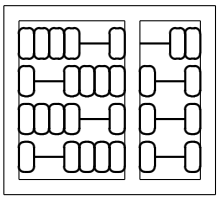

MO447 & MC919A
Digital Forensics
Topics in Digital Image Processing

Institute of Computing — UNICAMP
2nd Semester, 2014
Prof.: Anderson Rocha
anderson.rocha@ic.unicamp.br

Course Description

Days and Times

Class	Day	Time	Sala
All	Wednesdays	19 – 20:40	PB11
	Fridays	21 – 22:40	PB11

Extra-class aid

Students whom need extra-class help from the professor must send an e-mail with 24 hours in anticipation. However, every week an extra-class option will be available and broadly released to the class.

Evaluation

This class will be evaluated according to the following criteria:

1. **One written test**. **Weight**: 40% of the final grade.
2. **One practical assignment** solving one problem related to digital forensics (implementation and tests) documented with one report which may or may not be submitted to some related scientific event. The problem to be solved must be discussed a priori with the professor.
   - This assignment must be done in groups of either two or three people. The groups must be formed respecting the categories: undergrads, graduates, and special students (e.g., undergrad students must form groups with other undergrad students).
   - The programming language of choice is free (e.g., C, C++, Java, R, Python etc.).
   - The work must contain the resolution (implementation and tests) of one problem in the area of *Digital Forensics* documented by a technical report in the form of an article (model will be given later). The report and source code must be submitted.
   - At the end of the third week of class, a 1-page PDF document must be turned in (by e-mail) formalizing the problem to be solved and the team who will work on such problem. This document will serve as a "contract" about what will be done and what will be considered when grading.
   - Each team will present their final problem and solution to a committee in the end of the semester. **Weight**: 40% of the final grade.
3. **Seminar**. A 50-minute seminar presenting one forensic problem and solutions. Some possibilities will be given in class.

Grading

For graduate students, the final grade G_f will be converted to letter grades according to the following criteria:

A $G_f \geq 85\%$ (Approved);

B $70\% \geq G_f < 85\%$ (Approved);

C $60\% \geq G_f < 70\%$ (Approved);

D $N_f < 60\%$ (Failed);

For undergrads, **there is no** conversion.

Deadlines

- Written test: December 12th (Friday)
- Projects: December 15th-17th (Monday-Wednesday) according to the presentation dates.

Syllabus

The topics which will be discussed in this class include:

1. Introduction to Computational Forensics and to Document/Image Forensics
2. Historical Aspects in Image Forensics
3. Traditional and Modern Techniques for Image Manipulation
4. Art Authentication
5. Audio Forensics
6. File Carving Techniques
7. Image and Video Phylogeny
8. Pornography and Violence Detection
9. Searching for Suspects through Mugshots and Image attributes
10. Digital Image Forensics
    (a) Fundamental Questions;
    (b) *Passive and Blind Analysis* versus *Watermarking*;
    (c) Taxonomy
        i. Source attribution techniques (model versus specific);
        ii. Identification of synthetic images
        iii. Format-Based Forensics
        iv. Camera-Based Forensics
        v. Pixel-Based Forensics
        vi. Geometric-Based Forensics
        vii. Physics-Based Forensics
        viii. Video Forensics
        ix. Printer Forensics

x. Authentication techniques
xi. Steganalysis

11. Spoofing Detection
12. Cloud Forensics
13. Counter-Forensic Techniques;
14. Open issues and Research Challenges

Webpage

http://www.ic.unicamp.br/~rocha/teaching/2014s2/mo447

Special Students Access to the Laboratories *Graduate students in the "Special Student" category must look for the graduate students secretariat for obtaining the credentials for accessing the laboratories.*

Bibliografia

Most of the course's materials will be in the form of scientific articles. However, some additional material may be found in:

Livros

1. *Adobe Photoshop Forensics – Sleuths, Truths, and Fauxtography.* Cynthia Baron. Thomson. (2008)
2. *Photo Fakery – The History and Techniques of Photographic Deception and Manipulation.* Dino Brugioni. Brassey's. (1999)
3. *Photoshop Artistry.* Barry Haynes, Wendy Crumpler e SeÃ¡n Duggan. New Riders. (2007)
4. *Pattern Classification.* Richard O. Duda, Peter E. Hart e David G. Stork. Willey-Interscience. (2000)
5. *Machine Learning.* Tom Mitchell. McGraw-Hill. (1997)
6. *Pattern Recognition and Machine Learning.* Christopher M. Bishop. Springer. (2006)
7. *Artificial Intelligence – A Modern Approach.* Stuart Russell and Peter Norvig. Pearson. (2010)
8. *Digital Image Processing.* Rafael Gonzalez e Richard Woods. Prentice-Hall. (2007)

Book Chapters and Surveys

1. *Vision of the Unseen: Current Trends and Challenges in Digital Image and Video Forensics.* Anderson Rocha, Walter Scheirer, Terrance E. Boult e Siome Goldenstein. *ACM Computing Surveys (CSUR); v. 43, p. 26:1-26:42 (2011).*
2. *Digital Image Forensics.* Hany Farid. *Technical Report available at: http://www.cs.dartmouth.edu/farid/downloads/tutorials/digitalimageforensics.pdf; 1–199(2013).*
3. *Algorithms, Architectures, and Information Systems Security — Chapter: Overview of State-of-the-art in Digital Image Forensics.* Taha Sencar e Nasir Memon. World Scientific Publishing. (2008)
4. *Multimedia Security Technologies for Digital Rights Management — Chapter: Passive-blind Image Forensics.* Tian-Tsong Ng, Shih-Fu Chang, Ching-Yung Lin e Qibin Sun. Academic Press. (2006)
5. *Atualizações em Informática (2010) — Chapter: CSI: Análise Forense de Documentos Digitais.* Anderson Rocha e Siome Goldenstein. PUC-Rio. (2010)