COMPUTATIONAL FORENSICS AND INVESTIGATIVE INTELLIGENCE

11-688
Instructor: Rita Singh
Term: Spring 2018
Units: 12

This course covers the use of computational methods in crime investigation (forensics) and prevention (intelligence). In almost all areas of forensics and intelligence, computational methods continue to aid, and sometimes entirely replace, human expertise in tracking crime. This is desirable since automation can address the problems associated with scale and global crime linkage through diverse data computational tools can potentially overcome and surpass human capabilities for crime investigation.

This course is of a cross-disciplinary nature. It amalgamates knowledge from criminology, forensic sciences, computer science, statistics, signal processing, machine learning, AI, psychology, medicine and many other fields.

Students from all departments and schools are welcome to take this course.

Course objectives: The course aims to:

- Build awareness of global crime, global intelligence, and global investigative and law-enforcement practices.
- Expose the students to pre-emptive intelligence methodologies used in a-priori crime detection and prevention
- Show how different kinds of evidence are analyzed , emphasizing the role of computational methods of deduction
  - Show how these methods can be leveraged to address investigative challenges in multiple branches of forensics
  - Train students to imbibe the scientific methodology required to create new computational tools for forensic deduction from different kinds of evidence.
- Teach students how to leverage large volumes of data from diverse sources, for the analysis and interpretation of evidence. The focus will be on pattern discovery and information linkage.
- Apprise students of
  - Legal requirements that must be fulfilled for forensic evidence to be acceptable in courts of law across the world.
  - Requirements for engaging in legally actionable intelligence practices.

Instruction: This is an instruction-based course. There will be 26 lectures, two per week, each of 80 minutes.

Prerequisites:

- Prerequisites for CS students
  - CMU CS 15-112 (Fundamentals of programming) or Equivalent
  - CMU CS 21-241 (Matrix Algebra) or Equivalent
  - CMU CS 36-217 (Probability and Random Processes) or Equivalent

- Prerequisites may be waived for some students at instructors discretion

Student evaluations: Evaluations will be based on quizzes, homeworks and one team-based. There will be several quizzes during the course. The quizzes will be 10-minute spot-quizzes in class. The dates will not be announced beforehand.

There will be one homework every three weeks.

One team-based project will be assigned to students within the first three weeks of the course.

Grade distribution: Quizzes: 20% , homeworks: 40%, team project: 40%

Homeworks may require programming or being able to manipulate existing programs. The students will have a choice of programming language.

Outcomes:
1) To have enough depth of knowledge to be able to harness computational and AI techniques in solving forensic and intelligence challenges.
2) To have enough breadth of knowledge to anticipate the types of crime scenarios that we are likely to encounter at least in the near future (such as crimes on the IoT).