International Conference on Communication, Management and Information Technology (ICC 2015)

E-inclusion modeling for blended e-learning course

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Abstract

This study addresses the e-inclusion problem that relates to the inclusion of as many individuals as possible to enjoy benefits of information and communication technology. Despite the fact that European Union accepted an e-inclusion declaration in 2006 which aims to reduce disparities that exist among individuals and to improve the level of e-skills among people, nowadays e-inclusion problem still exists. Therefore it is necessary to find out new approaches to promote e-inclusion in society. We propose a more nuanced design approach that takes into account student's satisfaction with e-learning environment and e-materials, student's ability to learn, instructor willingness to share knowledge and others factors. Moreover we believe that e-inclusion means not only high level of digital skills but also the usage of these digital skills to benefit from new technologies. To obtain predictors for algorithms we did a data domain study based on knowledge management theory. The aim of proposed work is to present an e-inclusion theoretical model which is based on integration of several algorithms as multiply linear regression and cluster analysis. These algorithms were calculated based on statistical data obtained on evaluating a group of hundred blended e-course learners. In this paper we propose an architecture designed to predict e-inclusion degree of student based on machine learning and intelligent agent approach. We identified two main processes in the e inclusion prediction system. The first process consists of agent learning activities. Intelligent agents learn the appropriate algorithm to predict e-inclusion degree of student based on linear regression or cluster analysis. The second process includes activities to predict e-inclusion degree of student. This process covers analysis of e-inclusion risks and communication between student and instructor also. Proposed e-inclusion model consists of diagram, use cases diagrams and main algorithms of the system. As the result of the e-inclusion model is prediction of e-inclusion degree of person as well as e-inclusion risk factors for person, for instance inappropriate e-learning materials or no interest to learn, or dissatisfaction with e-learning environment, or others factors.

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1. Introduction

This study aims to address the e-inclusion problem that was outlined in the EU Digital Agenda 2020 that re to the inclusion of as many individuals as possible to enjoy the benefits of information and communic technology (ICT)\(^1\). Nowadays the digital divide goes beyond the issue of access to technology. Focus has sl from access to ICT to digital skills and the meaningful use of ICT\(^2\). There is a gap between knowing to do practical usage of digital skills. Learning a new skill and using it are two separate steps\(^3\). The 2010 OECD r stated that a second digital divide separates those with the competencies and skills that benefits from compute from those without these advantages\(^4\).

Several studies indicate that there is a need to look for factors that characterize the e-included individ Therefore, it is necessary to identify the factors that influence e-inclusion process so that individuals learn technologies and use them meaningfully. There are currently no comprehensive methods to monitor meaningf of digital skills in order to prevent the ICT usage gap.

There is no special technology for e-inclusion prediction. Usually systems predict whether students drop c complete course. Machine learning approach is used for student achievement and other event prediction. Ma learning and agent technologies are integrated with a particular interest on applying agent-based solutio supervised learning\(^6\). This study contributes to research of the meaningful ICT use in blended learning context. In this p The paper is organized as follows. In the section 2 technologies and methods of prediction are described. section 3 introduces e-inclusion model design. In the section 4 e-inclusion prediction algorithms are presented section 5 is conclusion part.

2. Technologies and methods of the e-inclusion prediction

2.1. Review of literature

According to Strickland\(^7\) predictive analytics is an area of data science that deals with extracting inform from data and using it to predict trends and behavior patterns. A predictive model is a statistical model or ma learning model used to predict future behavior based on past behavior. Machine learning approach is used into oriented systems to train agents. In the literature machine learning and agent oriented system development m\(n\) has following steps: agent selection, problem domain analysis and data selection and pre-processing, selecti machine learning method and algorithm, model evaluation and implementation with prediction function\(^8\).

Machine learning-based system has two main processes: (1) system training process and (2) the predi process (Fig. 1). Each of these two phases is subdivided into several steps and presented in the Figure 1.

Machine learning process begins with analysis of problem domain and data selection\(^9\). More appro selection of data is possible after deep problem domain analysis.

Data pre-processing aims to create a sample database containing both the training and test data for the model

Next step is selection of algorithm and method for prediction. Training data are transferred to the tra algorithm. At this stage a predictive model is build. In the literature this stage is known as creation of the know base\(^11\). It should be noted that no machine learning method or algorithm is clearly better than another, bu machine learning method should be assessed with test data sets for more precise results. Data analysis professi
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