UNIVERSITÀ DI PISA

DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

Dottorato di Ricerca in Ingegneria dell'Informazione

Doctoral Course

"**Anomaly Detection in IoT Streaming Data with Deep Learning**"

Ettore Ritacco

Institute for high performance computing and networking (ICAR)
National Research Council (CNR)
Via P. Bucci Cubo 8/C, 87036
Rende (CS), Italy

Short Abstract:

Modern industry and social life has started a quick process of automatization, equipping (wearable) devices with sensors, actuators and artificial intelligences. Any device is supposed to work according to expected functionalities, but sometimes they generate unexpected behaviors due to changes of their environment, external events, age or failures.

In this course, we will discuss on how to find anomalies in IoT Systems (networks of intelligent devices) by exploiting the huge amount of data their sensors produce, by comparing different anomaly detection techniques up to neural networks and deep learning.

Course Contents in brief:

1. Find the unexpected: anomaly detection (4h)
   a. Classification
   b. Clustering
   c. Python for dummies

2. IoT Data Streams (4h)
   a. Definition
   b. Data cleaning and filtering
   c. Data transformation
   d. Using python for data manipulation

3. A gentle introduction to Deep Learning (8h)
   a. Machine/Deep Learning
   b. Why Neural Networks?
   c. Gradient Descent and Back Propagation
   d. Recurrent Neural Networks

     e. Autoencoders

     f. Variational Autoencoders

     g. Pytorch Implementations

4. Finding anomalies in IoT Data Streams with Neural Networks (4)

     a. Supervised approach

     b. Unsupervised approach

     c. Pytorch solutions

Total # of hours: 20

CV of the Teachers

Ettore Ritacco is a researcher at Institute for high performance computing and networking (ICAR) of the National Research Council (CNR) of Italy. He is an expert on data science, data analytics and enabling technologies for data analytics. His current research is on studying User Profiling and Behavioral Modeling, Social Network Analysis, Recommendation, Information Propagation and Diffusion, Profiling for Cyber Security, Latent Factor, Deep Learning models and IoT Data Stream Analysis. He is mainly interested in new frontiers of Computer Science and Technology aimed at analyzing Complex Big Data.

Room and Schedule

Room: *Aula Riunioni, Dipartimento di Ingegneria dell'Informazione, Largo L. Lazzarino 1, 56122 Pisa, Edificio A, piano 6*

Schedule:

N.	Lesson	Day
1	Find the unexpected: anomaly detection	November 25, 14.30 - 18.30
2	IoT Data Streams	November 26, 14.30 - 18.30
3	A gentle introduction to Deep Learning (part 1)	November 27, 14.30 - 18.30
4	A gentle introduction to Deep Learning (part 2)	November 28, 14.30 - 18.30
5	Finding anomalies in IoT Data Streams with Neural Networks	November 29, 09.00 - 13.00