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Dossier "Academic Cyberplagiarism"

Cyber Cheating in an Information Technology Age

Karl O. Jones
School of Engineering
Liverpool John Moores University (UK)
k.o.jones@ljmu.ac.uk

Juliet Reid
School of Psychology
Liverpool John Moores University (UK)
j.m.reid@ljmu.ac.uk

Rebecca Bartlett
School of Engineering
Liverpool John Moores University (UK)
r.bartlett@ljmu.ac.uk

Abstract

Developments in technology have provided new means for students to engage in practices not considered appropriate at university, hence academics need to be more active in the prevention and detection of instances of academic impropriety. As academics we should be aware that scholarship is built on other people's works and ideas. Thus the challenge we have is to help students distinguish between scholarship and cheating. One thing is clear, however, in relation to both coursework and examination. The process of deterring cheating will always be far more effective than the act of detecting the cheating. Additionally the staff time and effort expended in informing students of correct academic practice is significantly lower than that needed to identify and pursue cheating students.

Keywords

academic integrity , academic plagiarism, plagiarism detection services

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Resum

Els desenvolupaments en tecnologia han proporcionat nous mitjans als estudiants per a dur a terme pràctiques que a la universitat no es consideren apropiades, de manera que el professorat ha de ser més actiu en la prevenció i detecció de casos d'impropietat acadèmica. Com a professors, hem de ser conscients que el coneixement es construeix a partir de treballs i idees d'altra gent. Així, el repte que tenim és ajudar els estudiants a distingir entre el coneixement i l'engany. Tanmateix, una cosa és clara amb relació tant als treballs de curs com als exàmens. El procés dissuasiu de fer trampes sempre serà molt més efectiu que l'acte de detecció de les trampes. A més, el temps i els esforços del professorat invertits a informar els estudiants sobre les pràctiques acadèmiques correctes és significativament més baix que el que cal per a identificar i perseguir els estudiants que fan trampes.

Paraules clau

integritat acadèmica, plagi acadèmic, serveis de detecció de plagi

Introduction

All forms of academic impropriety (or cheating) are of growing importance to universities across the world, prompted by mounting evidence that university students engage in academic practices considered unacceptable under university regulations (Jones *et al.,* 2005a). There is considerable belief (Ashworth *et al.,* 1997), and some empirical evidence (McCabe, 2001; Diekhoff *et al.*, 1996), that such cheating is increasing. Self-reported rates of academic impropriety vary somewhat in published studies, however typical estimates are higher than many academics might expect from personal experience. Park (2003) reports data from 6,000 US students, indicating between 63% and 87% (depending on academic discipline) admitted cheating during their college career. In the UK, Franklyn-Stokes *et al.* (1995) reported rates of academic impropriety varied from 54% of students admitting having made up references to 72% admitting to having copied coursework, all much higher than estimated detection rates of 1.3% (Björklund *et al.*, 1999) and approximately 2% from data from the academic faculty of one of the authors.

Universities should be committed to helping their students acquire the skills necessary to support their progression and to achieve their academic potential. Students enter university with a range of academic experiences and thus may not be familiar with the formal protocols of academic writing and referencing. Student's failure to follow these protocols may be considered as plagiarism. Most departments offer advice and information on appropriate referencing and recommend that if students are in doubt about what constitutes plagiarism, cheating or collusion, that they should discuss it with their tutors. Universities also employ a range of methods, including detection services such as Turnitin, to support good academic writing, as well as to identify and discourage plagiarism.

The paper details some of the prevalent practices in academic impropriety in general, before detailing some issues around cheating within an electronic context. A range of methods of identifying instances of academic impropriety are presented along with approaches for discouraging cheating, looking at one online detection service in particular. The paper ends with a discussion on the general issues of academic impropriety, followed by some concluding comments.

1. Levels of academic impropriety

As with many institutions across the world, universities in the United Kingdom publish regulations on assessment, stating practices that are deemed unacceptable. While each university has its own unique criteria, analysis of the regulations shows certain common themes. The most usual unacceptable academic practices are listed in Table 1. Of all the practices of academic impropriety, the one that causes most puzzlement amongst students is plagiarism, with confusion as to what does and does

Table 1. Practices deemed to constitute cheating, taken from Wood (2004)

Plagiarism: A student incorporates another person's or body's work by unacknowledged quotation, paraphrase, imitation or other device in any work submitted for assessment in a way that suggests that it is the student's original work

Collusion: The collaboration without official approval between two or more students (or between student(s) and another person(s)) in the presentation of work which is submitted as the work of a single student; or where a student(s) allows or permits their work to be incorporated in, or represented as, the work of another student.

Falsification: Where the content of any assessed work has been invented or falsely presented by the student as their own work.

Replication: Where a student submits the same or similar piece of work on more than one occasion for assessment to gain academic credit.

Taking **unauthorized notes or devices** into an examination.

Obtaining an **unauthorized copy of an examination paper**.

Communicating, or trying to communicate, with another student **during an examination**.

Being a party to **impersonation** in relation to an examination.

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not constitute plagiarism. Thus, a clear definition of plagiarism is extremely important to have, such as that from the Oxford English Dictionary which states: "To take and use as one's own the thoughts, writings or inventions of another". Some key features of the definition are: (a) it is not just "borrowing" someone else's work, but also "passing it off" as one's own; and (b) it is not limited to textual material, but any "works" including music, art, diagrams, design, software code, and so on. The definition also covers close paraphrasing as well as verbatim copying.

In practice, plagiarism is far easier with the internet as a medium, rather than through printed material, after all operations such as *copy and paste* are far easier from an electronic source than from a book. McCabe (2001) noted "there is evidence that cheating has increased in the last few decades, and the Internet is likely to intensify the problem".

Numerous authors have addressed the concern that the internet presents students with increased opportunities for cheating (eg, Baty, 2000), possibly combined with perceived decreased risk of detection. The seemingly limitless volumes of material available render the source material more difficult to identify, particularly in the absence of good IT skills. In discussing student plagiarism of internet sources, however, Wood (2004) proposes an alternate view – that student experiences with electronic media in particular may lead them to develop attitudes towards the ownership of academic work that are different from established wisdom and at variance with the conventions of academic writing. From this perspective, therefore, copying, or plagiarism, from the internet may not be "cheating" in the eyes of students – the material is seen as being in the public domain and without ownership. Many authors have addressed the varying definitions of plagiarism by different stakeholders in the academic community.

The authors' personal experience of hearing cases of alleged plagiarism and the academic literature suggest that to some extent academic staff and students do not share the same conceptualisations of cheating. The more obvious and extreme forms of academic impropriety will be conceptualised as cheating by staff and students alike. Other unacceptable practices, however, may be regarded by students as not cheating and not particularly serious. Park (2003), for example, reported that students consider cheating on exams to be "blatant" cheating, whereas other forms of academic cheating are viewed as less serious, or "not really" cheating.

2. Methods of undertaking e-cheating

Of concern is the indication (McCabe, 2001) that the ways that students engage in academic impropriety are getting more varied.

Through the web, there exists a wealth of information on a wide range of topics that offers assistance, and at the same time, temptation. Connors (1996) astutely observes that "academics who once praised the internet for giving students more access to information are now worried it is providing students with easy access to pre-written essays". St Omer (2001) reported that 42% of a class had used a website as an information source for an assignment, and that "the majority of students, having accessed information and music regularly, failed to understand that they had appropriated the work of another individual". St Omer also points out that often internet material can be a source of misinformation – something that students rarely take time to reflect on. Certainly, the authors are aware of very few courses which explain to students the difference in provenance between material found in textbooks, journals and the like, compared to web pages, often created by individuals rather than organisations.

The most obvious form of e-cheating is straightforward copying *cut and paste* from the internet or electronic media (such as data CDs or software). Word processing facilitates plagiarism through its *cut and paste* facility, further the electronic storage of work offers the opportunity for various forms of academic impropriety including collusion, replication and falsification. Students can use the internet to purchase or download work from web sites such as *www.schoolsucks.com* or *www.cheathouse.com*, which claim to have thousands of essays and reports for $30, while *www.123helpme.com* offers free essays, but charges for ones it claims are of higher quality.

It is also easier to cheat in examinations today, thanks to technology such as the internet, wireless computers and messaging devices (for example, mobile phones). In addition to telephones with astounding features, technological advances have given us Instant Messaging (IM) in mobile phones, as well as IM-enabled calculators. This presents lecturers with even more reason to be vigilant. The capability of IM allows students to send messages to other students across significant distances. This coupled with the availability of mobile phones equipped with quite sophisticated cameras means that students are provided with the opportunity to easily communicate examination questions and answers, including diagrams.

Portable electronic devices such as mobile phones and personal digital assistants (PDAs) have made unauthorised collaboration simple and hard to detect (Straw, 2000). Instances of malpractice detected in High School examinations in England rose by some 25% between 2004 and 2005, with over 60% of these cases involving mobile phones.[1] The classic ways of cheating such as crib notes and copying from books are still used, however technology is providing more sophisticated ways of cheating. A recent article suggested seven hi-tech gadgets for

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1. Visit: <news.bbc.co.uk/1/hi/education/4848224.stm> [Accessed: November 7 2008].

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cheating (Table 2). The cheating problem becomes even more complex when assessment is performed online, where there is the potential and temptation for students to collaborate and to surf for answers.

Table 2. Seven Hi-Tech Gadgets That Can Help You Cheat at Exams[2]

- **Text Messages - co**ntact people outside the exam room and receive answers very easily.
- **Mobile phones with built-in digital cameras -** photograph test questions, send them to friends outside via MMS and get back the answers in text or image format.
- **MP3 players -** Record notes to yourself, transfer the audio files to the MP3 player and have them play quietly during the exam. In particular, iPods are used to hide lists disguised as song titles and can also display images and videos.
- **SoundBug -** turns any surface into a speaker (www.soundbug.biz).
- **Programmable Calculators -** can hold text, formulas, even pictures.
- **Wireless Earphones and Microphones -** tiny earphones that students stick almost invisibly in their ears and for full communication students also have a tiny microphone.
- **PDAs -** allow information to be beamed across a distance via infrared, Bluetooth or wireless communication, furthermore these devices also have internet access capabilities.
- **Invisible Ink Pens - UV** Ink is invisible to the naked eye, but magically illuminated when exposed to a blacklight which is conveniently located on the opposite end of the pen.

3. Approaches to detection and prevention

While technological developments have provided novel ways for students to cheat, they have also presented academics with ways of catching cheats, from the complicated to the simple (for a list of selected examples of both forms see Table 3). Selingo (2004) reported how 50 engineering students were caught cheating after their submitted spreadsheet files had the properties checked revealing that the same computer created them all. Reisman (2005) suggests that for online examination universities should "lock down the desktops to prevent the installation of IM clients" and block e-mail services. This action has a number of drawbacks. In relation to distance learners, one cannot travel to every student's computer to ensure compliance, while for campus-based examinations it has

no effect on IM devices, such as mobile phones. Furthermore, it does not address wireless computer networks. Currently the only effective solutions would appear either to ban the use of all electronic equipment or to employ jamming techniques. The latter may seem extreme however simply switching off a campus wireless network does not prevent resourceful students from creating their own wireless computer network. Furthermore, one should also consider infra-red communication between devices. Privacy filters used by laptop users to block prying eyes on aircraft are being used to stop cheating in examinations.[3] A number of authors have provided admirable overviews of computer-based

Table 3. Some approaches to detection

- Generally available search engines or metasearch engines (eg, *www.google.com* or *www.metacrawler.com*). Although considered by many as the only tools required, they do have significant drawbacks: they are not foolproof, since students may pick-and-mix their sources; they are time consuming and may take multiple searches; and they are not necessarily accurate. Finally, search engines can only explore a small proportion of the whole web: the content of password protected and database sites remain concealed.
- Collusion detection (www.*copycatchgold*.com) looks for copying across a cohort.
- Analysis of structure and content of document by comparing with a central database (*www.turnitin.com*).
- Writing Style Analysis (www.*plagiarism*.com) is based on individuals having their own writing style.
- Computer program detection (*www.cs.berkeley.edu*) which compares programs within a cohort.
- JPlag is a system that finds similarities among multiple sets of source code files (www.*jplag*.de).
- Moss (Measure Of Software Similarity) is an automatic system for determining the similarity of C, C++, Java, Pascal, Ada, ML, Lisp, or Scheme programs (*http://theory.stanford.edu/~aiken/moss/*).
- The plagiarism finding tool searches for text fragments also available in other documents (*www.docoloc.com*).
- Shared Information Distance or Software Integrity Detection detects similarity between programs by computing the shared information between them (*http://genome.math.uwaterloo.ca/SID/*).
- Services that allow students to contact individuals willing to create custom personalized assignments for a fee include:
  – Rent a coder – for computer programs (*www.rentacoder.com*).
  – Student of fortune – for any domain (*www.studentoffortune.com*).

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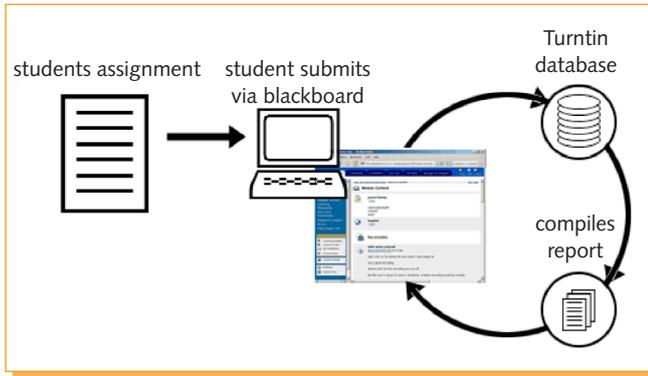
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Figure 1 How the Turnitin system works (taken from *www.ljmu.ac.uk*)

plagiarism detection systems, including Clough,(2000), Culwin *et al.* (2000), and Lukashenko *et al.* (2007).

The internet is not only a resource for cheating students: academics can exploit its potential for detection. Powerful search tools and specialised detection services that allow keyword or phrase searching across millions of documents enable academics to target suspect assignments. Furthermore, the proliferation of identical material on the web provides a greater opportunity to locate copied material: one does not necessarily have to identify the source the student used, evidence that it is not original work is sufficient proof.

An important point is the need for emphasis on prevention rather than detection. The amount of time academics spend producing learning materials needs to be replicated in developing an assessment strategy that minimises the opportunity for cheating. When creating assignments, academics need to be fully aware of electronic resources available to students and structure the assignment to allow students the opportunity to locate, retrieve and interpret information rather than requiring regurgitating the

material. Assignments that require higher order thinking skills are less likely to encourage cheating.

3.1. The Turnitin service

The Turnitin system[4] is probably the global leader in electronic plagiarism detection. Developed by iParadigms LLC,[5] Turnitin offers one approach to the growing problem of *cut and paste* plagiarism.

Student assignments submitted to Turnitin are compared against billions of internet documents, an archived copy of the internet, a local database of submitted student work and a database of some periodicals, journals, and online publications, such as Emerald Publishing (Figure 1).

For each document submitted to Turnitin, an originality report is generated to estimate the percentage of matches between that document and the previous list of sources (Figure 2), where the software looks for matches of strings of eight to ten words (Suri, 2007). While this source list seems exhaustive, work by Kaner *et al.* (2008) suggests that there are some major omissions such as the IEEEXplore[6] and ACM[7] databases of conference and journal papers, which is of particular concern for engineering and computing academics.

3.1.1. Practical issues in using Turnitin

Although widely used, Turnitin does have some issues in its application. Within Turnitin a filtering system can exclude low percentage reports allowing the academic to concentrate on checking documents with a higher similarity score. The percentage reported cannot be used as a measure of plagiarism, since Turnitin only indicates the level of matched text. Two obvious issues with this purely matching ability are reference lists used in the work and correctly quoted material, although the software does provide

Figure 2. Turnitin originality report (listing student name and % matched text)

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(a) Original reported level of matched material (9%)

(b) Reported level after excluding bibliography (2%)

(c) Reported level after excluding both bibliography and quoted material (1%)

Figure 3. Using the "exclude" facility

links to exclude these items. Figure 3 illustrates an example of a document that had a reported level of matched text of 9%, which after selecting the "exclude bibliography" reduces to 2% and eventually becomes a level of 1% when quoted material is excluded. A significant drawback for efficient use is that these actions have to be performed by the user and currently cannot be automated.

It would appear that there are some problems with the text matching algorithm. One of the authors' use of Turnitin (Jones, 2008) has revealed occasions where text highlighted can be considered as innocent. The first instance relates to a number of students within a class including the question within their answer. This is clearly not plagiarism and is also not something that the software can identify at the moment – the ability to include the question as part of the comparison documents but for exclusion purposes would alleviate this problem. The next problem is the identification of phrases that might be called *common language* with respect to the topic of the assignment, such as those shown in Table 4 that have come from recent student work that Turnitin has processed. For example, an essay on Evolutionary Computation is highly likely to have statement 1, although most academics would not expect such a phrase to be referenced.

Table 4. Illustrations of "common language matching"

> 1) "based on Darwin's Theory of Evolution"
> 2) "European Union Common Agricultural Policy"
> 3) "Technology has the potential to cause harm in the wrong hands"

Another area of concern is the matching of parts of phrases. Table 5 provides a selection of such phrases found in student assignments. The matched text increases the percentage level reported, however the relationship between the amount of bold

Table 5. Illustrations of "noise matching"

> 1) "**The potential** benefits from **AI technology to society are** unlimited as **the** utilization **of**"
> 2) "**find the shortest path** between **their nest** and **a food source**"
> 3) "**accuracy of** the **model parameters, the** algorithm **determines**"
>
> *Matched text is highlighted in bold, while words within the phrase that are not an identical match are left as normal font.*

text versus the non-bold text is cause for concern since the small groups of words highlighted can hardly be considered plagiarism. It is suggested that this is more a case of "noise" interfering with the matching process.

Overall Turnitin is a very valuable tool in the fight against academic impropriety; however it is not quite the automatic tool it first seems. To correctly identify instances of plagiarism, academics must spend a little time to ascertain whether matched text falls into any of the categories mentioned above. Only after this manual intervention can the true level of plagiarism be determined. In the early stages of use, it is recommended that academics concentrate their time and efforts on the extremely high levels of matched material. By doing this, one can be certain of identifying the major instances of similar text. It is important to remember that just because Turnitin identifies student work as having a certain percentage of matching text, it is not by itself evidence of plagiarism. It is up to the academic to carefully examine the material and view sources of matched text and make a judgment on the applicability of the reported matching. Academics must also be aware that if students submit both paper and electronic copies of their work, then a sample of the electronic submissions

should be compared against the paper versions to ensure that students are not attempting to present innocuous documents for use by Turnitin.

4. Discussion

If a university determines that significant proportions of students are engaged in inappropriate academic practices, there will clearly be an onus for the university to do something to address that. Hence, the university might strengthen efforts to detect such practices and/or increase the penalties levied on those who are detected. In relation to the latter, it is not an unreasonable proposition that students who engage in deception in academic work might also do so in other arenas. Certainly students themselves believe that those who cheat in academia are more likely to cheat in other contexts. Morgan *et al.* (1992), in a survey of 149 undergraduates in the US, for example, found that 87% of students thought that those who "routinely" cheat in education will repeat such behaviour in the workplace. The most common reason cited for this was simply habit. Were such beliefs to be substantiated, the implications for courses such as Computing, Engineering and Psychology would be great because the first degree opens up pathways for subsequent professional qualification.

It is often suggested that one way to address the rising incidence of academic impropriety amongst students is to undertake assessment by examination only. The results presented by Jones *et al.* (2005) suggest that this may not be the answer to the problem. Whilst self-reported rates of academic impropriety in this context are low in the UK data, the figures are much higher for the Bulgaria data, where assessment is more heavily dependent on examination. It may simply be that where marks go, student attention follows. This notwithstanding, the Bulgaria data indicate that students may benefit from tuition regarding acceptable practices in examined work. "Cheating" is unacceptable irrespective of an individual student's opinion regarding specific activities but increased awareness and a shared understanding of what is thought appropriate are desirable.

In relation to Turnitin, Sunderland-Smith *et al.* (2005) found that academics expected that "the software would highlight passages of text and identify those passages as plagiarised". It must be made clear that Turnitin should not really be considered a plagiarism detection system, it is merely a text matching system. Furthermore, Sunderland-Smith *et al.* state that academics "expected they would need very little input in identification of plagiarism". It is still the role of the academic to review the reports to determine if plagiarism has actually occurred, because Turnitin does not differentiate between correctly cited references and unacknowledged copying. Also one must be aware that there is a difference between incorrect referencing (for example through student inexperience) and intentional plagiarism, this judgement

can only really be made by a human and not by software. Across universities, academics have reported broad support for the use of Turnitin although they have expressed reservations about its capacity and its complexity of use.

5. Closing comments

Plagiarism is alive and well on campuses and in cyberspace. Nevertheless, academics should take some solace in the fact that while the internet is a useful resource for plagiarists, it is also an excellent tool to use against them. The range of academic impropriety is limited only by students' imagination and their ability to utilise technological advances. Fundamentally, universities need to create a climate that discourages academic impropriety, while students need to take responsibility for honest behaviour. For anyone who is not concerned about instances of academic impropriety, Ryan provides an interesting statement:

> Often lost in the discussion of plagiarism is the interest of the students who don't cheat. They do legitimate research and write their own papers. They work harder (and learn more) than the plagiarists, yet their grades may suffer when their papers are judged and graded against papers that are superior but stolen material. Students have a right to expect fairness in the classroom. When teachers turn a blind eye to plagiarism, it undermines that right and denigrates grades, degrees and even institutions. (Ryan, 1998)

The problem of students cheating during their degree is not going to go away. It is obvious that it will continue to increase. Of more concern to universities is the growing interest of sources outside education; for example commerce and industry are becoming aware of the significant levels of cheating and thus the possibility that graduates they employ have a degree that might be of less value than in previous years (Gulli *et al.* 2007).

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Karl O. Jones, Juliet Reid and Rebecca Bartlett

UOC

Karl O. Jones
Principal Lecturer in the School of Engineering at Liverpool John Moores University (UK)
k.o.jones@ljmu.ac.uk

Karl Jones is employed at Liverpool John Moores University (UK) as a Principal Lecturer in the School of Engineering. Karl was awarded a PhD in Fermentation Control (1995) from Liverpool John Moores University (UK) having previously gained a BEng (Hons) in Electrical and Electronic Engineering from Liverpool Polytechnic (1988). He obtained a Postgraduate Certificate in Teaching and Learning in Higher Education (2000) from Liverpool John Moores University. Karl's teaching interests include Artificial Intelligence; Engineering, Law and Ethics, and Computer Animation. He has been involved in a number of European Union funded projects on computer engineering education and is presently on the Management Team of the Thematic Network TRICE- ETN Teaching, Research, Innovation in Computing Education. He is a Chartered Engineer, on the Council of the Institute of Measurement and Control, a member of the IFAC Technical Committee on Automation, Mineral, Mining and Metal Processing, a Fellow of the Higher Education Academy and an experienced External Examiner.

Juliet Reid
Principal Lecturer in Psychology at Liverpool John Moores University (UK)
j.m.reid@ljmu.ac.uk

Juliet Reid is currently a Principal Lecturer in Psychology at Liverpool John Moores University (UK). Juliet holds a PhD in Psychology (2000) from the University of Exeter (UK), a Postgraduate Diploma in Management Applications of Psychology from the University of Wolverhampton (UK) and a BA (Hons) Psychology from the University of Sheffield (UK). She lectures mainly on the MSc Occupational Psychology programme, but also teaches Occupational Psychology and Psychometrics at Undergraduate Level. She is also actively involved in the work of the British Psychological Society, being Chief Examiner for the Board of Assessors in Occupational Psychology and a member and past Chair of the Division of Occupational Psychology Training Committee.

Rebecca Bartlett
Lecturer in the School of Engineering at Liverpool John Moores University (UK)
r.bartlett@ljmu.ac.uk

Rebecca Bartlett is currently Principal Lecturer in the School of Engineering at Liverpool John Moores University (UK). She holds a PhD in Image Analysis for Tribology (1998) from the University of Manchester and a Postgraduate Certificate in Teaching and Learning in Higher Education (1998) from Liverpool John Moores University. She is a Chartered Physicist and a Fellow of the Higher Education Academy. She currently lectures in Digital Image Processing and specialises in foundation programmes for engineering. She is responsible for managing the quality assurance processes within the School, and has been involved in a number of European Union projects concerning optical sensing for the water industry and computer engineering education, presently participating in the thematic network TRICE- ETN Teaching, Research, Innovation in Computing Education.

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