EMBC Workshop Proposal

Workshop Type (select one):

Workshop Title:

Open Challenges in Deep Learning for Biomedical Image Analysis

Workshop Organizer Name & Affiliation:

Ghada Zamzmi and Sameer Antani, National Library of Medicine, NIH

Workshop Organizer/Speaker Name & Affiliation 1:

Andrew Laine, Columbia University

Workshop Organizer/Speaker Name & Affiliation 2:

Dmitry Goldgof, University of South Florida

Workshop Organizer/Speaker Name & Affiliation 3:

Ming Jack Po, Google

Workshop Organizer/Speaker Name & Affiliation 4:

Siva Rajarman, National Library of Medicine, NIH

Workshop Organizer/Speaker Name & Affiliation 5:

Anthony Reina, Intel

Workshop Organizer/Speaker Name & Affiliation 6:

Zhiyun Xue, National Library of Medicine, NIH

Workshop Organizer/Speaker Name & Affiliation 7:

Mu Zhou, Stanford University

Theme (Select one):

- ◯ 01. Biomedical Signal Processing
- ⊙ 02. Biomedical Imaging and Image Processing
- ◯ 03. Micro/Nano-bioengineering; Cellular/Tissue Engineering & Biomaterials
- ◯ 04. Computational Systems & Synthetic Biology; Multiscale modeling
- ◯ 05. Cardiovascular and Respiratory Systems Engineering
- ◯ 06. Neural and Rehabilitation Engineering
- ◯ 07. Biomedical Sensors and Wearable Systems
- ◯ 08. Biorobotics and Biomechanics
- ◯ 09. Therapeutic & Diagnostic Systems and Technologies
- ◯ 10. Biomedical & Health Informatics
- ◯ 11. Biomedical Engineering Education and Society
- ◯ 12. Translational Engineering for Healthcare Innovation and Commercialization

Workshop Synopsis— Max 2000 Characters

Deep learning continues to make significant impact in biomedical research, engineering, and healthcare. It has been shown to have a significant impact in image acquisition, image analysis and understanding, and natural language processing applied to e-health data. In medical image analysis, deep learning, or artificial intelligence (AI), has spawned several research topics related to healthcare applications, which rely heavily on extracting useful information from complex images of various modalities. These applications demand high performance from key image analysis subtasks, e.g., segmentation, classification, visual information retrieval, and disease screening and diagnostics, among others.

In spite of these advances, there have been inadequate systematic studies discussing efficiency in deep learning model design, data characteristics impacting the performance, and prediction decision reliability. The proposed workshop aims to address these issues through invited presentations from leading organizations involved in deep learning and biomedical research. These will be followed by a moderated panel discussion.
The topics to be discussed in the workshop are identified below:
• Data and training challenges for reliable decision-making (e.g., adversarial learning, data augmentation, class imbalance, few-shot learning, anomaly detection)
• Design characteristics of deep learning models
    Resource sensitive engineering and design (e.g., model optimization, computational efficiency, memory and power use).
    Model design (e.g., lightweight architecture, model compression and ensembles, multi-task learning, uncertainty modeling)
• Interpretation transparency and explainability

The criteria above collectively aim to improve AI decision-making performance while also providing a pathway for use in latency-sensitive applications and resource-limited environments. We believe that there is a critical need for a workshop that comprehensively discusses these topics.

More information about the workshop can be found in: https://ghadazam.github.io/index.html#intro