

On the Heterogeneous Information Needs in the Job Domain: A Unified Platform for Student Career

Markus Reiter-Haas
Talto GmbH
Graz, Austria
markus.reiter-haas@talto.com

David Wittenbrink
Talto GmbH
Graz, Austria
david.wittenbrink@talto.com

Emanuel Lacic
Know-Center GmbH
Graz, Austria
elacic@know-center.at

ABSTRACT

Finding the right job is a difficult task for anyone as it usually depends on many factors like salary, job description, or geographical location. Students with almost no prior experience, especially, have a hard time on the job market, which is very competitive in nature. Additionally, students often suffer a lack of orientation, as they do not know what kind of job is suitable for their education. At Talto¹, we realized this and have built a platform to help Austrian university students with finding their career paths as well as providing them with content that is relevant to their career possibilities. This is mainly achieved by guiding the students toward different types of entities that are related to their career, i.e., job postings, company profiles, and career-related articles.

In this talk, we share our experiences with solving the recommendation problem for university students. One trait of the student-focused job domain is that behaviour of the students differs depending on their study progression. At the beginning of their studies, they need study-specific career information and part-time jobs to earn additional money. Whereas, when they are nearing graduation, they require information about their potential future employers and entry-level full-time jobs. Moreover, we can observe seasonal patterns in user activity in addition to the need of handling both logged-in and anonymous session users at the same time.

To cope with the requirements of the job domain, we built hybrid models based on a microservice architecture that utilizes popular algorithms from the literature such as Collaborative Filtering, Content-based Filtering as well as various neural embedding approaches (e.g., Doc2Vec, Autoencoders, etc.). We further adapted our architecture to calculate relevant recommendations in real-time (i.e., after a recommendation is requested) as individual user sessions in Talto are usually short-lived and context-dependent. Here we found that the online performance of the utilized approach also depends on the location context [1]. Hence, the current location of a user on the mobile or web application impacts the expected recommendations.

¹<https://talto.com>

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One optimization criterion on the Talto career platform is to provide relevant cross-entity recommendations as well as explain why those were shown. Recently, we started to tackle this by learning embeddings of entities that lie in the same embedding space [2]. Specifically, we pre-train word embeddings and link different entities by shared concepts, which we use for training the network embeddings. This embeds both the concepts and the entities into a common vector space, where the common vector space is a result of considering the textual content, as well as the network information (i.e., links to concepts). This way, different entity types (e.g., job postings, company profiles, and articles) are directly comparable and are suited for a real-time recommendation setting. Interestingly enough, with such an approach we also end up with individual words sharing the same embedding space. This, in turn, can be leveraged to enhance the textual search functionality of a platform, which is most commonly based just on a TF-IDF model.

Furthermore, we found that such embeddings allow us to tackle the problem of explainability in an algorithm-agnostic way. Since the Talto platform utilizes various recommendation algorithms as well as continuously conducts AB tests, an algorithm-agnostic explainability model would be best suited to provide the students with meaningful explanations. As such, we will also go into the details on how we can adapt our explanation model to not rely on the utilized recommendation algorithm.

CCS CONCEPTS

• **Information systems** → **Recommender systems**.

KEYWORDS

Job Recommendations; Real-time Recommendation; Heterogeneous Entities; Entity Embeddings; Practical Challenges; Case Study; Explainability;

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BIOS

Markus Reiter-Haas is a Researcher at Talto GmbH and responsible for the recommender system of the Talto student career platform. There, his research focuses on creating low-dimensional embeddings for effective retrieval in the job domain. He has a master's degree in Computer Science at the Graz University of Technology with a focus on Knowledge Technologies. He wrote his thesis about the evaluation of student job recommendations

on the Talto predecessor Studo Jobs. His research interest lies in Natural Language Processing in Social Systems, where he is pursuing a PhD degree.

David Wittenbrink works as Head of Platform at Talto GmbH where he manages the development of the Talto student career platform. In order to achieve his goal of providing an exceptional user experience, he focuses on applying modern web technologies to a content delivery strategy built upon recommender systems. He holds a bachelor's degree in Computer Science from Graz University of Technology. His main interest lies in leveraging the latest web platform standards to build high-quality Progressive Web Apps.

Emanuel Lacic is a Senior Researcher and Recommender Systems Architect in the Social Computing team at the Know-Center, the research partner of Talto GmbH. He is also a PhD student at Graz University of Technology and a former visiting researcher at the Computer Science department of the

University of California, Los Angeles. He has an M.Sc. and B.Sc. in Software Engineering and Information Systems from the University of Zagreb. His research interests are in the fields of Recommender Systems, Deep Learning and Social Network Analysis.

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