Welcome to the SES/ANSI November 2018 Webinar

“Artificial Intelligence and the Impact on Standards”

November 7, 2018
1:00 - 2:30 pm Eastern

Lisa Spellman - Moderator
General-Secretary, DICOM, SES Education Committee Chair

Peter Bajcsy Ph.D.
NIST – Guest Speaker

Michael Arnold
UL LLC - Guest Speaker

Norman Shaw
IEEE - Guest Speaker
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AI Technology and Standards

Webinar organized by SES: The Society for Standards Professionals
Wednesday November 7 from 12-1:30pm (CST)

Peter Bajcsy
Software and Systems Division, Information Technology Laboratory, National Institute of Standards and technology
Needs for AI Technology Standards

• Standard for **AI model representation**:  
  – NIST activity: Inter-operable Representation of Trained CNN Models

• Standard for **training data augmentation**:  
  – NIST activity: Augmentation of training data (models and their parameters) and confidence in AI-based model accuracy

• Standard for **AI as a service**:  
  – NIST activity: Training AI models in computer cloud environments
Inter-operable Representation of Trained CNN Models

Overview
- Survey of 50 AI frameworks

Evaluation Criteria
- Repository activity (commits, news, etc.)
- Community involvement (Github stars, papers)
- Licensing (looking for open-source framework)
- Offered features
- Installation and quick testing
- CPU only, docs, multi-processing, supported hardware, supported CNN types, etc.

Why NIST
- Given 50 AI frameworks, there is a need to establish inter-operable representations of AI models

Accomplishments
- Round 1: 50→22 (25 deprecated & abandoned, 3 proprietary licenses)
- Round 2: 22 → 10 (CPU only, Matlab, docs, …)
- Suitable framework candidates
  - Tensorflow, Caffe2, Keras, CNTK, PyTorch
- Watchlist of frameworks
  - DeepLearning4J, MXNET, Chainer, Apache Singa, Neon

Summary
- Analyzed AI framework & AI model format
- Explored inter-operable representation of AI models:
  - ONNX = open neural network exchange format
  - ONNX models are currently supported in Caffe2, Microsoft Cognitive Toolkit, MXNet, and PyTorch
Augmentation of Training Data and Confidence

Overview

- Terascale Image Collection
- Segment Unlabeled Images
- Generalization Accuracy
- Validation Accuracy
- Train CNN Model
- Apply Model
- Select and Annotate
- Manual Annotation

Why NIST

- There is a confidence problem in segmentation generalization accuracy for terascale image collections

Experimental Augmentation Results

- Dice - Annotated
- Dice - Augmented 30%

Summary

- Evaluated impact of augmentation models and the corresponding parameters on stem cell colony image segmentation results
- Outlined challenges related to sampling, augmentation, and the use of transfer learning and Generative Adversarial Networks (GAN) to improve the confidence in segmentation generalization accuracy
CNN Models in Computer Cloud Environments: AI as a Service

Overview
• CNN Models available to NIST researchers

Data and Methods
• Training Data
  • Retinal pigment epithelial (RPE) cell implants from NIH
  • Cell colonies, cell organelles, and concrete damage annotations for semantic segmentation and classification
• Current CNN models
  • Unet-RPE-Absorbance
  • Unet-RPE-Z01
• Docker containerization to run in a computer cloud
• Execution on GPU platforms

Why NIST
• There is a lack of AI models that (1) are directly available to scientists deriving microscopy-based measurements from TB-sized images and (2) run in computer cloud environments with GPUs.

Accomplishments
• Annotation tools, CNN-based semantic image segmentation training and inference have been deployed via the WIPP web system

Summary
• We aim at lowering the barrier for domain scientists to use existing CNN models and apply them to big image data via a Web Image Processing Pipeline (WIPP) running in a cloud.
IEEE Initiatives in Artificial Intelligence and Autonomous Systems

Norman Shaw - Director
IEEE Standards Association
Mandate

- Create “Ethically-aligned” autonomous and intelligent systems:
  - Incorporate ethical aspects of human wellbeing that may not automatically be considered in the current design and manufacture of AIS technologies
  - To reframe the notion of success so human progress can include the intentional prioritization of individual, community, and societal ethical values
IEEE Initiatives in Artificial Intelligence and Autonomous Systems

• Intersection of technology, policy and standards
  • An emphasis subject for IEEE Standards Association (IEEE-SA)

• Specific Activities include: Ethics Initiative (IC), Digital Trust & Identity, Internet Initiative

• IEEE Global Initiative for Ethical Considerations in Artificial Intelligence and Autonomous Systems
  • Ethically Aligned Design; Global Engagement; Standards Projects
  • Portfolio of standards working groups are underway – IEEE P7000™ Series

• Applications in Autonomous Systems
  • Focus on technology enablement of connected cars and autonomous vehicles
Initiative Milestones

- Currently more than 200 AI / Ethics experts involved from the US, EU, Australia, India, China, Korea, and Japan
- 13 Committees creating content plus groups supporting outreach, visibility, etc.
- Events featuring Ethically Aligned Design in India, Japan, China, World Economic Forum, EU Parliament, and UN/ITU in Geneva
IEEE Tools for Collaboration
Digital Inclusion through Trust and Agency
Industry Connections Program

- **INDUSTRY CHALLENGE**
  - A clear and imminent threat to the security of everyone’s digital identity within the digital universe
  - Lack of industry-recognized definition for “what is digital identity.”

- **The Desired Outcome via the Industry Connections Program**
  - Developing a framework for placing parameters on different “priority” levels of digital identity

- **Trust and Agency** – Using the “Digital Identity Framework Discussion” as a roadmap combined with the robustness of distributed ledger and other emerging technologies that provide a platform to support the digital citizen self-managing their data with the desired outcomes
  - The ability to be forgotten online and offline
  - Having the option with which (entity) to transact
  - Protecting and securing one’s data
  - Developing frameworks that equally benefit the privileged and the underserved
Ethically Aligned Design

A Vision for Prioritizing Human Wellbeing with Artificial Intelligence and Autonomous Systems
IEEE P7000™ Series Standards Projects

- IEEE P7000™: Model Process for Addressing Ethical Concerns During System Design
- IEEE P7001™: Transparency of Autonomous Systems
- IEEE P7002™: Data Privacy Process
- IEEE P7003™: Algorithmic Bias Considerations
- IEEE P7004™: Standard on Child and Student Data Governance
- IEEE P7005™: Standard on Employer Data Governance
- IEEE P7006™: Standard on Personal Data AI Agent Working Group
- IEEE P7010™: Wellbeing Metrics Standard for Ethical Artificial Intelligence and Autonomous Systems
IEEE Standards Development Process

1. Identify a Sponsor
2. Project approval
3. Develop draft standard
4. Sponsor ballot
5. Standards Board approval
6. Publication

- Revise or withdraw standard
IEEE-SA and Technology Policy

• Technology Policy = one of four IEEE 2015-2020 Goals:
  • Leverage IEEE’s technology-related insight to provide governments, NGOs and other organizations, and the public with innovative and practical recommendations to address public policy issues

• Connect technologists with policy makers/venues to amplify the voice of the technical standards community

• Working at the intersection of technology and policy to advocate for and inform policy makers and other stakeholders about the IEEE standards development paradigm of collaborative, bottom up, technical, consensus-based open standards development

• Facilitate and promote technology policy environments that promote open, inclusive and transparent standards development
  − Goal is to foster global competition, provide building blocks for innovation, enable global interoperability, scalability, stability and resiliency, and contribute to the creation of global communities that advance technology to benefit humanity.

• Develop and advocate contributions, positions and policies that promote best practices for open consensus and collaborative activities, including global standards and open participation
Trust: Digital Inclusion, Digital Identity & AS/AI
Integrated approach

- Optimizing the relationship & work of initiatives & programs
  - *Global Initiative on the Ethical Considerations in the Design of Autonomous Systems IC*
  - *Digital Inclusion through Trust and Agency IC*
  - *IEEE Internet Initiative/Internet Inclusion*
- Encouraging privacy & ethical responsibility in technology development & use
- Educating & informing developers & users
- Identifying opportunities for technical oriented outputs that support interoperability & trustworthy solutions and models
- Advocating for & bolstering collective action for a trust agenda
https://ethicsstandards.org/

https://standards.ieee.org/industry-connections/ec/autonomous-systems.html
Thank you

For more information, please contact:

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IEEE-SA
standards.ieee.org
INCORPORATION OF AI IN PRODUCT COMPLIANCE STANDARDS MANAGEMENT

iON Compliance, UL LLC
Industry now needs to move from point-in-time TIC to provide real-time risk and safety insights by dynamically monitoring and analyzing huge volumes of digital data.
Unprecedented volumes of data, gathered and connected in real time.

More regulation, More complex compliance, High cost of risk management.


Real-time monitoring, Demand for transparency and real-time insight.

These factors are increasing our customers’ exposure to risk and making it more difficult to manage their businesses.

The ability to retain control impacts safety, competitiveness, profitability and reputation.
THE CONSEQUENCES

Compliance
It’s **expensive** and **time consuming** to remain compliant

Productivity
Getting new products to market is **more complex than ever**

Risk
Increased liability exposure and cost of fines, recalls, and legal action

Foresight
We are **not solving high value problems of risk and insight** to protect our business and keep consumers safe
HOW ION FINDS SIGNALS IN NOISE

Step 1: Massive amounts of product, regulatory and other information ingested into iON

Step 2: Data is related to customer environment and specific problem to be solved (e.g., complaint to product)

Step 3: Additional dimensions added to data and relationships between elements defined (e.g., complaint to product risk to chemistry to supplier)

Step 4: Insights surface as patterns emerge between aggregate data elements to identify outliers and impacts

Step 5: Combining UL and customer expertise offers “focus” to the insights & makes them actionable & more accurate
ION – PROTOCOL AGGREGATOR

Automate product compliance tracking from a single source and enable predictive analysis to maintain protocols more effectively and robustly with less effort.
HOW PROTOCOL AGGREGATOR WORKS
# HOW PROTOCOL AGGREGATOR WORKS

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<thead>
<tr>
<th>Product Category ID</th>
<th>Country</th>
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<td>Family</td>
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HOW PROTOCOL AGGREGATOR WORKS

Protocol Details | SKUs | Revision History

- Energy & water conservation
- EnergyGuide
- #IECEE CB Scheme
- Uniform Plumbing Code (UPC)
HOW ION – PROTOCOL AGGREGATOR WORKS

Take action on your Impact
Take a look at the impacts affecting your protocols. Rate the accuracy.

**Water Tanks**

**Regulation**
N/A

**Requirements**
10 CFR 430 establishes an energy conservation program for consumer products as per the Energy Policy and Conservation Act (EPCA), as amended. The regulation...

**United States of America (USA)**


This final rule incorporates by reference the most recent versions of relevant industry standards; modifies the existing test methods for certain classes of CWH equipment; establishes new test procedures for determining the efficiency of commercial heat pump water heaters and standby loss for instantaneous water heaters and hot water supply boilers; clarifies test set-up and settings for various classes of CWH equipment; revises the certification requirements for CWH equipment; and establishes associated definitions.

**Products Covered**

- Boilers
- Water Heaters

**Regulatory Topics**

- Declaring/certifying conformity
- Energy Efficiency
- Testing

How relevant is this alert to the test method?

- Not relevant
- Relevant

Save Rating  NEXT ➔
RESHAPING THE LANDSCAPE

AGGREGATING DATA
Data ingestion and cloud databases eliminates disparate data sources

STAYING SAFE IS EASIER
Machine learning provides actionable insights to evolve your product quickly and knowledgeably

REDUCING RISK
Cost of recall, Product failure litigation, Impact on Brand, Impact on company valuation

EVOLVING NEEDS MET
Real time monitoring and updates make maintaining regulatory specifications and protocols easy
THANK YOU

These factors are increasing our customers' exposure to risk and making it more difficult to manage their businesses. The ability to retain control impacts safety, competitiveness, profitability and reputation.
Heather Benko

ANSI
Structure of SC 42

SC 42/WG 1 Foundational standards
SC 42/WG 2 Big data
SC 42/WG 3 Trustworthiness
SC 42/WG 4 Use cases and applications
SC 42/SG 1 Computational approaches and characteristics of artificial intelligence systems
SC 42/AHG Dissemination and outreach
SC 42 Progress

SC 42 program making great progress in its first year

- 9 projects underway
  - 5 international standards and 4 technical reports
  - 3 related to big data, 2 related to foundational AI, 3 related to AI trustworthiness and 1 AI use cases
- 4 working groups, 1 study group and 1 ad-hoc group setup to progress the work
- Extensive collaboration underway with internal and external liaisons setup
SC 42 Projects, Status and Leadership

SC 42/WG 1 Foundational standards

- Terms of reference: Development of foundational standards for Artificial Intelligence
- ISO/IEC AWI 22989: Artificial Intelligence Concepts and Terminology
  - Editor: Wei Wei (Germany)
  - Editor: Milan Patel (United Kingdom)

SC 42/WG 2 Big data

- Terms of reference: Standardization in the area of Big Data
- Convenor: Wo Chang (United States)
- ISO/IEC DIS 20546: Information technology – Big Data – Overview and Vocabulary
  - Editor: David Boyd (United States)
  - Editor: Ray Walshe (Ireland)
SC 42 Projects, Status and Leadership

SC 42/WG 3 Trustworthiness

- Terms of reference: Standardization in the area of AI Trustworthiness
- Convenor: David Filip (Ireland)
- Secretariat: Barry Smith (Ireland)
- TR on Bias in AI systems and AI aided decision making
  - Editor: Jutta Williams (United States)
- TR on Overview of trustworthiness in Artificial Intelligence
  - Editor: Orit Levin (United States)
- TR on Assessment of the robustness of neural networks - Part 1: Overview
  - Editor: Arnault loualalen (France)

SC 42/WG 4 Use cases and applications

- Terms of reference: Use cases and applications for AI standardization
- Convenor: Fumihiro Maruyama (Japan)
- Secretariat: Nobuhiro Hosokawa (Japan)
- TR on Use cases
  - Editor: Yuchang Cheng (Japan)
SC 42 Projects, Status and Leadership

SC 42/SG 1 Computational approaches and characteristics of artificial intelligence systems

- Convenor: Tangli Liu (China)
- Secretariat: Qun Zhang (China)

SC 42/AHG Dissemination and outreach

- Convenor: Wael William Diab (SC 42 Chair)
- Secretariat: Heather Benko (SC 42 Secretariat)
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