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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "INSPIRE standards as framework for artificial intelligence applications: a landslides example" *by* Gioachino Roberti et al.

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Reviewer report: nhess-2020-134 "INSPIRE standards as framework for artificial intelligence applications: a landslides example"

In the presented work an application that tries to demonstrate the value of INSPIRE compliance in enhancing the knowledge interoperability in field of Landslide susceptibility analysis. The manuscript introduced, highlighted and discussed valuable information and critical points and current issues in mapping natural hazards using spatial data and AI. However, the reviewer still need to discuss here some points that still need

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Discussion paper

to be elaborated within the text for clear the confusion with readers, especially those who are on various level of experience or scientific backgrounds.

GR: Dear reviewer, Thank you for the insightful revision and useful comments. Our replies are below your comments and we edited the text to address your observations when needed.

General comments:

Abstract:

1- What kind of enhancement the authors refer to rather than standardize the knowledge interoperability using the standard vocabularies, please clarify this.

GR: We enhance knowledge transfer and interoperability of data and data analytics as they are based on the same data structure and semantic standards.

2-"The use of INSPIRE-standardized vocabularies in ontologies that express scientific _ models promotes the adoption of the standards across the European Union and beyond" This sentence need enormous work to be carried to fulfill its objective, in your current work, how much or how far did you consider your present work contributes to this end? Taking in mind the various methods of the Risk assessment researcher: Data selection and representation, variable selection and optimization, modeling type physical to datamining...etc.

GR: In this study we start from showing how to modify INSPIRE to make it possible to use it for landslide-specific applications. By suggesting these landslide-specific schema and code list extensions, we set the ground for INSPIRE-compliant landslide susceptibility studies. Other organizations can build on top of these extensions and future landslide susceptibility application can be compared as they formally refer to the same data structure and semantics. Note that we do not force any specific “Data selection and representation, variable selection and optimization, modeling type physical to datamining...etc” for landslide susceptibility/hazard/risk method, rather, we provide the

data structure and semantics to store and share whichever method has been chosen by the modeler. For example, data selection is encompassed in the schema structure under “Influencing Factor” which are “unbounded in multiplicity and can be defined qualitatively or quantitatively”, leaving broad range of possibilities to the modeler.

3- . As matter of fact, any analytical model using spatial data, suffers from uncertainty started with modeling ambiguity, surrogate data, error propagation..etc. in different extend, Therefore, the extension to Natural Risk zone susceptibility schema, need to consider the model accuracy assessment, validation and error quantification of data (spatial and aspatial) and used model.

GR: Data quality standards are discussed in the Natural Risk Zone schema and they refer to ISO standards (Section 7 and 8 in D2.8.III.12 Data Specification on Natural Risk Zones). However, we recognize that specific code list (semantics) dealing with data quality and model uncertainty are missing. We hope that the INSPIRE thematic group will address this point. We briefly mention the importance of models parameters semantics at lines 329-331 “by embedding the ontology concepts related to statistical parameters (e.g. receiving operating curves, confidence intervals) or physical parameters (e. g. friction angles, viscosity), it will be possible for the numerical outputs of quantitative methods to be explained in natural language”

1 introduction

L27 P2 : "EU countries are aligning and .... Europe (Cho and Crompvoets, 2019)." Most of the high quality sensors collected data and field works supported by scientists located in Europe, thus, Please mention the main rebuttals why the application still limited in literature.

GR: In-depth discussion on why INSPIRE is slowly adopted is beyond the scope of this paper. Cho and Crompvoets, (2019) suggest that the slow INPIRE adoption by EU countries may be due to legal and policy issues. Regarding the scientific literature, there are a few cases which make use of INSPIRE, and we discuss them in the paper.

Furthermore, INSPIRE is a geospatial framework which is not something commonly discussed in the geological/geomorphological literature.

L43 P2: More standards are still missing need to be mentioned here, like: 1- Standards for input data volume concerning the study area extent and landslide type. 2- Standard for outcomes accuracy concerning the type/quality/amount and extent of reserch details coverage.

GR: This is a general introduction to standards and AI, beyond the field of natural hazards. Regarding the "1- Standards for input data volume concerning the study area extent and landslide type and 2- Standard for outcomes accuracy concerning the type/quality/amount and extent of research details coverage". These are a currently discussed topics in the geological/geomorphological literature, and there is no universal agreement on such standards. This paper focuses on the INSPIRE semantic and data framework standards in which multiple different approaches to landslide susceptibility mapping can fit and can provide interoperable results.

L45 P2 : "Deep learning techniques....such as JPEG, or WAV)" Deep learning still not widely applied in Hazard and vulnerability mapping. The authors may mentioned the most common models in the literature instead like physical or datamining statistical models.

GR: This is a general introduction to standards and AI, beyond the field of natural hazards. The methods to asses landslide susceptibility are discussed in section 1.4 of the paper, but a review of physical and statistical methods for landslide susceptibility mapping is beyond the scope of this paper.

L210 to 221 P 10: too general information, please discuss in more details the susceptibility modeling like in light of using machine learning (classification/clustering..etc) or physical model of slope structure analysis.

GR: In this paragraph we present a detailed description of the schema structure and

how inputs and outputs of susceptibility modelling can be mapped to this schema. We do not discuss how susceptibility modelling can be done, leaving space to the many possible approaches. A review of physical and statistical methods for landslide susceptibility mapping is beyond the scope of this paper.

L275 P 17: "Quantification of this value has yet to be made, but calculations.. Lombardia Region, Italy, alone." Please extend this paragraph by mentioning some details or statistics.

GR We realized that sentence was incorrect and rephrased: A comparative study (Craglia and Campagna, 2010) of regional SDI in the context of INSPIRE implementation, showed that inefficient data access and use at the European level results in economic losses in the 100-200 Million Euro annual range. The same study, shows that the regional SDI of Lombardia, Italy, allowed € 3 m/year savings to companies working in Environmental Impact Assessments (EIA), and Strategic Environmental Assessments (SEA). Savings in the same order of magnitude can be expected by adopting INSPIRE standards in the geological hazard assessment domain.

L285 to L315 P 18: Can we assume that, the mentioned limitations, were the reason behind the scare mentioned in L28,29 P2 " EU countries are aligning and serving INSPIRE data at a slow pace...are available across Europe"?

GR The slow adoption pace of INSPIRE standards is influenced by many factors. The limitations listed in this paragraph may be part of the reason.

L323, 324 L19: " However, in current geological assessments, expert judgment is still widely applied (e.g., Association of Professional Engineers and Geoscientists of British Columbia, 2010)," Please add recent references to support this statement.

GR: Unfortunately, guidelines for professional practice are not updated very often. In this context a reference from 2010 is to be considered “recent”. We edited the text and added another reference. Now reads: “However, in current geological assessments

and geomorphological mapping applications, expert judgment is still widely applied (e.g., Association of Professional Engineers and Geoscientists of British Columbia, 2010, Guzzetti et al., 2012),"

Specific comments: L55 to L60 P3: Not clear, please re-write.

GR: We rephrased

L125 P3: "in geohazard mapping to produce landslide susceptibility maps (Jackson Jr et al., 2008)" Can you add more recent studies.

GR: There is no other study using this expert-based approach based on ontological matching for landslide susceptibility mapping. The framework presented in this paper can be adopted with any method used to assess landslide susceptibility. In the schema, landslide susceptibility is an element that can be quantitatively or qualitatively defined.

Figure 2. Please mention one study for each sub-category

GR: I do not understand this comment. Do you mean a reference for each landslide type? They are all from Hungr et al 2014

Figure 3 and 5. . Please use multiple layout as the figure is not readable on A4 paper mode.

GR: We modified figure 3, showing only the extension done for this project, and we deleted Figure 5 and replace it with Tables 4 and 5. In the tables captions there is the link to the actual match report table from the webmap application

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