

A photograph of the University of Central Florida campus, featuring Millican Hall and a large fountain. The image is overlaid with a yellow filter. The text is centered over the image.

Enhancements to Cybersecurity Curricula to Support Behavioral Aspects of Cyber

Bruce D. Caulkins, Ph.D.

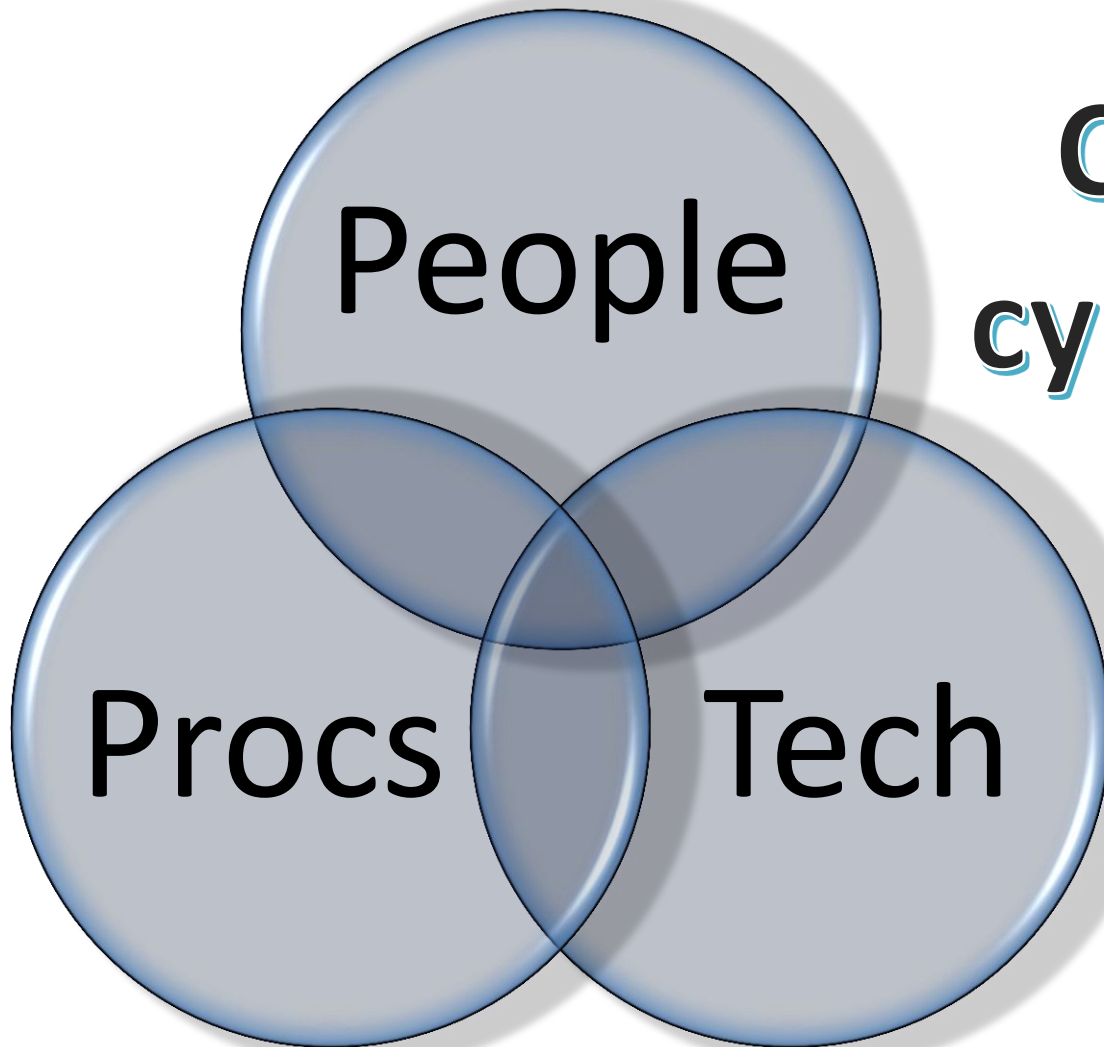
**Research Assistant Professor, Institute for Simulation &
Training (IST)**

Program Director, M&S of Behavioral Cybersecurity

University of Central Florida (UCF)

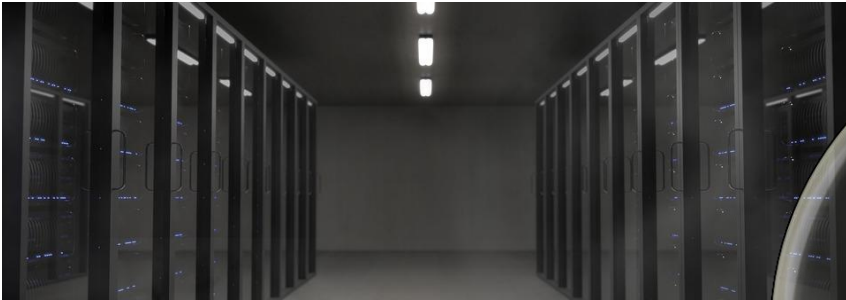
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People, Processes and Technology of Cybersecurity Education



**Current education in
cyber has an imbalance
here...**

People, Processes and Technology of Cybersecurity Education



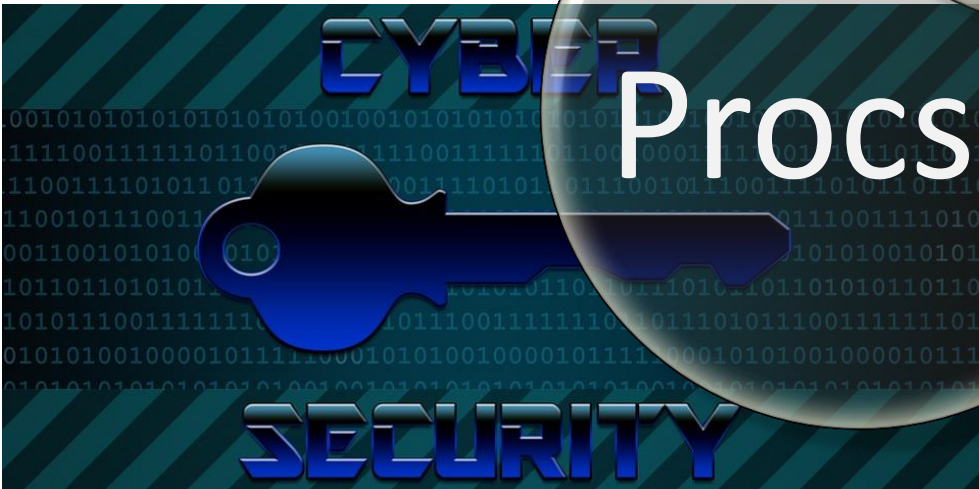
People



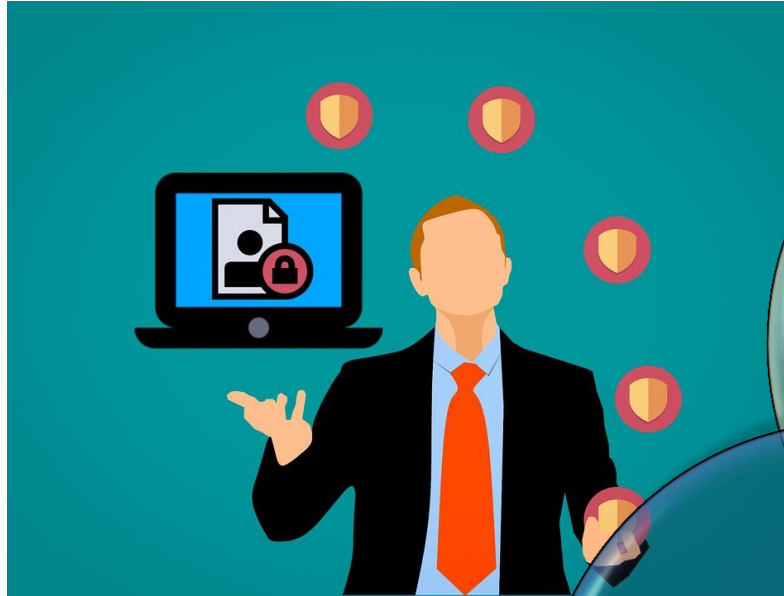
Important! But...

Procs

Tech



People, Processes and Technology of Cybersecurity Education

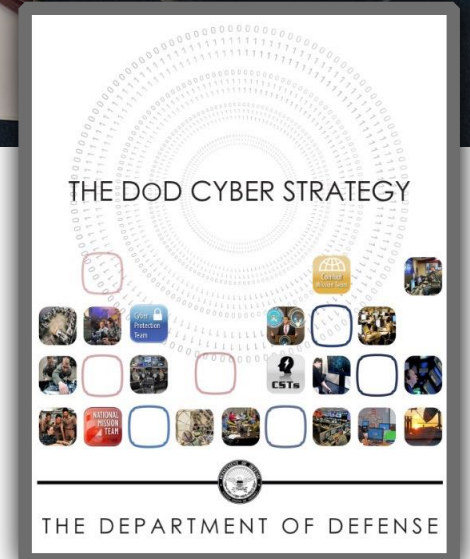
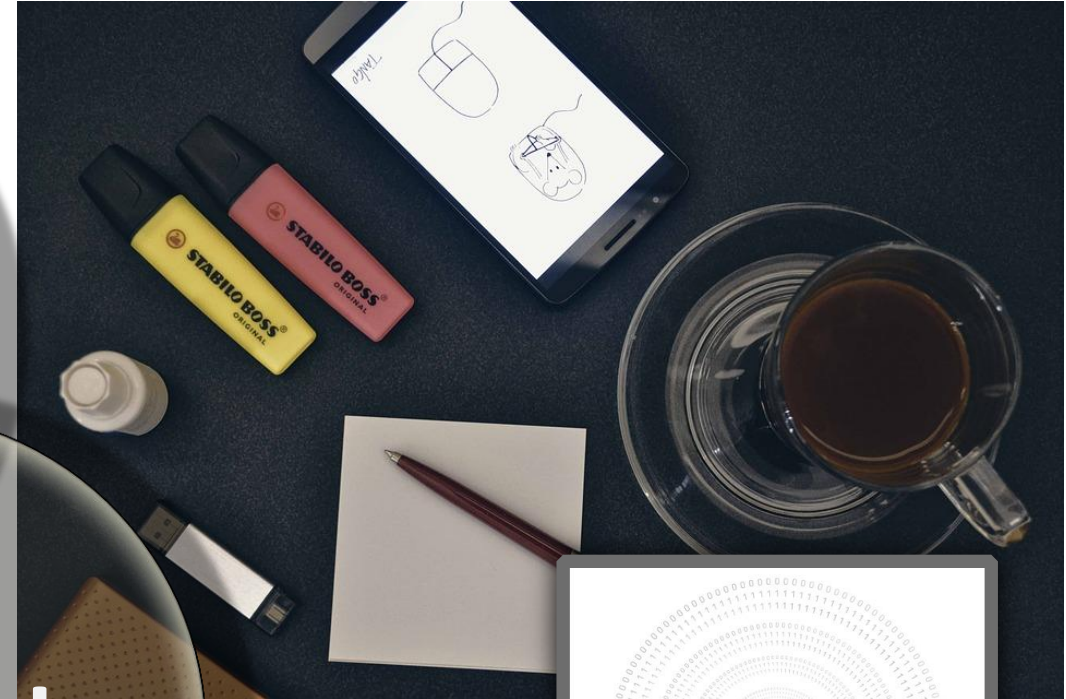


Laws,
regulations,
policy, etc...

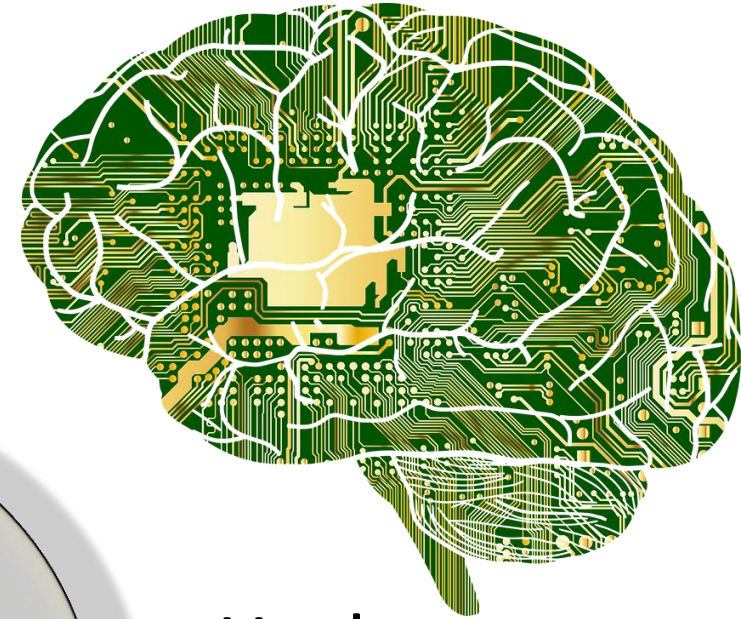
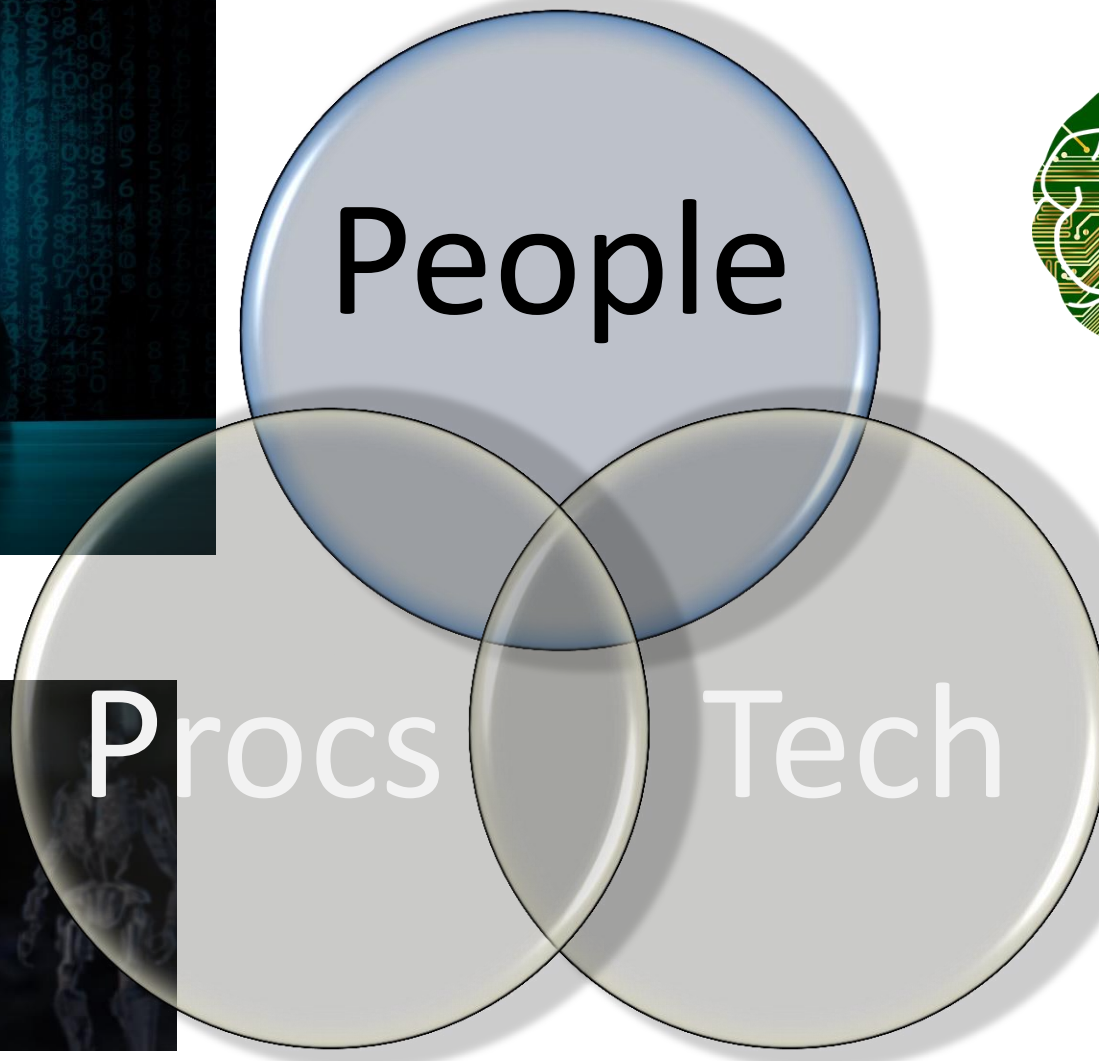
People

Procs

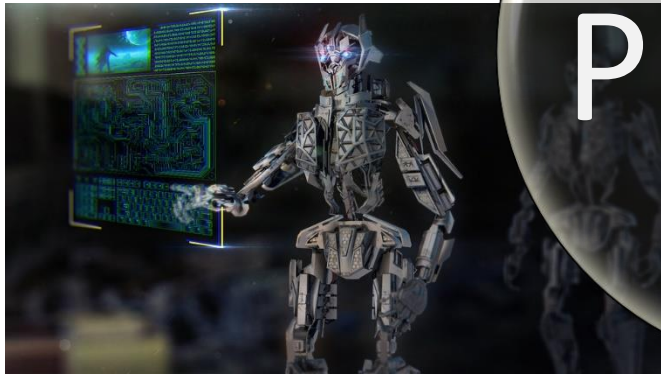
Tech



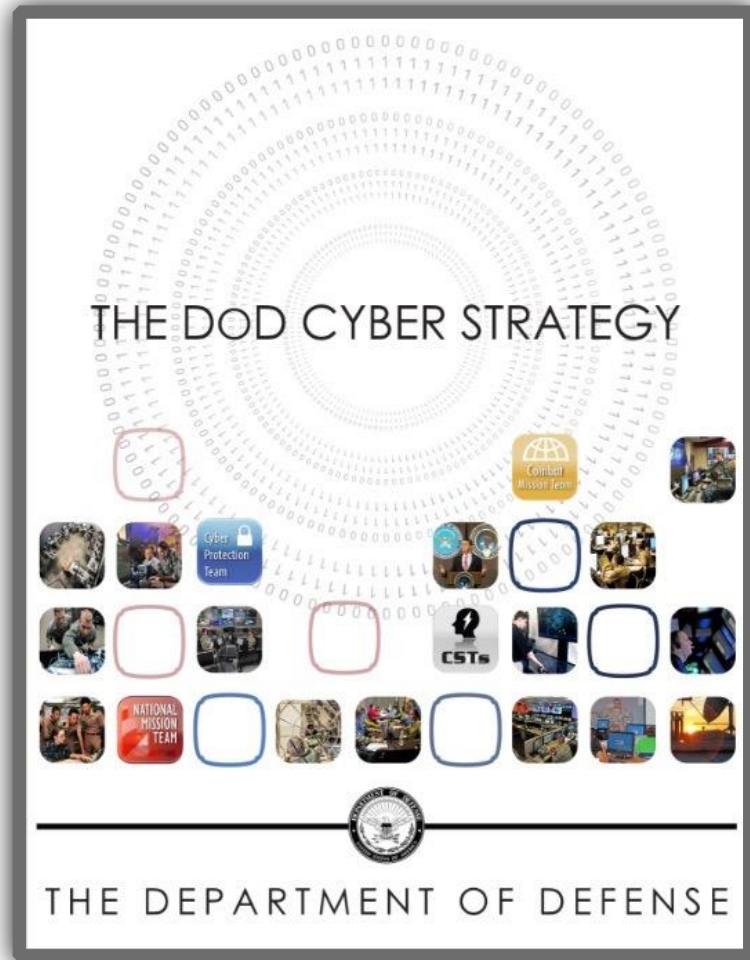
People, Processes and Technology of Cybersecurity Education



Hackers, users,
sysadmins,
automation...

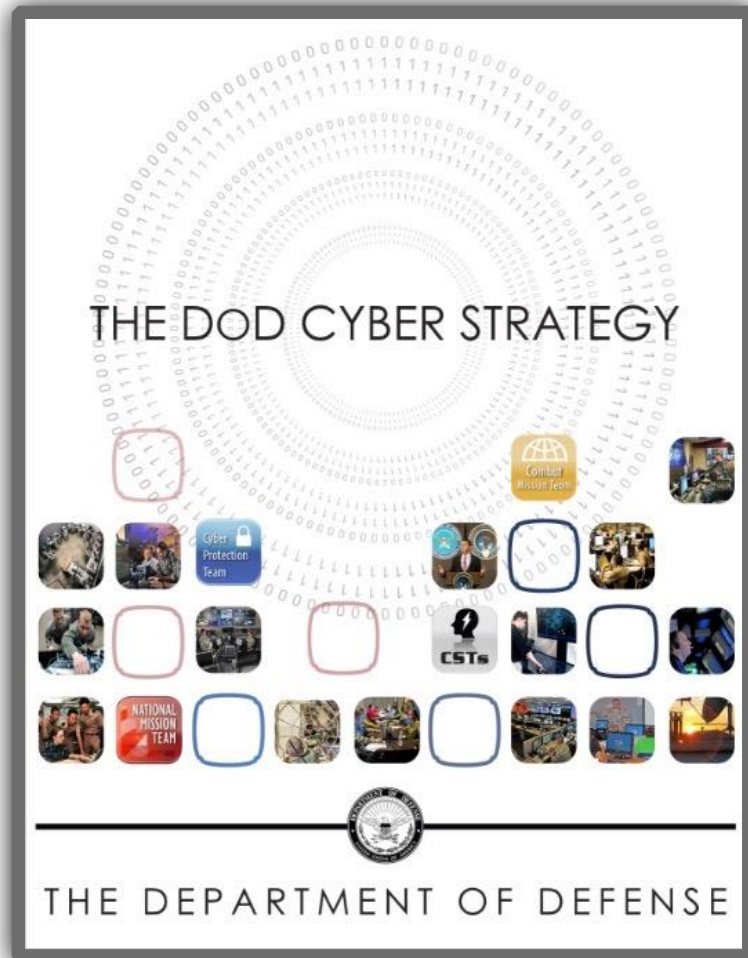


United States DoD Cyber Strategy



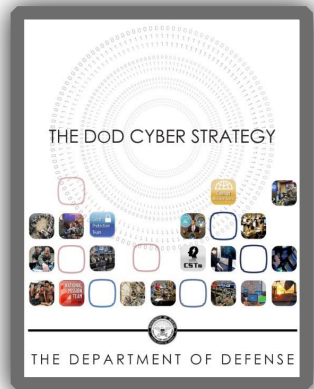
- ✓ Sets prioritized strategic goals and objectives for DoD's cyber activities and missions to achieve over the next five years
- ✓ Focuses on building capabilities for effective cybersecurity and cyber operations to achieve success in DOD's three primary cyber missions

DoD's Three Primary Cyber Missions



- ✓ Defend DoD networks, systems, and information
- ✓ Defend the nation against cyberattacks of significant consequence
- ✓ Support operational and contingency plans

DoD's Three Primary Cyber Missions



Defend DoD networks,
systems, and information



Defend the U.S. homeland and
U.S. national interests against
cyberattacks of significant
consequence

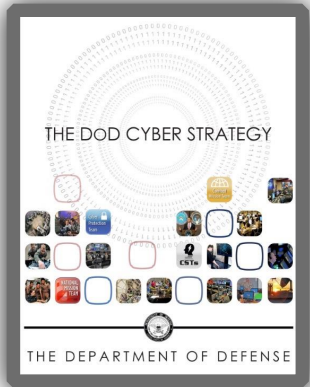


Provide cyber support to
military operational and
contingency plans

The purpose of these principles and processes is to plan, develop, and use U.S. capabilities effectively, and to ensure that cyber operations occur in a manner consistent with the values that the United States promotes domestically and internationally.

DoD's 5 Strategic Goals

1. Build and maintain ready forces and capabilities to conduct cyberspace operations
2. Defend the DoD information network, secure DoD data, and mitigate risks to DoD missions
3. Be prepared to defend the U.S. homeland and U.S. vital interests from disruptive or destructive cyberattacks of significant consequence
4. Build and maintain viable cyber options and plan to use those options to control conflict escalation and to shape the conflict environment at all stages
5. Build and maintain robust international alliances and partnerships to deter shared threats and increase international security and stability



DoD's 5 Strategic Goals

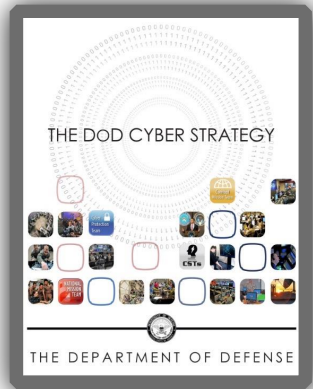
1. Build and maintain ready forces and capabilities to conduct cyberspace operations

2. Defend the DoD information network, secure DoD data, and mitigate risks to DoD missions

3. Be prepared to defend the U.S. homeland and U.S. vital interests from disruptive or destructive cyberattacks of significant consequence

4. Build and maintain viable cyber options and plan to use those options to counter cyberattacks and cyber threats at all stages

5. Build and maintain robust international alliances and partnerships to deter shared threats and increase international security and stability



What can academia and industry do to help here??
Quite a bit... (UCF example)



ESTABLISHED

1963

FIRST CLASS

1968

A photograph of three young women with long dark hair, all wearing sunglasses and smiling. They are outdoors in front of a brick building with green foliage in the background. The woman on the left is wearing a black shirt, the middle one a white shirt with a gold 'F' logo, and the right one a maroon shirt. The text 'CURRENT ENROLLMENT' is centered above them in white, and '66,138 STUDENTS' is written in large yellow letters across the middle of the image.

CURRENT ENROLLMENT

66,138 STUDENTS



DESIGNATED
**“HIGHEST
RESEARCH
ACTIVITY”**
BY CARNEGIE FOUNDATION

UCF and Cybersecurity

- ✓ UCF is a 3x winner of the U.S. National Collegiate Cyber Defense Competition (2014 to 2016); placed 2nd in April 2018 - <http://www.nationalccdc.org/>
- ✓ Hack@UCF club has over 300 members
- ✓ In 2016, UCF was designated as a National Center of Academic Excellence in Cyber Defense Education (CAE-CDE) and Research (CAE-R) – robust tech side to cyber education
- ✓ UCF is a strong collaborative research university in Modeling & Simulation (M&S), computer science, engineering, digital forensics, Big Data, & human factors
- ✓ In 2015, UCF started a first-of-its-kind program in the graduate-level M&S of Behavioral Cybersecurity
- ✓ UCF's cyber cluster on campus for faculty, cuts across disciplines:
<http://cyber.cecs.ucf.edu/>

Fall 2015...

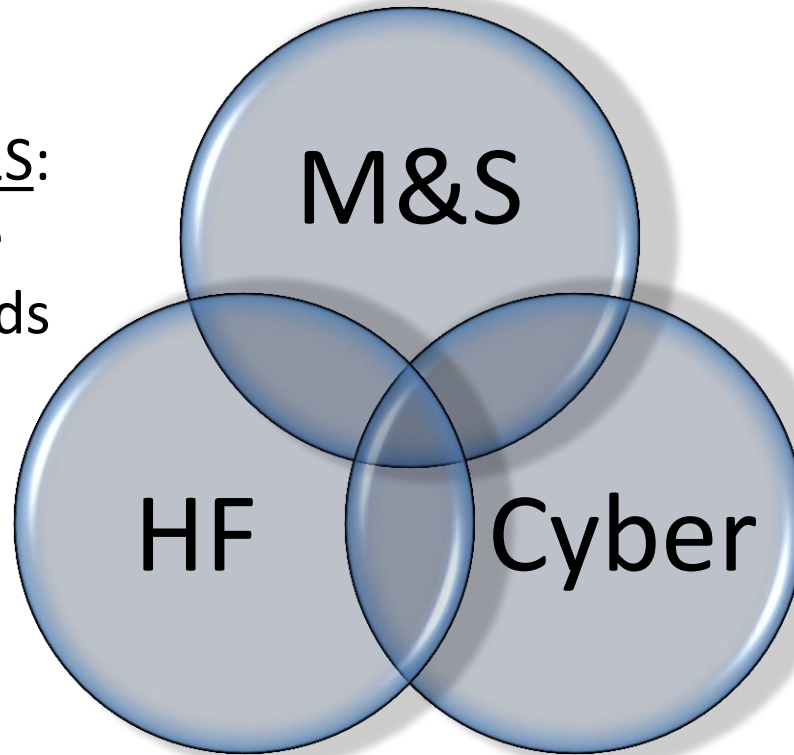
- UCF decides to look at the behavioral, “people” side of cybersecurity education and training
- Created the “Modeling and Simulation of Behavioral Cybersecurity” graduate certificate program
- Three cohort/groups so far
- Focused on cognitive aspects
- Students come from all areas



M&S of Behavioral Cybersecurity

Behavioral Aspects of M&S:

- ✓ Training & performance
- ✓ Interdisciplinary methods for problem solving
- ✓ Cognitive modeling
- ✓ Team performance



Cybersecurity for M&S:

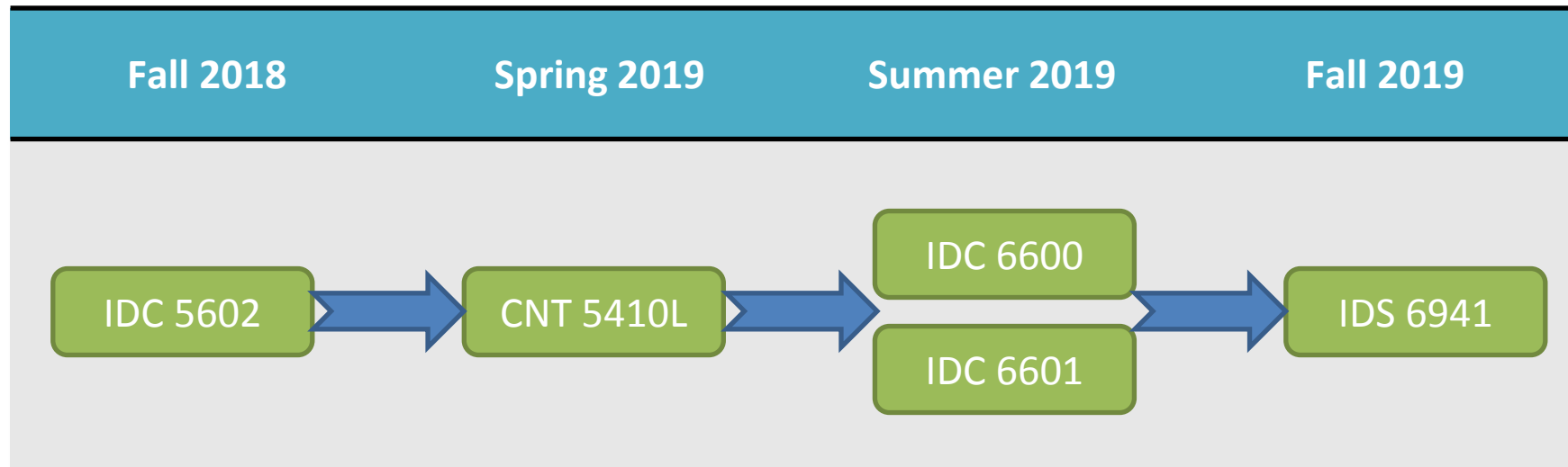
- ✓ Cyber ranges
- ✓ Anomaly detection
- ✓ Cyber aptitude testing
- ✓ Attack vector simulation

Behavioral Aspects of Cybersecurity:

- ✓ Insider threat detection
- ✓ Cyber workforce development
- ✓ Cyber team dynamics
- ✓ Hacker motivations

M&S of Behavioral Cybersecurity Graduate Certificate

- 15 credit hours, 5 courses – currently in “3rd cohort” of students
- Combined “mixed” mode and online sections:
 - ✓ “Mixed” mode is delivered face-to-face
 - ✓ Online section as well, both synchronously or asynchronously
- Starts every Fall Term and ends the following Fall Term



M&S of Behavioral Cybersecurity Graduate Certificate

IDC 5602

IDC 5602 Cybersecurity: A Multidisciplinary Approach (Fall) – Intro course; M&S fundamentals as applied to cybersecurity

CNT 5410L

CNT 5410L Cyber Operations Lab (Spring) – Hands-on, lab-based approach to learning cybersecurity operations

IDC 6601

IDC 6601 Behavioral Aspects of Cybersecurity (Summer) – Focuses on human, social, and behavioral issues related to cybersecurity

IDC 6600

IDC 6600 Emerging Cyber Issues (Summer) – Discusses emerging topics in cybersecurity by examining current events and coordinating guest speakers from expert leaders in industry

IDS 6916

IDC 6941 Capstone in M&S of Behavioral Cybersecurity (Fall) – Capstone course, group assignments covering all subjects in certificate

Future Work

- ✓ Continue work at UCF
- ✓ Expand to other universities in US and elsewhere (Howard Univ, ...?)
- ✓ Work with academic agencies at state, federal, international levels (FC2) to expand reach
- ✓ Collaborate!!! International, federal, industry, academia



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