The 11th Prognostics and Health Management Conference

Besancon, France

May 4 - May 7, 2020

Proposal for PHM 2020 Special Session

- **Title of the Special Session:**

Industrial AI and Deep Learning for PHM applications: Opportunities and Challenges

- **Technical Outline of the Session and Topics:**

Outline of the Session

During the PHM2019 conference in Paris, a panel discussion was organized on "Deep Learning for PHM: Opportunities & Challenges3, with representatives of several industrial companies and academia.

The conclusions of that discussion are available on the conference website. Essentially, deep learning has essentially been applied today to image processing and NLP. Huge potential opportunities were identified in PHM: transfer learning, feature learning, etc., but the challenges are considerable—not the least one being the relatively limited availability of data; more precisely, data is available to operators but physical knowledge typically resides with OEMs.

What we would like to address this time is:

- Case studies of successes achieved or obstacles encountered in attempting to apply deep learning to PHM
- Ideas on business models to justify and promote data sharing between asset users and OEMs
- Examples of use of deep learning to bridge the gap between expert knowledge and data-driven approaches ("explainable AI")
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In addition, as cybersecurity is a key issue that stands in the way of data sharing, we would like to discuss how blockchain technology could help address that issue.

Topics of the Session

Traditional machine learning approaches in PHM in comparison to deep learning approaches Feature Learning
Reinforcement Learning
Generative methods
Auto-Encoders
Semi-Supervised Learning
Incremental Learning
Transfer Learning
Domain Adaptation
Unsupervised Learning
Security & Blockchain

- **The name, a very short bio, contact details, complete address and IEEE membership (if applicable) of the session organizer**

(Give the detailed information on the special session organisers, mention their expertise and the special session corresponding author. If applicable mention your IEEE membership information, if not just mention Not Member instead of the number)

Special Session Organizers Names	Title	Affiliations, complete address and contact details and email	Country	IEEE Member Number	IEEE RS Member
Madhav Mishra	Dr.	Luleå University of Technology, Sweden	Sweden		Yes
Pierre Dersin	Dr.	Alstom Digital Mobility, France	France		Yes

Organizers Photos	Organizer short biography and expertise
	Dr. Madhav Mishra is a senior researcher at the Division of Operation and Maintenance at Luleå University of Technology, Lulea, Sweden where he received the Ph.D. degree in Operation and Maintenance Engineering from the Luleå University of Technology within the framework of the SKF-University of Technology Centre (UTC). He obtained Master degree in Control Systems Engineering with specialisation in Mechatronics from the Netherlands. He worked at Philips Semiconductors/NXP in Nijmegen in the Netherlands as a Senior Design Engineer Mechatronics where he has involved in design and developed of the high-speed rotating machine. His research focus is on diagnostics and condition monitoring, prognostics, developing new algorithm based on Artificial Intelligent for new application. He is also focusing on Smart Cities related to PHM and Maintenance perspective. In the international arena, he is a visiting researcher at the NASA Ames researcher centre, California, USA since June 2015; he has established research collaboration between NASA, USA and Luleå University of Technology, Sweden. He is a member of the Editorial Board of the International Journal of prognostics and health management (IJPHM). Dr. Mishra is a member of IEEE including IEEE Industrial Electronics Society Membership, IEEE Reliability He has receipt several awards during his PhD research.
	Dr. Pierre Dersin is RAM (Reliability-Availability-Maintainability) Director and PHM (Prognostics & Health Management) Director of ALSTOM Digital Mobility. With ALSTOM Transport since 1990, with expertise and experience in railway RAM and maintenance, he founded the "RAM Center of Excellence" and initiated the PHM activity at ALSTOM. He holds a Ph.D. in Electrical Engineering and a Master's degree in Operations Research, both from MIT. He has authored numerous publications (among other in IEEE Transactions, ESREL, RAMS, French Lambda-Mu symposia, IEEE-PHM Conferences). He served on the IEEE Reliability Society AdCom from 2012 to 2017 and is a member of the IEEE Future Directions Committee. He contributed four chapters in the "Handbook of RAMS in Railways: Theory & Practice" (CRC Press, 2018). His research interests include hybrid PHM methods; the application of machine learning and in particular deep learning; links between PHM and reliability engineering; reliability of systems of systems; and dynamic optimization methods applied to maintenance; with strong emphasis on railway applications.