Developing a New Digital Forensics Curriculum

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Overview

• Undergraduate certificate program
• Self-contained curriculum package
  – Three courses: one basic, one advanced, one special topics
  – Hands-on lab exercises
  – Designed with express intent to distribute
• Covers all fundamental disciplines
  – Computer science, law, social science, psychology, and accounting
• Currently revising for institutional distribution
  http://publish.illinois.edu/digital-forensics/
Introduction

• Increased use of digital devices necessitates development of a standardized curriculum
• Field plays a major part of many investigations
• Still a new/rapidly-developing area of study
• Presents a challenging position for the education community
• Establishment important for several reasons:
  – Provides means for validating qualifications
  – More efficient screening for expert witnesses
  – Simplifies evaluation of degree options
  – Increases employability for such degrees

• Spring 2013 workshop:
  – Findings indicate that adoption of curriculum hindered by practicality
Existing Curriculum Standards

These observations are by no means novel, and there have been concerted efforts from the digital forensics education community to establish standardized curriculum.

• The American Academy of Forensic Sciences (AAFS)
• Forensic Science Education Programs Accreditation Commission (FEPAC), published and offers accreditation based on, a standard that includes digital forensics
  – Forensic Science Education Programs Accreditation Commission (FEPAC – 2012)
  – Forensic Science Education Programs Accreditation Commission (FEPAC – 2014)

➢ However, only a few universities has adopted this standard and received their accreditation for digital forensics
Difficulty of Implementation

- Balancing training and education
- Textbook selection
- Finding qualified faculty
- Lab setup
- Selecting appropriate prerequisites
- Lack of curriculum standards
Our Digital Forensics Program

- Self-contained curriculum package
  - Instructor course content handbook
  - Lab exercises handbook
  - Presentation lecture slides
  - Remedial reading sources
  - Homework/exam question sets

- Topics organized by modules
  - Combined to form a coherent narrative
Program Goals

• Lower entry barrier for institutions
• Work toward curriculum standardization
• Provide educational introduction to the field
• Reflect all fundamental disciplines of the field
• Make curriculum accessible and useful
Introductory Course Development

• Curriculum objectives:
  – Focus on computer forensics, network forensics, and mobile device forensics
  – Provide relevant interdisciplinary perspectives

• Necessity of relying on up-to-date material

• Requiring knowledge prerequisites rather than course prerequisites
Pilot Course Design

• 16-week course consisting of:
  – Two 75-min lecture sessions per week
  – One 60-min lab session per week

• Course topics organized in modules:
  – Psychology, computer forensics, U.S. legal system, network forensics, law, fraud examination, and mobile device forensics and malware
Define digital forensics and its subfields
Evidence handling/Scientific Method

Psychology
- Psychology of cyber crime
- Criminal profiling

Computer forensics
- Introduction to file systems
- NTFS analysis
- Deleted file recovery and file carving
- Windows Registry, log files, link files, Recycle Bin
- Web browser forensics, email forensics, EXIF
U.S. legal system
• Disputes, courtroom workgroup, attorneys
• Judges, juries, legal process

Network forensics
• Networking fundamentals review
• Network evidence acquisition
• Protocol analysis, packet analysis, flow analysis
• Application protocols, statistical flow analysis
• Network intrusion detection and analysis

Law
• Fourth Amendment: reasonable expectation of privacy
• Warrant vs. subpoena, Federal Rules of Evidence
• Privacy laws, computer crime laws
Pilot Class Topics (cont.)

Fraud examination
• Introduction to fraud examination
• Characteristics and skills of a forensic accountant
• The nature and extent of fraud, Benford's Law

Mobile device forensics and malware
• Mobile device technology fundamentals
• Mobile device evidence extraction and analysis
• Mobile network evidence
• Legal and ethical considerations of interception
• Malware taxonomy, detection, and circumvention
1. Coordination between instructors/modules proved challenging

2. Differing understandings of the knowledge prerequisites among the professors/students
   – Wide range in levels of computer literacy
   – Some students struggled during lab exercises
3. Enrollment consisted mainly of Computer Science and Law students
   - Law students had difficulty with technical aspect compared to Computer Science students
   - Decision to shift focus to investigative and evidentiary complexities
   - Lab modules revised to include more teamwork between Law and Computer Science students
Evaluation Methodology

- Illinois Science, Technology, Engineering, and Mathematics Education Initiative (I-STEM)
- Evaluation intended to provide feedback on implementation and efficacy of curriculum
- Evaluators collected data using the following:
  1. Three student surveys: pre, mid, and end-course
  2. Course and lab section observations
  3. Mid and end focus groups with students
Student Feedback Summary

Course objectives/content were thoroughly covered.

- Strongly Disagree: 0%
- Disagree: 0%
- Neutral: 25%
- Agree: 75%
- Strongly Agree: 0%

Student Response %
Student Feedback Summary

For the amount of time I invested in this course, I'm satisfied with what I learned.
Having multiple instructors teach the course was helpful.
The group assignment contributed to my learning.

- Strongly Disagree: 0%
- Disagree: 0%
- Neutral: 13%
- Agree: 75%
- Strongly Agree: 13%

(Student Response %)
Student Feedback Summary

• Students felt there was a lack of communication among the instructors
• Topics felt out of place and did not fit together
• Suggested using a single, long-term case study
• Potential benefit of glossary of technical terms
Revisions

• Incorporating a fictitious case study that advances as the course progresses

• Changing order of modules
  – Non-technical material before technical material
  – Highlight wider social impact of the field
  – Other modules will be ordered to best fit
Revisions (cont.)

• Four changes to address computer literacy
  1. Extend focus on investigations, evidence analysis, and group activities to earlier parts of course
  2. Offer students a primer on technical fundamentals
  3. Quick-reference glossary of terminology
  4. Prerequisite quiz for completion before course enrollment
Conclusions and Future Work

- Alpha version of curriculum package available in Summer 2014
- Welcome any feedback from education, research, and professional communities
- Dedicated Workshop Aug 7, 2014 - DFRWS
- Developing curriculum for advanced course to be piloted at UIUC in Spring 2015

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Questions?

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