are critical for acquiring, processing, and, ultimately, executing military operations. The unmanned aerial vehicle (UAV) is particularly valuable to collecting ISR. This research aims to enhance UAV performance to provide enhanced ISR. More information can be found [here](#).

#### Interactive Human-AI Teaming for AI Model Development, Debugging and Repair (U.S. Army)

(PI: Chris Re, Co-PI: Kayvon Fatahalian, Computer Science)  
Advancements in the field of Artificial Intelligence (AI) and Machine Learning (ML) have allowed for rapid improvement of capabilities within nearly all industries. This research aims to apply such advancements to identifying misinformation campaigns. More information can be found [here](#).

#### Accessible Machine Learning for Misinformation and Influence Operation Analysis (U.S. Navy)

(PI: Chris Re, Computer Science)  
Advancements in the field of Artificial Intelligence (AI) and Machine Learning (ML) have allowed for rapid improvement of capabilities within nearly all industries. This research aims to apply such advancements to identifying misinformation campaigns. More information can be found [here](#).

#### ViroMeter: A Portable Health Assessment (U.S. Navy)

(PI: Utkan Demirci, Co-PI: Akin Demir, School of Medicine /Radiology)  
The COVID-19 pandemic critically disrupted the daily life of civil society and military personnel. This research aims to develop a portable, low-cost, rapid assessment tool for a range of medical conditions to keep Soldiers, Sailors, Airmen, Marines and Guardians safe. More information can be found [here](#).

#### Projects Transitioned in 2022

1. [Camera Relocalization using 3D Point Clouds for Enhanced Underwater Situational Awareness \(U.S. Navy\)](#) (PI: Leonidas Guibas, Computer Science)
2. [Creating Machine Learning Models with Labeled Data \(U.S. Navy\)](#) (PI: Chris Re, Computer Science)
3. [Real-time State Awareness Navigation System for Autonomous Fly-by-Feel Aerial Vehicle \(U.S. Navy\)](#) (PI: Fu-Kuo Chang, Aeronautics and Astronautics)

### H4D Course (MS&E 297)



Hacking for Defense (H4D) run by Precourt and the Gordian Knot Center is a university course founded in 2016 and is now taught at more than 70 colleges and universities worldwide and on three continents. The course has had more than 2,000 students through the program, all working towards solving defense and intelligence problems. At Stanford University, the original home of the H4D course, the class has worked with 48 teams from across Defense and Intelligence communities and its students have conducted more than 7,000 interviews with Defense Department stakeholders, which has incubated 15 companies now delivering solutions to the government.

More information about H4D Course Problem Titles and Summaries in 2022 can be found [here](#).

### H4D Events

This year, the H4D program and course had the distinct pleasure of hosting distinguished guests for thought-provoking events. Below is a sample of some of the events we sponsored:



#### Energy Challenges in the Defense Department - Featuring Nina French, PhD, PE

March 29, 2022  
Dr. Nina French, technical director of the Energy Portfolio at the Defense Innovation Unit, discussed energy opportunities and challenges facing the Defense Department. The Defense Innovation Unit and is responsible for technical due diligence and assessments of the commercial technology. More information can be found [here](#).



#### Navy Undersea Research Program (NURP) Review

June 7, 2022  
The Office of Naval Undersea Research Program (NURP) supports STEM research with Navy Undersea relevance. The Annual Review was held at the University of Rhode Island on June 7, 2022. 73 people attended the Review, representing 11 different universities including Stanford University. In addition, representatives from the Naval Information Warfare Systems Command (previously SPAWAR) and ONR represented the Navy.



#### Developing a Defense Innovation Network

July 18, 2022  
H4D team hosted the coordinator of Harnessing Emerging Research Opportunities to Empower Soldiers (HEREOS) Program, Dr. Ramaswamy Nagarajan. The purpose of his visit was to explore this unique government-academia-industry partnership and a co-location model involving DEVCOM Natick Soldier Center, and UMass Lowell and companies to develop technologies to address warfighter needs.



#### House Armed Service Committee Visit- Building the National Security Innovation Base

August 29, 2022  
Congressman Rob Wittman (R-Va., 1st District), vice ranking member, House Armed Services Committee (HASC), and ranking member, Seapower and Projection Forces subcommittee, visited with our office and Steve Blank. Defense Department energy challenges, the impact defense-relevant research is making in the government, and the Hacking for Defense course were the major topics of discussion.



#### Office of Naval Research NEPTUNE Program Review

November 17-20, 2022  
Naval Enterprise Partnership Teaming with Universities for National Entrepreneurship (NEPTUNE) Program aligns university research with the National Defense Strategy (NDS) and establishes entrepreneurial practices to accelerate delivery of university-derived technologies and products to the defense and commercial sectors. The NEPTUNE Annual Review was held at Carnegie Mellon University on November 17-20, 2022. Stanford supports the 9 colleges and universities involved in the program by fostering discussions between scientists and researchers with operational defense personnel.

### Publications

As thought-leaders, the Program continues to lead thinking on transitioning technologies and commercial products into the defense marketplace. Here are a few examples.

1. ["The Iron Man Model: How Startups and the Military Can Work Together"](#), Jeff Decker, *Future*, June 3, 2022
2. ["Why the Defense Industry Could Be the Most Transformative Market for Startups"](#), Jeff Decker and Mrinal Menon, *Fast Company*, May 14, 2021

### Blogs

In 2022, H4D created a blog focused on technologies and the defense sector to serve as a resource for researchers and entrepreneurs interested in pursuing defense challenges and customers. Here are some examples of our most recent blog posts. Here are some examples of our most recent blog posts. Sign up to get the blog delivered right to your inbox [here](#).

1. [Energy Challenges in the Defense Department Featuring Nina French, PhD, PE](#), April 20, 2022
2. [How to Navigate the Army Innovation Roadmap for Conducting Business in the Defense Marketplace - Part I](#), February 24, 2022
3. [Opportunities for Startups Interested in the Defense Marketplace](#), January 28, 2022

### Team

Learn more about the H4D Program Team [HERE](#).



Fu-Kuo Chang, Faculty Director



Jeff Decker, Program Director



Nilay Papila, Sr. Program Manager



Copyright © 2022 Stanford Hacking for Defense Program. All rights reserved.  
You are receiving this email because you've attended one of our events.

Hacking for Defense Program  
Stanford University  
Yang & Yamazaki Environment & Energy Building  
473 Via Ortega, Suite 324 Stanford, CA 94305

Any feedback or comments? Contact us at [hacking4defense@stanford.edu](mailto:hacking4defense@stanford.edu)