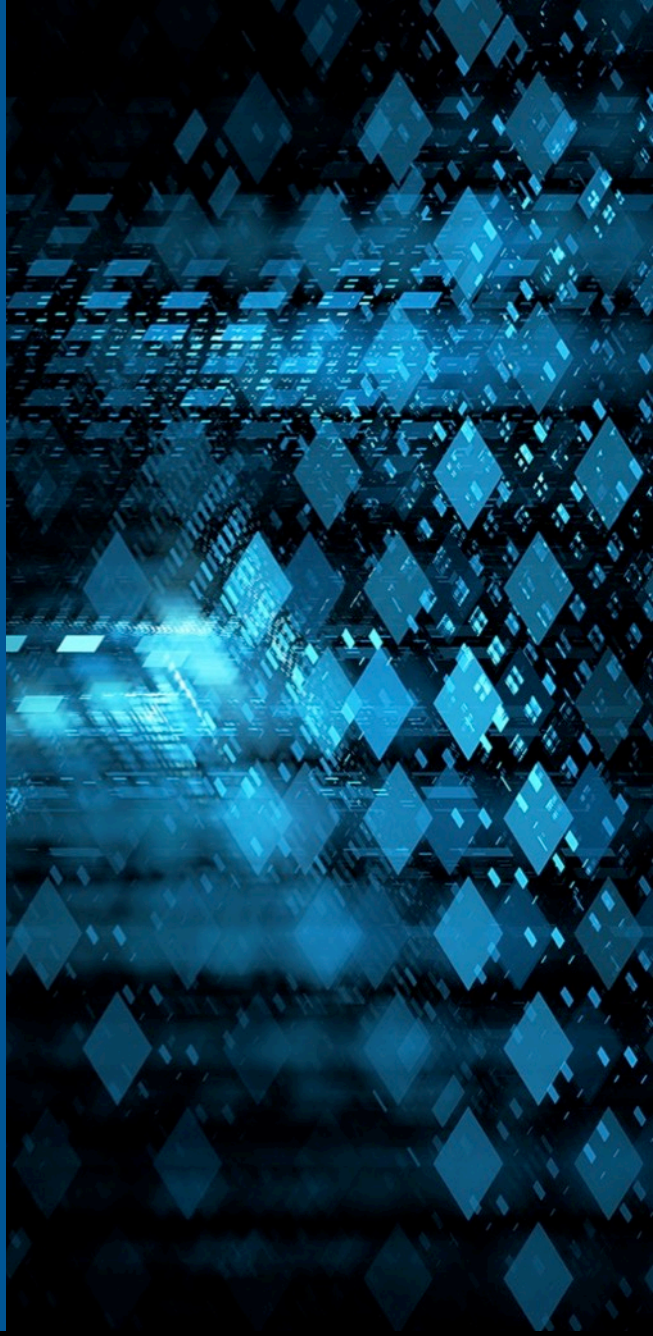
ETC Overview

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213



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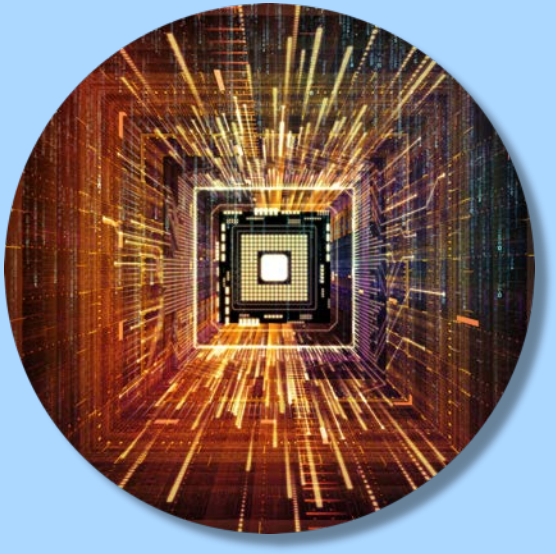
SEI Emerging Technology Center:
Making the recently possible mission-practical

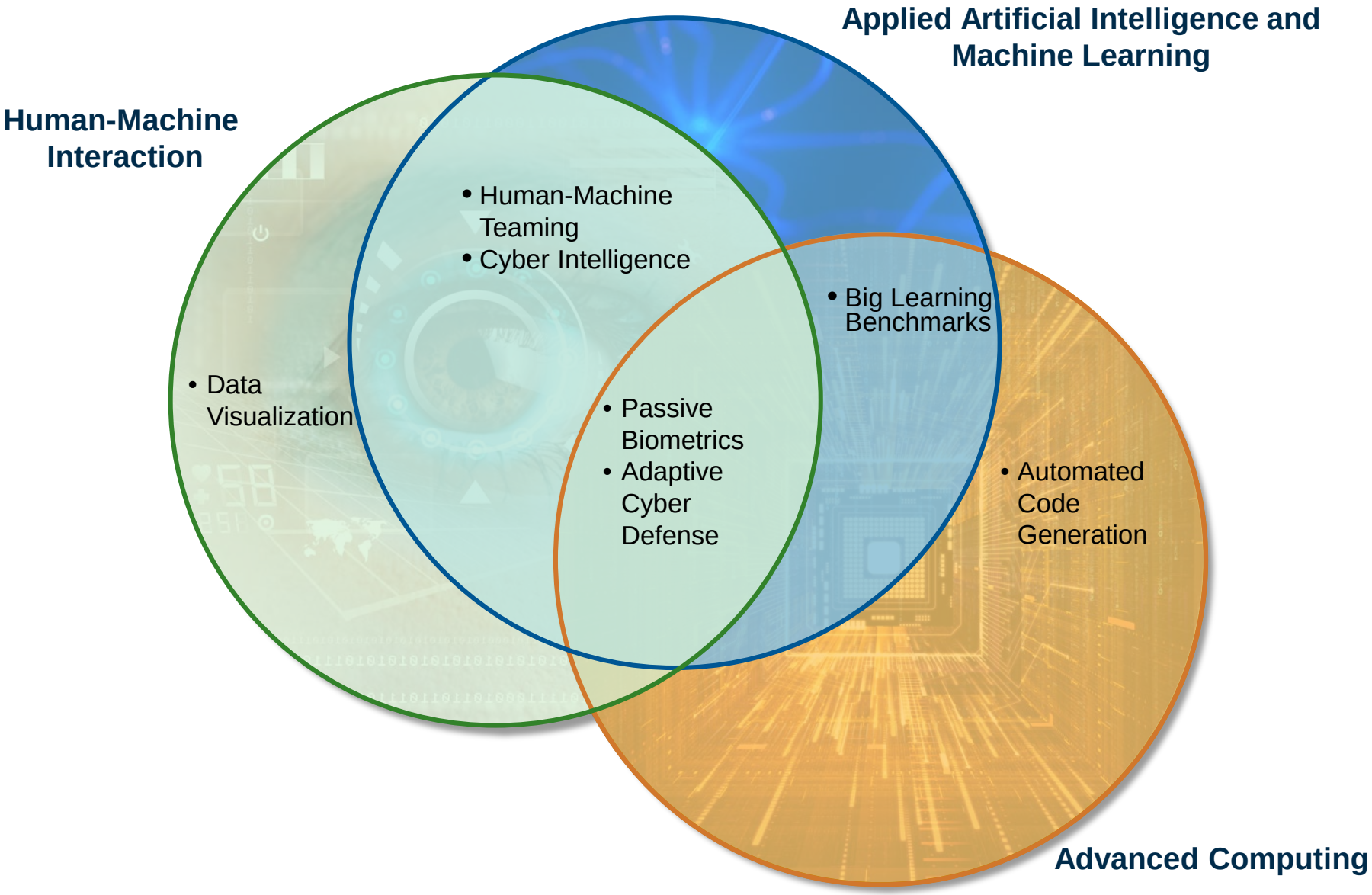


Advanced Computing

Applied Artificial Intelligence and Machine Learning

Human-Machine Interaction

ETC Selected Projects



Adaptive Network Defense/ Moving Target Research

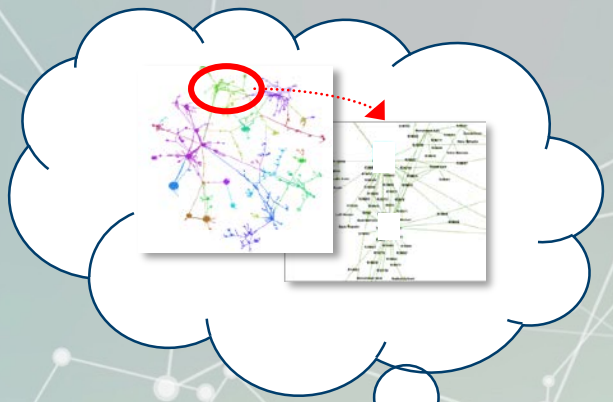
Driving concept: Creating unpredictable conditions for cyber attackers because a moving target is harder to hit.

- A platform that allows organizations to develop and deploy new techniques on an enterprise-like environment, and that allows for a better understanding of how these cutting-edge techniques interact simultaneously on the same environment.
- Examples of techniques: periodic password changes to create a changing environment, protocol diversity to make network spoofing harder, and redundant data to allow for double-checks and restoration.

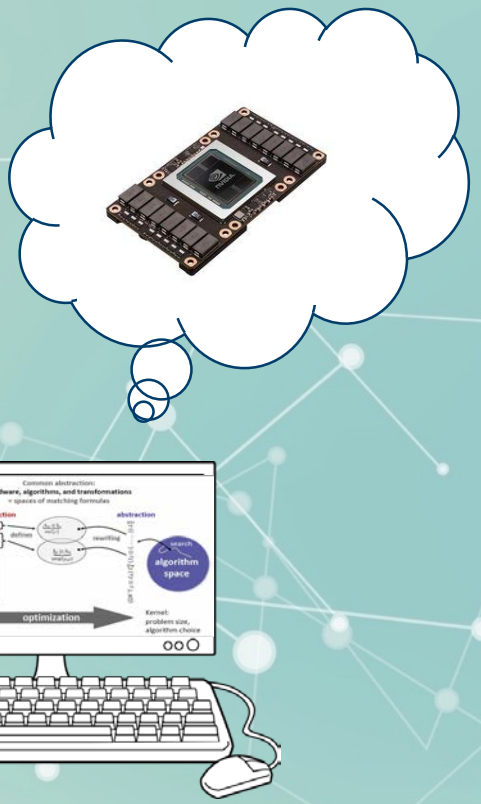
Automated Code Generation

Automate code generation for data-intensive, irregular algorithms.

With the right abstraction, automated code generation is possible.



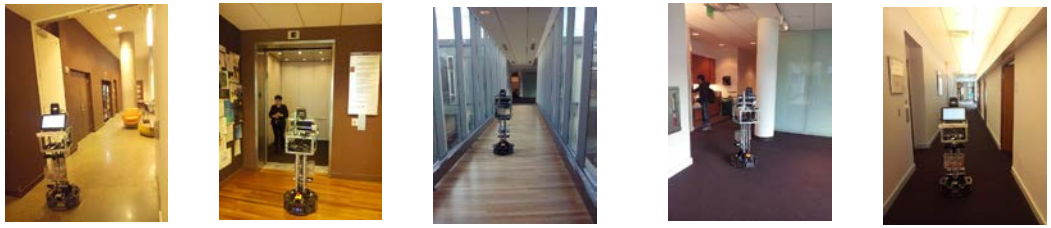
Separation of Concerns



Human-Machine Teaming

Improve users' trust and acceptance of robots through explanations and predictability.

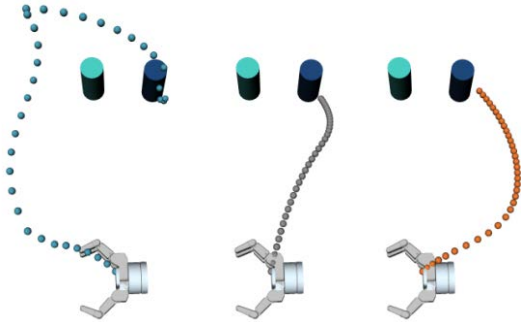
- Why did the robot do that? – Explainability



I started from room 3201, I went through the 3200 corridor, then I took the elevator and went to the seventh floor, then I took the 7th floor bridge, then I passed the kitchen, then I went through the 7400 corridor, then I reached room 7416.

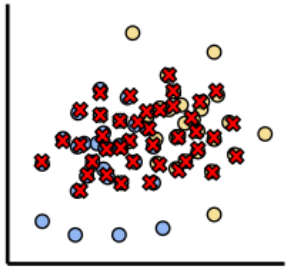
I traveled 26 meters and took 152 seconds on the 7th floor.

- What will the robot do next? - Predictability



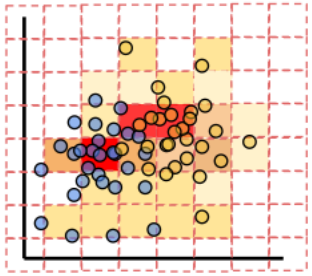
Dragan et al 2015

Data Visualization



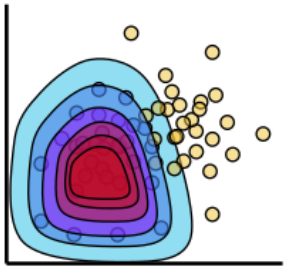
Random Sampling

Select records with a distribution the same as the original data



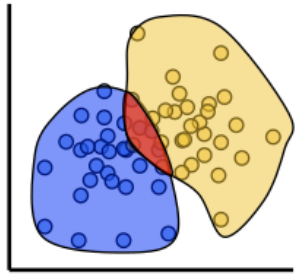
Density Sampling

Select records with probability proportional to the number of neighbors



Uncertainty Sampling

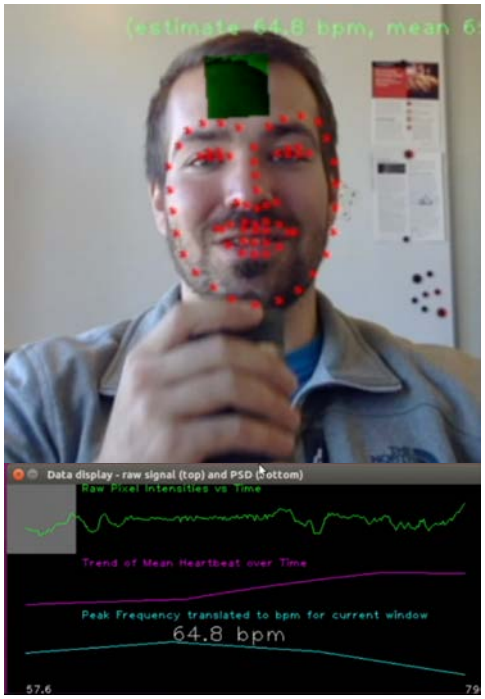
Select records that are outside the “normal” range of features or classifiers



Query By Committee

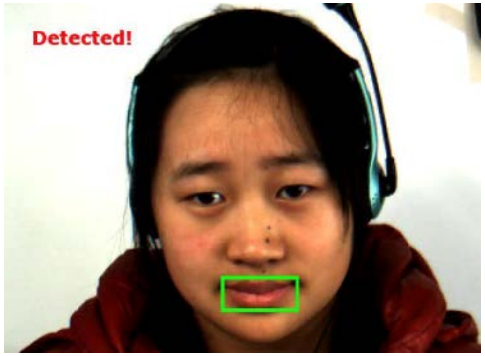
Select records for which multiple classifiers’ predictions conflict

Passive Biometrics



Biometric traits imperceptible to the human eye hold information that can be used in a variety of security scenarios.

- Security checkpoints
- Media analysis and exploitation
- Detecting face liveness to counter face spoofing
- Machine emotional intelligence
- Continuous emotion recognition from video



Our biometrics portfolio includes projects to extract heart rate from video and detect and analyze facial micro-expressions.

Cyber Intelligence

The acquisition and analysis of information to identify, track, and predict cyber capabilities, intentions, and activities to offer courses of action that enhance decision making.