Introduction to IRTF Network Machine Learning (NML) Proposed Research Group (RG)

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Internet Research Task Force (IRTF)

- The IRTF promotes research of importance to the evolution of the Internet by creating focused, long-term Research Groups working on topics related to Internet protocols, applications, architecture and technology

- The IRTF has a sister standardization organization, the Internet Engineering Task Force (IETF), focuses on the shorter term issues of engineering and standards making

- The IRTF is a bridge between the academic or future-oriented research and the standardization for commercial or engineering usage in the Internet area

Motivation of the Proposed NMLRG

- Networks and network problems become more and more complicated, many varieties and dynamically changing
  - Looking for new mechanism that can adapt to various and dynamic environment
  - Looking for autonomic mechanism to replace human operations, even human programming
- Machine learning was also motivated by tasks that are extremely difficult to program by hand
  - Advantages: robustly solve complicated tasks, reliance on real-world data instead of pure intuition, be able to adapt to new situations
- The Network Machine Learning Research Group (NMLRG) provides a forum for researchers to explore the potential of machine learning technologies for networks.

Potential Usage in Network Area

- **The machine learning mechanism can be used to intelligently learn the various environments of networks and react to dynamic situations**
- **Many network aspect can benefit: network establishing, controlling, managing, network applications and customer services, etc.**
  - acquire knowledge from the existing networks so that new networks can be established with minimum efforts;
  - use machine learning mechanisms for routing control and optimization;
  - predict future network status in network management;
  - autonomic and dynamically manage the network;
  - analyze network faults and support recovery;
  - learn network attacks and their behaviors, so that protection mechanisms could be self-developed;
  - unify the data structure and the communication interface between network/network devices and customers, so that the upper-layer applications could easily obtain relevant network information, etc.

Precondition of Applying Machine Learning Approach

- Although it is different from big data or data mining, machine learning does also need **data**. However, machine learning can be applied with small set of data or dynamic feedback from environment. The quality of data decides the efficient and accuracy of machine learning result
- There is **no generic machine learning mechanism** that could suitable for all or most of use cases. For each use case, the developers need to design a specific learning path, which may combine multiple approaches or algorithms together. The feature design and learning path design are the key factors in the machine learning applications

Example Use Case - Network Traffic

- Network traffic is one of the most important objectives that needs to be managed
- Traffic meet preconditions of applying ML
  - Data, measurable
  - Complicated & dynamic changing
  - Sudden vs. regularity
- There are many different types of network traffic
  - Various use cases in different scenarios

Let’s have good discussion today

and in the future!

Thank You!

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