

# Developing Curriculum Analytics and Student Social Networking for Graduate Employability Model

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## ABSTRACT

This research focuses on developing graduate employability among university students. The ability to find a graduate position became one of the key tertiary education goals for enrolled students. However, there are lots of factors that affect graduate employability. At the same time, students could be unaware of employability complexity, and their choices may be made blindly. I aim to create a graduate employability model that will help to build a learning path and strategy to the desired career. I am using curriculum profiling, and student performance data to model skills and abilities students develop in their subjects. Besides, I am building a student social network model to analyse students' interactions and ties. Ultimately, my research aims to predict graduate employment and recommend options for better student choices.

## Keywords

Graduate employability, curriculum analytics, network analysis

## 1. INTRODUCTION

Graduate employability became one of the key indicators of university performance. Despite the desire to be standalone institutes and the fact that university education is much broader than simple skill training, universities accepted employability development as one of the goals for tertiary education to satisfy student and industry needs. For instance, graduate attributes, derived from professional industry requirements, are injected into the curriculum, and work-integrated learning became a part of the learning process, aimed at providing work-related experience to students. However, after completing the course, students are not equally employable; one of them find a relevant position upon graduation, while others are stuck without any job offers. What makes one graduate more employable than another?

Literature reveals different factors that affect graduate em-

ployability [1, 8]. They can be aggregated as social, human, behavioural and environmental factors [4]. Social factors define the position of a graduate person in society. As the result, attending a better university, having a large network, belonging to certain social classes will benefit employability chances. In addition, human factors describe personal traits a person have. So, skills developed during the learning course and previous work experience will improve graduate's employability in comparison with another graduate, who is missing these abilities and practice [5]. Furthermore, behavioural factors combine one's attitude toward successful employability [3]. For example, being an active job seeker and dedicated participant of career-related events and workshops makes a difference with a passive waiting for a good position on market demand. Finally, environmental factors are not related to a graduate, but the market situation in general [8]. Economics recession has a negative impact on employability in general, without regards to any personal factors. However, mentioned facets of graduate employability relatively objective and can be analysed by data-driven approaches [2]. There is another, subjective, dimension of perceived employability, which effects chances to be employed based on individual self-evaluation and believes [8].

In my research, I aim to create a student or graduate employability model. However, I understand the complexity of all factors. Moreover, the nature of some factors, such as the economic situation, cannot be altered on a graduate or even university level, falling into the mercy of global processes. Thus, I decided to focus on skills and competences as human factors, and student networks as social factors for my research.

## 2. GRADUATE EMPLOYABILITY MODEL

In my research, I focus on creating a graduate employability model and investigating the effect of skills, developed by students at university, and student social networks, build through various subjects and courses, on employability after graduation.

### 2.1 Developing skills through the degree

Students are required to undertake a number of credit points to obtain the degree, which is done by completing multiple subjects. At the same time students are developing their skills and abilities, going through various tasks, assignments and group activities. Knowledge and skill development are integrated into the curriculum and it makes curriculum the source for skill data mining. While curriculum data shows

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quantitative skill outcomes, students performance will be used for quality research. Clearly, students with in-depth, comprehensive approach will benefit more from the subjects in comparison with effortless students. Implementing these aspects of skill development is part of my project.

### 2.1.1 Current work

Recently, I created a curriculum profile for the university. Curriculum profile is a hierarchical data structure with skills as the basis nodes, which are aggregated into larger nodes, such as subjects, courses, degrees, faculties or the whole university. Course coordinators benefit from curriculum profile by visualising course outcomes and comparing intended expectations with reality. Students will be able to make more rational choices selecting from the various subjects and navigate their degree with more predictable results.

The curriculum profile is build using off-the-shelf ontology and automated data curriculum data collection. However, the idea behind curriculum profiling requires modular structure with replaceable components. Thus, any ontology that works according to aligned rules can be used as a data source for the curriculum profile via application programming interfaces (APIs).

### 2.1.2 Future work

Firstly, current curriculum profile is working for one university and has only two modes: the whole university and three selected data science courses. Future development will include all courses from the university available for analysis and comparison.

Secondly, curriculum data is miscellaneous and exist in multiple forms. On the one hand, different universities or even faculties have incompatible curriculum data. On the other hand, some part of the curriculum, such as “Teaching Strategies” or “References”, are less meaningful for text analytics, while others, such as “Content” or “Learning Outcomes”, are richer. The planned research aims to compare each part of the curriculum data to reshape and refine a data source for better text analytics. In addition, it eases the compatibility issues between faculties and universities.

Finally, the created curriculum profile will be matched with student performance data to provide quality perspective on developed skills and market data of employed graduates. It will allow visualising learning path leading to the successful employment, revealing key subjects and skills that helped to achieve it in comparison with other graduates.

## 2.2 Student networks

Another part of graduate employability model is student social networks. During the learning process, students are involved in multiple subjects. Over the years of study, they interact with hundreds of students, tutors, industry representatives [6, 7]. Even more, indirectly, they can know thousands of other students via the people they know. The process of forming these networks is random. However, networks are reported as an important factor that affects employability [2], and student social networks are a great source of strong and weak ties useful for graduate employability. In my research, I aim to model student networks and predict

how they change the ability to become employed after graduation.

### 2.2.1 Future work

As part of network analysis, I plan to create a bipartite university network by semester for a selected period of time. The nodes of the network will be students, and edges will be subjects they have selected. Overall network visualisation will help to understand student relationships, identify key subjects and dynamics of network spread. The finalised network will be compared with career data from graduates, who were part of the network as students, to identify choices they made in networking and career outcomes. The contribution of this study will be a student networking model that can predict employment chances for a given student and recommend networking strategies to become more employable.

## 3. ADVICE SOUGHT

For this doctoral consortium, I seek for advice regarding two questions. Firstly, *what mathematical, probabilistic and statistical methods could benefit my curriculum and network analysis*. I identified several common methods used for other studies. So, skills can be presented as vectors, and further comparison will be reduced to vector comparison, metrics, and space projections. Similarly, I adopted networking methods that allow evaluating network density, clustering, diameter and reach. However, I am looking for more models and methods for my curriculum and network analysis.

Secondly, *are there other factors that affect graduate employability and can be improved at university*. Currently, I use the curriculum data for extracting skills and related careers to identify possible outcomes after completing a subject or course. After that, I will use student performance data to normalise skills outcomes. Also, I use student enrolment data to build bipartite networks. After that, all this results will be matched against actual employment data after graduation. My method creates investigates learning paths and strategies that could lead to successful employment. Thus, I consider human capital (personal skills and abilities) and social factor (student networks), as factors of graduate employability to be improved through the degree. However, I acknowledge the complexity of other factors and their interactions. My research will benefit from experts opinion on developing graduate employability at universities.

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