Toolkits:

Enabling Ubiquitous Intelligence in future networks

[Presentation to Joint ITU-ETSI Workshop on Machine Learning in Communication Networks 16-Mar-2020]

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https://www.itu.int/en/ITU-T/focusgroups/ml5g/Pages/default.aspx
Agenda

• ITU Toolkit for Enabling Ubiquitous Intelligence in future networks
  • Data handling framework
  • Distributed Sandbox
  • Serving/optimization framework
  • Orchestration of intelligence
  • Interoperable marketplace
  • Levels of intelligence

• Potential collaboration opportunities
Enabling ubiquitous intelligence: Toolkit #1: data handling

- Approved: ITU-T Y.3174 “Framework for data handling to enable machine learning in future networks including IMT-2020”
- https://www.itu.int/rec/T-REC-Y.3174-202002-P/en (prepublished)

- How to handle the diversity in network data sources?
- How to handle the increased flexibility and agility in future networks?
- How to approach the different kinds of data handling requirements?
Enabling ubiquitous intelligence: Toolkit #2: ML Sandbox

- Ongoing work: Machine Learning Sandbox for future networks including IMT-2020: requirements and architecture framework

(simplified figure from ITU-T ML5G-I-232)

ML sandbox allows experimentation, comparison, benchmarking, testing and evaluation before the Model hits the live network
Enabling ubiquitous intelligence: Toolkit #3: Serving framework

• Ongoing work: Serving framework for ML models in future networks including IMT-2020
• https://extranet.itu.int/sites/itu-t/focusgroups/ML5G/input/ML5G-I-227-R1.docx (status: draft)

Requirements and architecture for serving ML models in future networks including IMT-2020, including inference optimization, model deployment and model inference.

Serving framework provides platform specific optimizations, deployment preferences and inference mechanisms.
Enabling ubiquitous intelligence: Toolkit #4: MLFO

- Ongoing work: Requirements, architecture and design for machine learning function orchestrator
- [https://extranet.itu.int/sites/itu-t/focusgroups/ML5G/input/ML5G-I-216-R1.docx](https://extranet.itu.int/sites/itu-t/focusgroups/ML5G/input/ML5G-I-216-R1.docx) (status: draft)

MLFO orchestrates the operation of machine learning pipeline across the network to provide a managed AI/ML integration for the operator.

(simplified figure from ITU-T ML5G-I-216-R1)

- ML Underlay
- ML Overlay
- ML Sandbox
  - Model Optimizer
  - ML pipeline
  - ML pipeline
  - Serving framework
  - NF-s
  - NF-s
  - Simulated ML Underlay

Intelligence in the network

Managed ML

Unmanaged ML

Operator control, confidence
Enabling ubiquitous intelligence: Toolkit #5: Intelligence levels

- Approved: ITU-T Y.3173 “Framework for evaluating intelligence levels of future networks including IMT-2020”
- [https://www.itu.int/rec/T-REC-Y.3173-202002-P/en](https://www.itu.int/rec/T-REC-Y.3173-202002-P/en) (prepublished)

Intelligence levels helps MLFO to interoperate between different ML solutions in the network.
Enabling ubiquitous intelligence: Toolkit #6: ML Marketplace

- Draft Recommendation: ML marketplace integration in future networks including IMT-2020
- ITU-T Y.ML-IMT2020-MP (status: under Q20/13 review)

(simplified figure from ITU-T Y.3173)

Enables standard mechanisms to exchange ML models and related metadata between the network and ML marketplace.
Liaisons

ETSI ZSM (closed loop)

ETSI ENI (Intelligence levels)

O-RAN (Data handling)

Linux Foundation AI (open source, AI challenge)

IRTF NMRG (AI challenge)

MPEG (ISO/IEC) (model compression)

LS are published in ML5G website

https://extranet.itu.int/sites/itu-t/focusgroups/ML5G/SitePages/Home.aspx
Accessible via guest account for non members of ITU-T
Collaboration to enable ubiquitous intelligence

ITU AI/ML GLOBAL CHALLENGE IN 5G

• Spread over 9 months in 2020
• Bringing participants from all member countries of ITU.
• Four tracks, 2 rounds, 1 conference.
• Apply AI/ML to IMT-2020 networks
• Encouraging open source
• Mentoring students
BACKUP slides
ITU ML5G Challenge: AIMS and Objectives

- Bring together network operators, network manufactures and academia
- Innovate and solve 5G problems with AI/ML
- Apply ITU’s AI architecture in 5G

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* Secure data handling practices (sandboxes for Real anonymized network data)
Students
Students need to be registered as students at a university when they sign up for the ITU ML5G Challenge.

Professionals
Anyone else is considered a “professional”. A person who has the necessary skills to complete the problem sets they choose to tackle in the Challenge.

ITU ML5G Challenge: Participation and Timelines

Students
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Professionals
Anyone else is considered a “professional”. A person who has the necessary skills to complete the problem sets they choose to tackle in the Challenge.
ITU ML5G Challenge: Potential collaboration opportunities

Proposal-1: Co-branding, Joint messaging and promotion, Joint analysis of use cases, identify ML solutions/models/datasets which fits a solution.

*Example of expected feedback:* “yes, this looks interesting and my organization has seen similar problems”, “yes, we have similar models in our marketplace”, “yes, there are optimization tools which can work with such models”.

Proposal-2: Collaborate on contributions to open source, hosting platforms.

Proposal-3: Swap notes on funding opportunities, sponsors, hosts, joint conference opportunities [*sponsor package can be discussed separately*].

Next step: Open a channel for coordinating the above and follow ups with ITU. Please send participation interest to vishnu.n@ieee.org, ai5gchallenge@itu.int
Thank you!