Template for AI characterisation

This ready-to-use format template has been designed by LORIA[1] and Inria in the context of the AI4T project. It is based on the LORIA Report on template for analysing AI-related features in learning resources[2].

Although Artificial Intelligence Educational Resources -AIERs- are becoming increasingly common, there is currently no tool to comprehensively map the characteristics of AIERs and help users make informed use of these resources.

This AI4T template focuses on the characteristics of AI integration in educational resources at all levels: scientific, technical, regulatory, ethical, etc. in order to enable teachers to better understand the resources they or their students use.

How does it work?

This model is organised in 7 layers divided into 3 groups.

Group 1: Layer 1 - Usage Scenario / Layer 2 - Decision level
Group 2: Layer 3 - Technology / Layer 4 - Algorithm
Group 3: Layer 5 - Personal data / Layer 6 - Data security / Layer 7 - Transparency

For each layer :

◆specific questions are asked that can help the user to find relevant information.

◆additional information is provided by the LORIA experts in AI in education who designed this model.

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[1] Loria (Lorraine Research Laboratory in Computer Science and its Applications) is part of a research unit (UMR 7503), common to CNRS, the University of Lorraine and INRIA. It is a member of the AI4T consortium and brings its expertise in AI in education (and on learning analysis) to the AI4T Erasmus+ project.
[2] Report on template for analyzing AI-related features in learning resources - Jiajun PAN, Azim ROUSSANALY, Anne BOYER - AI4T Erasmus+ project, 2022.

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The template for the characterisation of AI-related features in learning resources

Group 1: Usage Scenario and Decision level

This class is to clarify the purpose and users of an AIER and to help users to understand what their role is in using the Artificial Intelligence Educational Resources - AIER.

- Layer 1: Usage Scenario

■ Who is the resource for?

> - Learner-oriented AI,
> - Instructor-oriented AI and
> - Institutional system-oriented AI.

■ What are the purposes of the resource?

> Usage scenarios layer describes the users and applications of the AIER, which is often the first information teachers want to know. AIER could be classified into 3 types:
>
> ◆ Learner-oriented AI,
>
> ◆ Instructor-oriented AI and
>
> ◆ Institutional system-oriented AI.
>
> There are many different usage scenarios based on the type of AIER. For example, learner-oriented AIER could be an intelligent computer system designed to help students learn a course, while a teacher-oriented AIER could be one that automatically generates questions and tests for teacher-prepared courseware for a particular course.

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- Layer 2 : Decision level
  - What is the decision for the AI?

  - How sensitive this decision is?

  - Who bears the responsibility for the decision?

  - How far is the teacher in the decision loop?

Decision level layer describes the proportion of the final outcome that is attributable to the faculty when teacher using AIER. Normally, the decision level depends on the output of the AIER. For example, for AI that uses scoring strategies to automatically assess student learning outcomes, the level of decision making depends on whether the scores are sent directly to the student or to the teacher and who makes the subsequent assessment results. Decision level helps users to know their right and role in using an AIER.

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Group 2: Technology and Algorithm

This class is to clarify the approaches the AIER used to reach its purpose and to help teachers understand how it works.

- Layer 3: Technology

■ What is the issue addressed by the AI?

> ✎

> Technology layer describes the AI technologies used in the AIER. Considering that an AIER may be an educational platform, a standalone or online application, aso., several different technologies may be used in a single resource. The purpose of this layer is to clarify whether AI-based technologies are actually being used and to introduce users to what kind of AI technologies are being used.
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> The technology could be one of the following list:
>
> ◆ Automatic generation of educational content(Courses, texts and so on) ◆ Improved educational content ◆ AI assistance for teachers to provide personalized instruction for each student ◆ Fast feedback to students ◆ Assistance in monitoring students.
>
> ◆ Automatic assesses students' learning behaviour and learning routes ◆ Automatic records the student's learning process.
>
> ◆ Targeted improvement based on learning analysis ◆ Chatbot between teachers, students, parents and relevant groups ◆ Other technology for educational tasks.

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- Layer 4 : Algorithm

■ Which family of approaches do the algorithms related?

✎

- Knowledge-based Systems:
- Machine Learning:
- Deep Learning:

■ What are the algorithms?

✎

Algorithm layer describes the algorithms used in the AIER. Compared to the previous layer, this layer focuses more on the scientific level than on the technical level. We will declare the family of the algorithms from three common groups: ✪ Knowledge-based Systems, ✪ Machine Learning and ✪ Deep Learning. Note that we are aware of the debate about whether deep learning is machine learning or not. However, we have separated them here because it is easier for teachers to understand. For each group, the algorithm could be selected from the following list :

- ◆ Knowledge-based Systems: Rule-based systems (or expert systems), Ontology, Semantic networks and so on.
- ◆ Machine Learning: Clustering, Approximate possibility, Regression Analysis, Representation and Dimensionality reduction, Active learning, Decision Trees, and so on.
- ◆ Deep Learning: Convolutional Networks (CNNs), Long Short TermMemoryNetworks (LSTMs), Recurrent Neural Network (RNN), Generative Adversarial Networks (GANs).

Please note that we will only identify the algorithms used in this layer and briefly introduce the algorithms, without comparing and evaluating the algorithms used.

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Group 3: Personal Data - Data security - Transparency

This class is to clarify the input data used by AIER and the secure handling of that data, to make it clear that AIER demonstrates the transparency of the internal mechanisms and to help users trust in the security of AIER.

- Layer 5: Personal data

■ What kind of personal data is used?

> Personal data layer lists the personal data used in the AIER. Nowadays information security is increasingly valued. In addition to the data explicitly proposed for input in the AIER, external sources, such as shared social accounts, may collect additional personal information. The creation of this layer is necessary to enable users to clarify this information.

- Layer 6: Data security

■ Is the personal data anonymous? If yes, how does it work?

■ What are the possibilities for outsiders to audit the resource?

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Data security layer specifies whether non-user visitors and external visitors to the AIER can access the data and how the data is to be handled securely. This layer is related to the previous one. Different personal data should be handled in different ways, such as anonymity, encryption, and denial of access.

◆**Anonymization** means that the information recipient is completely unable to identify the data subject directly or briefly. There are five common data anonymization operations: generalisation, suppression, anatomization, permutation, and perturbation.

◆**Encryption,** also known as **pseudonymization** means that the information receiver cannot identify the data subject directly, but the information can be de-anonymized by the data manager after cross-identification with other information.

◆ **Denial of access** is a simple and straightforward way to keep the information only in the information manager, without giving access to others.

In this layer, it also clarifies whether the data will be used by external visitors. Many software share data with their own data partners nowadays, and if this is the case, it can also lead to different issues regarding the security of the data.

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- Layer 7 : Transparency

■ Is there a mechanism for explaining decisions? If yes, how does it work?

Transparency layer clarifies the level to understand the internal mechanism of the AIER. For example, in the educational tasks to assess students through their learning behaviors, the internal mechanism of this AIER is about which learning behaviours were selected and which parameters were used to generate the final report. If the final assessment report is given to the teacher that shows these parameters or if the AIER's introductory website explains the internal mechanism of this AIER, it will help teachers understand the possibilities, limitations, and risks of this AIER in education.

In addition to this, the transparency to teachers of the intermediate results generated by AIERs in the educational tasks is worth declaring at this layer. For example, an AIER delivering personalised instruction may have to first generate a profile of each student that it uses to recommend different educational content in the process of accomplishing this task. If the profile is available for teachers, it will help users understand and trust this AIER.