

# CS355-15 Digital Forensics

**23/24**

**Department**

Computer Science

**Level**

Undergraduate Level 3

**Module leader**

Yu Guan

**Credit value**

15

**Module duration**

10 weeks

**Assessment**

Multiple

**Study location**

University of Warwick main campus, Coventry

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## Description

### Introductory description

In this module, you will learn about the scientific techniques used to collect probative facts from digital data often in relation to cyberphysical crime.

### Module aims

The module will focus on a subfield of digital forensics that involves analysing image and video data for forensic purposes. This subfield (digital image forensics) is getting increasingly important since digital cameras and sophisticated photo editing softwares have become commonplace. Advanced machine learning methods are now capable of generating fake images and videos that can easily fool humans. Image forensic experts develop and use computational techniques to identify photo forgery, detect image sources and collect crime-related evidences from image data.

### Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The module will deal with core concepts and enabling methodologies in multimedia-based digital forensics. It will also examine current applications, and address theoretical and practical challenges. More specifically the syllabus will cover:

- Methodologies and standards for acquisition and processing in digital forensics
- Modalities of device fingerprints
- Extraction and representation of device fingerprints
- Enhancement of device fingerprints
- Source device identification based on device fingerprints
- Content/device linking based on device fingerprints
- Content integrity verification based on device fingerprints
- Source-oriented image/video clustering based on device fingerprints
- Digital content hashing
- Data hiding
- Digital watermarking for copyright protection
- Digital watermarking for content authentication
- Steganography
- Steganalysis
- Counter-forensics and counter-counter-forensics

## **Learning outcomes**

By the end of the module, students should be able to:

- Understand the basics of image and video data acquisition and analysis, and computational methods to detect image or video forgery.
- Identify and/or design a suitable computational technique to establish or revoke authenticity of a given image/video.
- Apply the identified computational techniques to detect authenticity of image and video data.

## **Research element**

The 'Sensor based forensics' section in the syllabus is based on recent research advances on this topic. The students will be reading from research papers instead of textbooks. They will also implement the techniques described in the research paper.

## **Subject specific skills**

Knowledge of types of image forgery  
 State-of-the-art forensics methods  
 Forensics algorithms  
 Forensics practices.

## **Transferable skills**

Programming  
 Knowledge of image and video processing  
 Knowledge of basic probability, linear algebra and transforms  
 Report writing  
 Analytical thinking.

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# Study

## Study time

| Type              | Required                    |
|-------------------|-----------------------------|
| Lectures          | 20 sessions of 1 hour (13%) |
| Practical classes | 9 sessions of 1 hour (6%)   |
| Private study     | 121 hours (81%)             |
| Total             | 150 hours                   |

## Private study description

Studying textbook, lecture notes, other resources provided  
Solving the exercise questions and practice problems, given during the lectures  
Coursework preparation including programming and report preparation.

## Costs

No further costs have been identified for this module.

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## Assessment

You do not need to pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

## Assessment group D4

|   | Weighting | Study time |
|---|-----------|------------|
| Individual practical assignment 1<br>Individual practical assignment. | 15%       |            |
| Individual practical assignment 2<br>Individual practical assignment. | 15%       |            |
| In-person Examination<br>Exam   | 70%       |            |

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- Answerbook Pink (12 page)
- Students may use a calculator

## Assessment group R3

|  | Weighting | Study time |
|--|-----------|------------|
| In-person Examination - Resit<br>resit examination | 100%      |            |

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- Answerbook Pink (12 page)
- Students may use a calculator

## Feedback on assessment

Written feedback on coursework will be provided to the students.

[Past exam papers for CS355](#)

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## Availability

### Pre-requisites

Students must have studied the content of CS131 Mathematics for Computer Scientists II or CS137 Discrete Mathematics II or ES193 Engineering Mathematics or have studied equivalent material.

## Courses

This module is Optional for:

- UCSA-G4G1 Undergraduate Discrete Mathematics
  - Year 3 of G4G1 Discrete Mathematics
  - Year 3 of G4G1 Discrete Mathematics
- Year 3 of UCSA-G4G3 Undergraduate Discrete Mathematics
- Year 4 of UCSA-G4G4 Undergraduate Discrete Mathematics (with Intercalated Year)
- Year 4 of UCSA-G4G2 Undergraduate Discrete Mathematics with Intercalated Year

This module is Option list A for:

- Year 4 of UCSA-G504 MEng Computer Science (with intercalated year)
- UCSA-G500 Undergraduate Computer Science
  - Year 3 of G500 Computer Science
  - Year 3 of G500 Computer Science
- UCSA-G502 Undergraduate Computer Science (with Intercalated Year)
  - Year 4 of G502 Computer Science with Intercalated Year

- Year 4 of G502 Computer Science with Intercalated Year
- UCSA-G503 Undergraduate Computer Science MEng
  - Year 3 of G500 Computer Science
  - Year 3 of G503 Computer Science MEng
  - Year 3 of G503 Computer Science MEng
- USTA-G302 Undergraduate Data Science
  - Year 3 of G302 Data Science
  - Year 3 of G302 Data Science
- Year 3 of USTA-G304 Undergraduate Data Science (MSci)
- Year 4 of USTA-G303 Undergraduate Data Science (with Intercalated Year)