

## WIK

In 2016, Newton and Lang in the Springer Handbook for Academic Integrity book chapter reviewed the legality of contract cheating services. There are vast differences in the legal status of such companies. In New Zealand, advertising or providing an assistance on cheating by a third party is not legal. Older similar laws were adopted in 17 states in the US. The New Zealand law inspired Australia to propose a similar law at the federal level. Legal approach to tackle contract cheating was also pursued by the report of the Quality Assurance Agency in the United Kingdom.

## IJEI

There are numerous studies about plagiarism, ghost writing, contract cheating, as well as the incentives of students to breach academic integrity. Specifically the extent of contract cheating has been a topic of many recent publications. Clarke and Lancaster (2006) researched a site RentACoder with programming solutions contracted both for educational fraud and for legitimate use cases. They found out that more than 12% posts intended some form of cheating. Evaluation of the number of postings and their attributes at one of the contract cheating sites was a topic for the same authors. Lancaster and Clarke (2012) identified an increase in the number of postings asking for such services.

## ICAI

Lesson three – We Must Do Something With Contract Cheating.

The contract cheating sector poses maybe a largest shared fight for us in these days. There is no doubt that student learning and the integrity of our educational institutions is undermined by contract cheating, but presentations by Cath Ellis, David House & Kane Murdoch (of University of New South Wales, Sydney Australia), Thomas Lancaster (of Imperial College London), and Douglas Harrison (of UMUC) reminded us also the dangers for our students. They are constantly tricked and seduced into the world of contract cheating, which steals their education, identities, threatens them by extortion.

## ARX

API invocation sequences were proposed as another related approach to programmers who are looking for a target object beginning with a different object. To get appropriate code fragments from the web, they rely on code search engines. Then they statically analyze snippets of code in order to identify the sequences of method invocation. Another paper presents a novel approach for programmer to assists by suggesting him/her the code snippets. The way how a given programming context should include an API is suggested to a programmer. "Context-Aware IDE-Based Meta Search Engine for Recommendation is proposed about Programming Errors and Exceptions".

## BELA

Established retrieval methods help us to find similar text. For a candidate retrieval stage, we adapted a Sherlock tool and employed a text fingerprinting method. This method chinks a text into a 3-word sequences and computes a digital signature of the input text from probabilistically selected subset of these chunks for. The chunks are retained with the mean probability of 1/16. The users can choose between full string matching and the Encoplot algorithm in the detailed comparison stage. All strings (including repetitions) are matched by an adapted the Boyer-Moore algorithm, which finds 12 or more identical words. Grozea developed the Encoplot as an efficient character 16-gram comparison method with linear time complexity achieved by ignoring repeated matches.

## WIK

According to QAA, the activities and customers of such services can be seen as 'false representation' and 'failure to disclose information', which allows for using existing fraud laws might be used. The terms and conditions used by contract cheating companies were compared to the UK Fraud laws in a subsequent research project. This project concluded that the disclaimers, terms and conditions generally state that any custom written products should be used only as 'study guides' or 'revision

aids'. In this case, the responsibility is placed onto the student client and the companies would be unlikely to fall foul of Fraud law.

#### IJEI

The studies examining percentages of cheating students are also relevant for this paper. Donald McCabe (2005), in a large North American survey, found that students reported cheating on written assignments by turning in work done by another person in 7% of undergraduate and 3% of graduate ones. In 2004, Australian studies revealed that 1.1% of students surveyed admitted to contract cheating, whereas in 2009 the number increased to 3.5%. In Iran, Zafarghandi et al. (2012) surveyed students to find out that 7.9% of them were engaged in contract cheating.

#### ICAI

We should be equipped with appropriate tools, policies and procedures to identify and respond to the threat of contract cheating. We should also redesign our approach to teaching and learning and reconsider the admissions and graduation decisions and the measures which should be used as their bases. The third Wednesday of October each year is the international day of action against contract cheating. It is a good start for responding to the threat – as the conference presentation of me and Evangeline Mourelatos of Deree, American College of Greece encourages more institutions to participate in the 4th day of action on October 16th 2019.

#### ARX

The keywords from a programming context in an IDE were used in an Eclipse plug-in that uses the APIs of popular web search engines (viz. Google, Yahoo, Bing). They consider the context of the code as well as popularity of the candidate search results to determine relevant results. Possible links or relatedness among pieces of a software development project can be discovered by analyzing the projects artifact repositories, as shown in some works. Suggestion of code samples or relevant Q&A Discussions is a primary intention of most the above-highlighted works.

#### BELA

A backend server application together with a web-based fronted application form the HyPlag prototype, which is loosely coupled to a REST web service interface. We used Java's Spring Boot framework to realize the backend. The content features are stored mainly in an Elasticsearch index. We integrated the GROBID2 and ParsCit3 parsers, which extracts text, header metadata, citations, and references from PDF. The outputs of both parsers are combined to increase precision and recall of the extraction. MathML4 is used to represent and process mathematical content in HyPlag. To convert PDF that include mathematical content to TeX, HyPlag uses InftyReader5.

#### WIK

The share of guilt of these companies stemming from inappropriate use of the products was shown by several media stories. A Lithuanian analysis showed that contract cheating services were unlikely to violate existing laws, whereas an Australian analysis concluded contract cheating may be targeted via fraud, forgery and conspiracy. New legal approaches to tackle contract cheating were pleaded by these three studies. In Canada, contract cheating is legal. A new law, based on the principle of strict liability, was proposed by a follow-up research study. The strict liability lessens the requirement for prosecutors.

#### IJEI

In 2013, the first economic investigation of assignment market was conducted at 3 UK universities. Researchers asked 90 students using a hypothetical discrete choice experiment to examine their behavior. A willingness to buy an essay was found that half of the students. For a 1<sup>st</sup> grade assignment, some of the students would not hesitate to pay up to \$445. Crowd-sourcing (crowd working market) was examined by an earlier study, which found that providing their work for

assistance on exams or homework assignments without additional incentive was acceptable for 79.0% of crowd workers. When additional incentives were offered, this number increased to 81.4%.

#### ICAI

Lesson #4 – Great work is being done.

Seeing the diverse and fantastic efforts making cheating the exception and integrity the norm done by professionals and students around the globe is the jewel of the conference. Those who are spending their time to proactively educate our students about academic integrity taught us. We learned from two Canadian institutions (Ryerson University and Sheridan College) about through integrity tutorials, from Aldelphi University (USA) that honesty awareness weeks, or from Ukrainian Secondary Schools how to implement new academic integrity courses.

#### ARX

The main focus is to use different sources to leveraging code snippets (or discussions about code) in order to assist a programmer in writing the code. Secondly, the relevant code/content from various sources such as the Web is picked by standard information retrieval (IR) techniques in most of the existing works. For instance, the text mining techniques based on term frequency-inverse document frequency, using APIs of existing search engines to fetch relevant content. Specifically, the reviews are analyzed for sentiment in the area of code review, parameters affecting code review are studies, and review process is semi-automated.

#### BELA

There are two main views presenting the results of the combined detection approach in the user interface of HyPlag: Figure 2 shows the Results Overview and Figure 3 shows the Detailed Comparison View. The users are allowed to upload and manage files via a dashboard area that also allows to configure, start and track analyses. The principle of the analysis views is explained on an example of a retracted journal article from bioengineering. According to the retraction note, the journal retracted the article, because a three-page mathematical analysis without attribution from a paper by Freeman et al. was reused. We compared the retracted article using HyPlag not only with the source indicated in the retraction note but also with other publications by source paper's first author – Freeman.

#### WIK

The intend to help students to cheat does not have to be proven by prosecutors. Instead, just simple offering services that could be reasonably interpreted as being used for contract cheating, make the companies are liable for prosecution. Existing laws have limitations, which make the prosecution of contract cheating companies rare; The he apparent potential of a legal change pose a challenge to contract cheating companies. Additionally, the demand for contract cheating would not be reduced simply by putting these services out of the law. There should be a holistic, multi-pronged approach to tackling contract cheating, as called by the above-mentioned research studies.

#### IJEI

The reasons given by the students for engaging in contract cheating were also addressed by many researchers. At Melbourne University, Devlin and Gray (2007) identified eight main motivators by conducting focus groups with students. These reasons are: Inadequate criteria for admission, insufficient understanding of plagiarism, insufficient academic skills, teaching/learning problems, laziness/convenience, pride in plagiarizing, pressures, education costs. Gullifer and Tyson (2010) provided another list of students' reasons for plagiarism: poor time management (lack of time to complete tasks), perceived disjuncture between required effort and received grade, pressure to do well, too much work to complete over too many subjects.

#### ICAI

Azalea Hulbert (West Virginia University, USA), the Emory Integrity Project (Emory University, USA), and the University of Monterrey (Mexico) have done lot of work on integrity culture creation and they speak about it. Our responses to integrity violations should be improved, which we learned from the talk about implementing restorative practices in academic integrity processes, given by the folks at MacEwan University (Canada). The team at the College of William & Mary (USA) want to enhance student success and retention after suspension, and shared their new mentoring program with this goal. Adriana Barberena (University of Monterrey, Mexico) conducts her research on what students learn through the process.

#### ARX

Other works propose a tool which statically analyzes the code to automate the code review process, which is different approach from our work, as just the comments of three OSS are reviewed and characterized on the basis of their sentiment. Various (semi-) automated tools of code reviews available for use are described in detail but concerning specifically to security aspect of the software. The performance of these tools depends on code quality; the tools are based on static analysis. The work presented in this paper, however, aims mainly to provide an assistance in reviewing a given fragment of source code.

#### BELA

In Figure 2, for the example, the match views show the similarity of text (left), mathematical content (right), and citations (middle) in the retracted article by two papers by Freeman et al. and Xu et al. The source paper named in the retraction note is represented in the upper result summary. The retracted article is moderately similar to both comparison documents, particularly in the introduction, as indicated by the match views for text. The overlap in keywords and general scientific phrases causes this similarity and for either of the two comparison documents, it likely would not have caused suspicion. However, a clearly suspicious similarity that should prompt a user to detailed review the documents, can be revealed by the match view for mathematical content (right) in the upper result summary.