

# Editorial

**P**HM SOCIETY established International Journal of Prognostics and Health Management (IJPHM) in 2009 to facilitate archival publication of peer-reviewed results from research and development in the area of PHM. As a journal solely dedicated to the emerging field of PHM IJPHM is the first of its kind and has been a focal point for dissemination of peer-reviewed PHM knowledge. While for the first few years the journal maintained only an online presence, the printed volumes will now be available and can be obtained upon request. PHM is broader than any single field of engineering: it draws from electrical, electronics, mechanical, civil, and chemical engineering, computer and materials science, reliability, test and measurement, artificial intelligence, physics, and economics. IJPHM publishes multidisciplinary articles from industry, academia, and government in diverse application areas such as energy, aerospace, transportation, automotive, and industrial automation. IJPHM is dedicated to all aspects of PHM: technical, management, economic, and social. In addition to regular periodic volumes IJPHM also publishes special issues with quality papers dedicated to focused topics.

The first IJPHM volume came out in 2010 with three research papers that discussed the key issue of PHM performance that is still relevant to the maturing field of PHM. Business models for PHM are still being debated and established to clearly identify the value proposition and realize commercial (or safety) value of the health forecasts. While the methods and technology have greatly improved in the last five years, some fundamental questions still remain. These three papers highlighted one of such issues and started a healthy discussion towards setting up standardized methods to implement and evaluate PHM solutions.

The first two papers dealt with metrics for evaluating the performance of PHM methods while the third one highlighted the fact that PHM has many stakeholders and that these metrics must be designed keeping user objectives

of these stakeholders in mind. The paper by Saxena, Celaya, Saha, Saha, and Goebel was the first of its kind that surveyed offline prognostic metrics that incorporate probabilistic uncertainty estimates from prognostic algorithms. The paper attempted to standardize the various metrics under a unified prognostic framework and provides guidelines to assist researchers in using the metrics. The debate started by this paper is still current and pushes the state-of-the-art in prognostic performance evaluation. The second paper by Feldman, Kurtoglu, Narasimhan, Poll, Garcia, de Kleer, Kuhn, and Gemund presented a general framework, called DXF, to compare and evaluate performance of diagnostic algorithms/approaches. Using a set of standard metrics and a benchmark dataset thirteen different algorithms were evaluated. These evaluations highlight different aspects of diagnostic performance and, therefore, suggest directions for improvements as needed for each of these algorithms. Above all a method is presented to standardize performance evaluation in a systematic framework. The final paper by Wheeler, Kurtoglu, and Poll highlighted a very important aspect that goodness of performance is defined by stakeholders' user objectives and expectations. Therefore, these metrics must map to objectives that are relevant to users. A comprehensive review of cases from industry and military aerospace applications is presented to identify gaps in existing metrics towards these goals.

I am confident that this first issue of IJPHM will prove to be an indispensable reference for researchers in PHM. The PHM Society is proud to make these papers available to the global community through open access.

ABHINAV SAXENA, *Editor*  
Intelligent System Division  
NASA Ames Research Center  
Moffett Field, CA 94035 USA



**Dr. Abhinav Saxena** is a Research Scientist with SGT Inc. at the Prognostics Center of Excellence of NASA Ames Research Center, Moffett Field CA. His research focus lies in developing and evaluating prognostic algorithms for engineering systems using soft computing techniques. He has co-authored more than seventy technical papers including several book chapters on topics related to PHM. He is also a member of the SAE's HM-1 committee on Integrated Vehicle Health Management Systems and IEEE working group for standards on prognostics. Dr. Saxena has been serving as editor-in-chief of the International Journal of PHM since 2011 and has led technical program committees in several PHM conferences. He has a PhD in Electrical and Computer Engineering from Georgia Institute of Technology, Atlanta. He is SGT Technical Fellow for Prognostics, has been a GM manufacturing scholar and is also a member of several professional societies including PHM Society, SAE, IEEE, AIAA, and ASME.