PHME Standards Panel

PHM standards in a machine learning domain

Welcome- Jeff Bird (PHM Society)

Provocative remarks by panelists

Daniel Gagar (Siemens)

Danilo Giordano (Politecnico di Torino)

Steve King – Invited (Cranfield University)

Dr Huiqi (Yvonne) Lu and Dr Samaneh Kouchaki

Oxford University

Open discussion through Google Meet Chat

Have standards or compiled bodies of knowledge helped machine learning innovations and applications? What is missing?

Can standards help in ML tasks, supporting technology and project processes?

Need a formal taxonomy, definitions of inputs, outputs, and validation procedures?

Facilitate hybrid (ML with physics) approaches to exploit all of our knowledge?

PHM Society Standards Committee

Jeff Bird, Brian Weiss, John Madsen, Ravi Rajamani
PHM Society Role?

Society Objectives
1. Free access to PHM knowledge,
2. Interdisciplinary and international collaboration
3. Advance the engineering discipline

Observations
1. Diverse body of PHM knowledge out there: Standards, lessons learned, information, few case studies
2. Multi-disciplinary awareness and engagement is lacking: Many entrants come from single specialities
3. Wide continuing standards participation is difficult: Small companies, long time frame for development
4. To mature knowledge from theory to practice is challenging: Knowing about relevant standards across disciplines, Developing Body Of Knowledge to complement academic training
5. Data and information sharing protocols are essential but problematic: Proprietary and sector specific information
PHM Society Activities

**Traditional**
1. Panels
2. Special issues of journal and tutorials- subjects?
3. Program updates and on-line forum
4. Connections among PHMers currently connected

**New initiatives**
1. Standards Users Group
2. PHM Standards Portal
3. Standards Review Portal: *PHM- ISO Connect*
4. *Machine Learning specific??*
PHM Standards Portal

One stop entry point for PHM Standards on the Society website
Organization Links: ASME, DAU, IEC, IEEE, ISA, ISO, RTCA, SAE, ...
   With summary of scope and activity, briefings like those today
Background: PHM tutorials, panels, papers
Publications: PHM Society Journal and special issues
   https://www.phmsociety.org/journal/special-issue/Standards
   Other journals
Interaction: PHM Society Forum
   http://www.phmsociety.org/forum/592
   ISO document review
Specific ML: David Leslie Turing Institute Guide
   IMDRF/DITTA Overview of AI Standardization Activities
   MHRA Position Paper by BSI and AAMI
   Others?
PHM-ISO Connection

PHM Society is a paying member of the USA Technical Advisory Group for ISO 108 that covers diagnostics and prognostics internationally. We have access to all evolving documents for review through the USA TAG.

How to engage the PHM community to benefit ISO AND Us?


Proposed approach- PHM-ISO Connect:
1. Identify to the community evolving standards
2. Coordinate reviews of key evolving standards by qualified reviewers through our OJS
   1. Qualify reviewers and review managers
   2. Review through OJS: review managers + reviewers + reviews
   3. Provide high value feedback to US TAG and ISO
10th Anniversary Review

Standards review, users’ perspective, innovation debate, adaptation, manufacturing, standards and education:
https://www.phmsociety.org/events/conference/phm/12/phm_standards
http://www.phmsociety.org/node/1529
http://www.phmsociety.org/node/1562
http://www.phmsociety.org/node/2208
http://www.phmsociety.org/forum/592

**Highest:** Promoting awareness and adoption of standards, Define technical processes – Guidebooks, Define Career Field Competencies

**Medium:** Leverage of practical, industry experience to complement theory based education; Recruiting new members to Standard Committees to ensure continuity; Move beyond Certification to and Qualification

**Low:** Avoidance of duplication between standards organisations, especially inconsistent guidance; Recognition of implementation challenges in educational projects; Link Assessments to Competencies and Courseware; Identify Principles and Applications for Importance/application of standards based on statutory and regulatory requirements
1. Have standards or compiled bodies of knowledge helped machine learning innovations and applications? What is missing?
2. Can standards help in ML tasks, supporting technology and project processes?
3. Need a formal taxonomy, definitions of inputs, outputs, and validation procedures?
4. Facilitate hybrid (ML with physics) approaches to exploit all of our knowledge?
Machine Learning Standards Questions

1. Have standards or compiled bodies of knowledge helped machine learning innovations and applications? What is missing?
2. Can standards help in ML tasks, supporting technology and project processes?
3. Need a formal taxonomy, definitions of inputs, outputs, and validation procedures?
4. Facilitate hybrid (ML with physics) approaches to exploit all of our knowledge?
5. What do we need to do to ensure model solutions provide line of reasoning, or a satisfactory level of explainability, that’s meaningful to a domain user beyond tools such as LIME or SHapley algorithms?
6. Do we need to encourage greater use/knowledge of the traditional signal processing/statistical methods rather than immediately reaching out for complex ML solutions?
7. Is it important to develop standardisation policy around such applications?
8. How can such standards lead to innovations instead of having a negative impact on the process?
9. What level of organisational transparency is required about the ML models and the flow of data and results?
Way Forward

• IJPHM papers and Communications
  Indexed in the Emerging Sources Citation Index
  – Submit an abstract
  – Submit an abstract for the Standards Special Issue

• Updates on standards in progress
  – *PHM Standards Portal* – what else would be useful there?
  – Users Group
  – Forum discussions

• ISO TC 108 Standards Review Process
  – *PHM-ISO connect*: want to help?

• What else would be useful?
  Standards forum: [https://www.phmsociety.org/forum/592](https://www.phmsociety.org/forum/592)