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NETSEARCH: Demystifying the research process of a student during their research project

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Abstract

Conducting research is a difficult task. Learners, typically with little domain competence, are faced with many challenges when commencing a research project, from choosing a topic, to constructing effective search queries implemented across multiple academic repositories. The 21st century learner is also expected to use technology as a tool; to research, systematise, evaluate, and communicate information effectively and seamlessly, in addition to knowledge creation. This multiplicity of demands creates a complicated tapestry of challenges for both supervisors of projects and students alike. Tools like TurnItIn, which is a plagiarism detection service, attempt to dissuade students from merely being passive researchers and move them to becoming active researchers. However, these tools work only at a surface level and a supervisor is completely unaware of the processes used to garner research articles, be this in a structured research approach or merely obtaining a bibliography list for a classmate.

This paper presents an innovative research platform, NETSEARCH, which is designed to address the challenges of conducting and managing research projects in a single platform. The learners' effective engagement with research papers is visualised through a digital ecosystem to identify learners who are struggling or disengaged with the process of conducting research, enabling early intervention, and to eliminate the possibility of plagiarism through the digitisation of the research process.

Keywords

Research, Student engagement, Ecosystem, Plagiarism

1. 21st Century Challenges with learners conducting research

Plagiarism has always been an issue in academic endeavours, were students are typically trying to gain an unfair advantage in an assignment or examination by using work completed by other people. This can have a severe impact on the learners' academic career and may lead to expulsion. There are many tasks that fall under this umbrella. For the purposes of the paper we will consider the tactics typically associated with learners unethically conducting research in a higher education setting. These are:

- *Citation sharing*: this usually occurs when two students simply swap their citations to increase the amount of citations that they have when submitting their work
- *Citation spoofing*: this is when a student adds citations to their bibliography to increase the count of citations / masquerade their paper as a more in depth examination of a topic by including papers that are published in top tier journals. Typically the learner has not read or even accessed the paper
- *Plagiarism*: this is the process of copying part or a complete document and portraying it as the learners' own work to gain a competitive advantage

The environmental contexts of the learning environment where the research is taking place has migrated to an open forum of easy access to published and unpublished work for most domains. Learners are freely using websites to purchase assignments or article spinning software to “*spin*” the content in a battle against current defenses used by academics. While there are many strategies when spinning content, the goal is to change the original article by replacing words to help reduce the similarity index that is primarily used by plagiarism detection software, like TurnItIn. This has sparked an integrity war of text matching versus article spinning.

Unfortunately, the vast and ever expanding amount of digital resources available and the increase of software techniques to aid in the learners' attempts to “*beat the system*” have catapulted the academic ecosystem into chaos. Lecturers are

spending an increasing amount of time being the guardians of academic integrity. If we consider the three approaches that learners are engaging with: citation spoofing, citation sharing and plagiarism, then it is extremely difficult for a lecturer to determine if a learner simply has not accessed or read a paper. Under interrogation the student simply states, “*I can't remember*”. Unfortunately, these activities require huge amounts of time to participate in and they are typically not recognised or quantified as part of a typical role within an academic institute. There is a need for technology to bridge the gap between supervisor and student and act as a nuclear weapon in the plagiarism war. NETSEARCH was designed as this weapon with the following goals:

- automatically visualise the learners’ level of effective engagement with the literature for early intervention
- provide a search engine that takes into consideration how a community of learners perceive academic papers
- eliminate the possibility of plagiarism from research projects
- eliminate citation sharing and citation spoofing
- create an ecosystem to ensure transparency for the supervision approach and the digital process that was followed by the student

The following section describes the NETSEARCH platform.

2. Introducing the NETSEARCH Platform

NETSEARCH provides a two strand platform, with one strand associated with a student and the second with the supervisor of that student. The following subsections provide more detail on the main features of the NETSEARCH platform.

2.1. Project Management

NETSEARCH provides a simple interface to allow students to manage their projects. When a student creates a project, they are required to invite a supervisor to manage the process. The platform provides functionality to ensure that there is transparency between the student and the supervisor.

2.2. Search Engine Management

NETSEARCH provides a simple interface to allow students to conduct a federated search across many academic repositories. NETSEARCH takes into consideration how other students using the same search terms have interpreted papers and uses this wisdom of crowd analysis to optimise search results. The platform guides a learner through a four step process to evaluate each of the papers returned from a search. The steps are as follows – 1): Describe the papers abstract using keywords, 2): Access the full paper and read it, 3): Rate the relevance of the paper against the used search terms, and, 4): Complete and submit a review of the paper.

2.3. Project Progress Overview

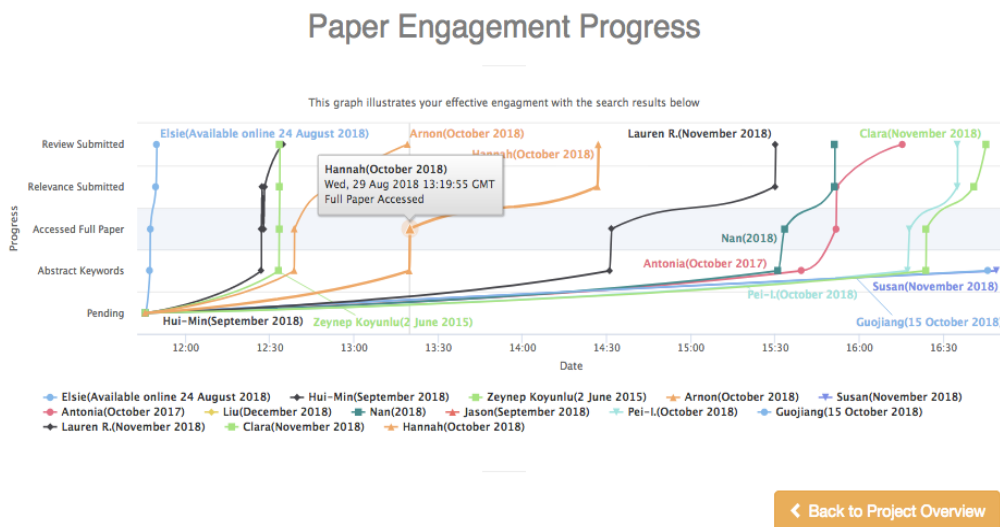


Figure 1: Illustration of the learners' effective engagement with research papers

NETSEARCH tracks a learner’s engagement to maximise their efforts and ensure that work is progressing. Visuals are provided to highlight the research approach that is being followed, as shown in Figure 1. In Figure 1 the four step process is presented for each paper returned for an individual search. This allows a supervisor to quickly and easily see student interactions with each paper and how long the process is taking. If the four steps are completed in a short time frame (documented with an almost straight vertical line) a supervisor can see that a student is not engaging with that paper.

2.4. Management of Tasks

Research projects are constructed from many smaller tasks. NETSEARCH provides a simple interface for managing tasks. Tasks are dynamically added through various engagements within the system including meeting minutes between the supervisor and the student, tasks associated with submitted reviews and papers a supervisor recommends to a student. There is also a task management feature to track the engagement of the supervisor.

2.5. Version Control of Minutes of Meetings

Image analysis of user response from the UniDoodle student response system

Date of Meeting	Latest Update	Options	Status
2018-10-23	2018-10-23	View	open
2018-10-05	2018-10-23	View	closed
2018-10-16	2018-10-16	View	closed
2018-10-09	2018-10-11	View	closed

ATTENDEES : aidan.mooney@mu.ie (AI), amy.thompson.2016@mumail.ie (AM)
 MINUTES SUBMITTED : 2018-10-10 11:35:48, by amy.thompson.2016@mumail.ie (AM)

The minutes have been completed

The possible Venn Diagram answers were discussed and a plan to make them in paint with the template from Seamus and put in a database was decided. Languages for the project were discussed and a decision to go with JavaIMAJ was decided.

ACTIONS
 There are no actions listed for this meeting

Figure 2: An illustration of a sample minutes archive for a project

NETSEARCH includes a version control system for conducting and capturing the minutes of various meetings. Only members of the application can be logged as attending the meeting and all attendees have the right to modify the minutes. A sample set of minutes from a project can be seen in Figure 2 with the minutes from the selected meeting shown. It can be seen that each record of a meeting is displayed on the left panel and the actual minutes are seen on the right. All actions contained within the interface are synced with the task management system.

2.6. Automatic Generation of a Literature Review

When using NETSEARCH, a student submits reviews for papers that they have evaluated. The system allows for the automatic construction of a literature review document using reviews submitted using the standard APA style. Here, the user can select to include papers they have deemed a “perfect” fit to their project and/or ones that they feel were “useful” to their project. The literature review is outputted in word format.

2.7. Learning Ecosystem

It can be challenging to monitor the progress of a single student conducting research. However, when a supervisor is required to supervise multiple students a comparison across all students is impossible. NETSEARCH addresses this challenge by creating suitable visuals using particle spring graphs to show the amount of reviews conducted by the entire student population, an evaluation of the papers, an overview of the students’ progress and the number of connections a paper has. As the visual is a spring graph, as seen in Figure 3, clustering becomes highly visible, which can identify citation sharing, plagiarism, and students who are completely disconnected with the research process.

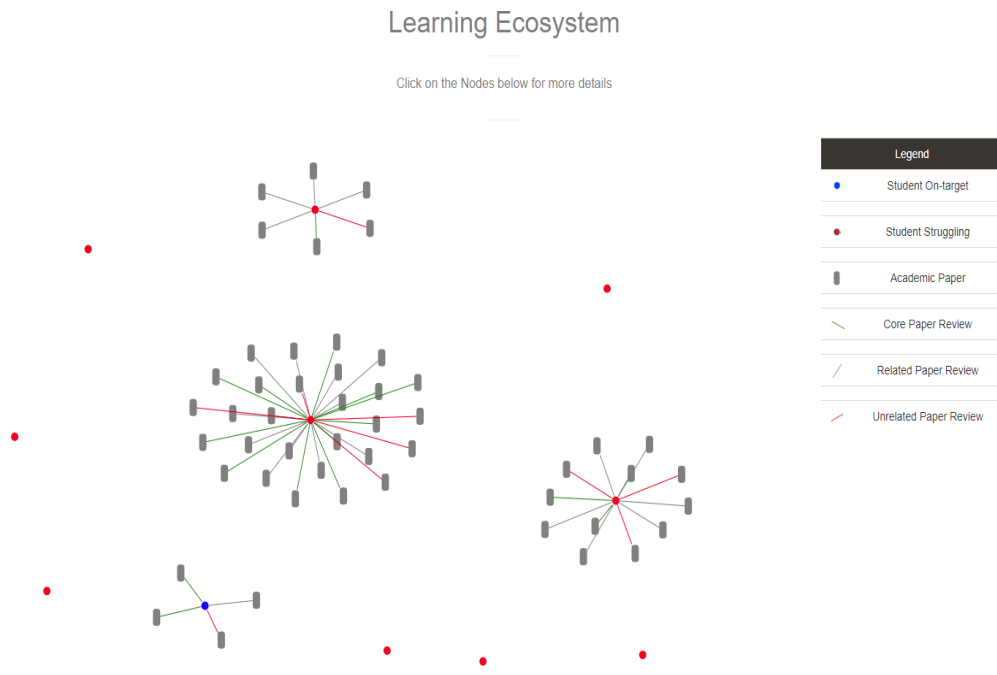


Figure 3: NETSEARCH Learning Ecosystem

NETSEARCH automatically detects how the students are progressing. In Figure 3, the circle nodes represent students conducting research. The system colours these nodes based on the research process being followed by the learner and how well they are progressing. Blue nodes indicate that the learner is progressing fine, while a red indicates that the learner needs an intervention to aid in the evolution of their research. The learner nodes are connected to papers that they have reviewed and the colour of the connection indicates the learners' categorisation of the paper as either a core relevant paper, related paper for their research or an unrelated paper. NETSEARCH allows easy access to all reviews submitted and an evaluation of the global ecosystem interacting with the papers identified by the global community by simply clicking on the nodes on the graph.

2.8. Automatically generating digital reports to encapsulate the research process followed by both student and supervisor

A supervisor can generate digital reports at any stage throughout the process, which can facilitate in conducting meetings with students. There are three types of reports that NETSEARCH can create. The first type is a report focused on reviews submitted. This report provides a detailed analysis of the process taken by the student when completing the review. The second type is a report focusing on the progress of a student. This report gives a detailed breakdown of the complete process followed by the student, including how the student reacted when a supervisor recommended a paper, task completion rates, and paper engagement rates. The third report type focuses on supervisor engagement and highlights the number of meetings held, tasks assigned and papers recommended throughout the process. As these reports can be created at any stage throughout the process it provides a platform to ensure that there is transparency between the supervisor and student for the approach followed.

3. Conclusions and Future Work

In this paper we present NETSEARCH, a platform for conducting and managing research. This platform allows students to conduct federated searches across academic repositories and retain the results in a centralised location. The returned papers can be analysed at the student's convenience using the presented four step approach. The platform will allow students to reflect on all submitted reviews, log all meetings with their supervisor and interact with tasks assigned by the supervisor.

The supervisor can monitor the effective performance of students in their individual projects as well as the general population through a learning ecosystem in real time. By digitising the process the NETSEARCH is not relying on text matching to detect plagiarism removing the students ability to utilise article spinning software. There are many features to ensure transparency at every stage of the research process to ensure that suitable interventions can be put in place. NETSEARCH aims to demystify the process of carrying out literature reviews and student interactions with a

project and is designed to equip supervisors with the tools necessary to guide students in the 21st century.