

# Adaptive Applications to Assist Students with Autism in Succeeding in Higher Education

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**Abstract.** In this demo we discuss a few possible scenarios showing adaptation of presentation and information to assist autistic students in succeeding in higher education. These students not only have specific information need, they are also more concerned about their privacy. We use WiBAF (Within Browser Adaptation Framework) for user modeling and adaptation to give users control over the sharing of their data.

## 1 Introduction

Adaptive frameworks have been used to take into account various features of the users when presenting information. One of the dimensions that can be considered for adaptation is individual traits – the features that together define the user as an individual: personality traits, cognitive factors, cognitive/learning styles (CS/LS). If we consider user’s context, among other factors of environment that are not really “user” features, we can distinguish affective state such as motivation, frustration, engagement. In the European project Autism&Uni<sup>1</sup> the transition of young adults on the autism spectrum to a university environment is being studied as well as ways to help them navigating through the university system and succeeding in their studies in the best possible way. Like other individual traits autism has everything to do with the personality. Having autism can also influence the affective state such as getting anxiety in certain situations which are not problematic for people without autism. Although apparently all of us have autism to a certain degree.

Despite the existence of a large number of tools to support autistic people, especially kids to develop certain skills, to our knowledge there are no tools to support students with autism during their studies in higher education. We also need to take into account that autistic people tend to be more concerned about their privacy than other people. We think that this is the area where adaptive technologies could help and more specifically we consider the new generic adaptive framework that we are developing at the TU/e called WiBAF [6].

WiBAF is radically different from the previous platforms AHA! [3] and its successor GALE [7] in that in WiBAF the user modeling and adaptation can both be performed completely within the browser. This property makes it possible to

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<sup>1</sup> <http://www.autism-uni.org/>

offer end-users the power of making decisions in the Privacy vs. Personalization trade-off described by Kobsa [5]. It also makes it easier to add adaptive functionality to existing websites without the need for major changes or software installation. WiBAF has been used successfully by TU/e students in an “Adaptive Web-Based Systems” course already, to develop a variety of adaptive applications with client-side user modeling and adaptation.

This demo paper is the first attempt of the authors within the scope of the Autism&Uni project to show possible ways of adapting information to autistic students. We identify two different ways in which WiBAF can be useful:

1. customising the web page. At the moment the adaptation decisions are based on the information about autism collected through a number of workshops at TU/e that involved several experts in the domain (see *Acknowledgements*).
2. allowing students to make decisions about what is done with their data.

Those are discussed in sections 3 and 4 respectively. But first, in section 2, we talk a bit more about autism and briefly describe the situations when assisting students with autism would be helpful.

## 2 Use scenarios for assisting autistic students

One of the major problems with autism can be described as follows. Non-autistic people are good at making semantic connections between topics that they study. On the other hand, autistic people are good at “seeing trees in the forest”, they like details, sometimes maybe too much, but they have difficulties setting up semantic connections between the details thus with “seeing the whole forest” [2]. It feels like autistic people have their own ways of processing and analysing information, their own ways of learning and as such can be linked to different CS/LS. Furthermore, typically the social skills of autistic people are underdeveloped which results in their preference for individual rather than group work.

Within Autism&Uni project about 20 scenarios were collected describing the situations when students with autism need support. Because of the lack of space we discuss only two typical scenarios:

1. Lectures, group work and other study activities differ between high school and university. Students are assumed to have a higher level of independence, lectures move from small classrooms with tens of students to lecture halls with hundreds of students, etc. It takes more effort for students with autism to adapt to these new ways of working. In order to reduce their anxiety we can show the students what situations they will face in a customised way, according to their “CS/LS”.
2. People with autism find it difficult to find their way around big areas such as a university campus and suffer from anxiety when they do not know where to go. They need to know when and where the next lesson is going to be, how to reach the library, the cafeteria, registration offices, etc. They need very concrete pointers, not a site overview to explore.

### 3 Possible customisation

Regarding the adaptation to the study environment of a large lecture hall (first scenario), autistic students need to be prepared before actually going into a noisy hall, going through crowded corridors, etc.. Such introductory information to reduce anxiety is not needed for non-autistic students. For presenting this information we need to distinguish types of students depending on the order they prefer to learn dealing with new situations and on the type of content that is more effective.

As discussed in the previous section we consider that the needs of autistic students can be linked to different CS/LS. In [8] we showed possible ways of inferring and adapting to three dimensions of CS/LS: global vs analytic, verbal vs visual, active vs reflective. Concentration on details characterises autistic learner as having analytic style. As such (s)he can be guided in depth-first order through the domain hierarchy. Need for structure, clear goal, help with understanding of the semantic connections between the topics suggest that the student may need graphical representation of the domain. This need can be linked to visual style and could be helpful in developing global style. For students with autism every new situation feels like new because they have difficulties with establishing semantic connections between similar situations. But for one specific situation we could have a set of instructions on how to deal with it and then the student can turn this knowledge into real action. This can be linked to reflective style.

We could therefore consider autistic student as analytic, visual and reflective who prefers to read more details about specific situations, one by one, see examples on how to deal with these situations, watch a video with an overview of the university life to get a broader picture and then turn this knowledge into action. Not all autistic students however are the same. Opposite global, verbal and active preferences or other combinations of those could also be possible. For this reason our domain experts suggest that as discussed in [8] it might be interesting to try inferring different patterns by observing student's browsing behaviour while interacting with the application and to adapt information correspondingly.

For the second scenario, the student can be helped by entering the schedule into a system that will then present him/her a step by step procedure. This is again related to the fact that autistic students like to concentrate on one task at a time. Overall, in this day and age young people are used to a very busy (or even fancy) interface style on informational websites. According to the domain experts autistic students on the contrary need a simple interface (without distractions) in which only the most relevant information is shown, with a very limited number of options. Throughout the process of acquiring information they may also need frequent reminders of the essential information.

In the demo session we will show the scenarios' implementation in WiBAF.

### 4 Taking decisions about what is done with the data

According to our domain experts, people with autism tend to have less trust in other people. Therefore it is expected that they will also not trust services

that store and use their data. People in general are becoming more concerned about privacy issues [1], so this does not only apply to autistic users. To develop trust, it is important for services to allow users to scrutinize their user profiles [4]. WiBAF not only allows to inspect, modify and delete parts or the whole user model, but also allows the user to define rules about where the user data is stored, in what level of detail and for which usage. Moreover, it allows them to specify situations in which they should or should not be tracked. In exchange for data the user discloses, the service should offer better customisation and recommendations as described in Section 3.

## 5 Conclusions and Future Work

In this paper we presented our first ideas of how adaptive technologies, in particular WiBAF, could help students with autism reduce their anxiety when studying at the university. To do so we looked at two specific scenarios. More scenarios and more types of adaptation to support autistic students will be developed in the future. Even though the current demo has been prepared using guidelines given by the domain experts, evaluation of these and future scenarios with autistic students is yet to be done by the universities participating in the project.

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<sup>2</sup> <http://www.handicap-studie.nl/>

<sup>3</sup> <http://royhoutkamp.nl/>