

# CIFRE PhD thesis

## PhD Position on Network visibility with Machine Learning

The Network and Traffic Optimization research team of the Mathematical and Algorithmic Sciences Lab, Huawei France Research Center, located in the Paris area, is looking for highly motivated candidates for a PhD thesis on Network Traffic Analysis. The thesis will be jointly supervised with INRIA within the CIFRE framework.

### PhD thesis

According to NSS Labs, 55% of internet traffic is already encrypted. That number is expected to increase to around 75% by 2019. As a consequence, network service providers are “going dark” as every bit of encrypted data crossing their network looks the same. They cannot anymore protect, prioritize, and optimize traffic efficiently. Gaining visibility into encrypted traffic has become critical for network operators.

The analysis of encrypted traffic is facing two main challenges. Firstly, labeled examples are scarce and difficult to obtain. It requires either to analyze flows using heavy inspection methods or to have a priori knowledge on traffic. And supervised learning methods do not generalize well when being trained with few samples in the dataset. Secondly, new applications may appear over time or old applications may change their behavior. In this context, traditional supervised methods, which map unseen flow instances into one of the known classes, do not have the ability to detect new types of flows. Indeed, Models that are built through training on older version of applications often make poor and ambiguous decisions when faced with more recent or new applications - a phenomenon commonly known as *concept drift*.

To overcome these challenges, The PhD thesis will focus on *semi-supervised learning techniques* that make use of the available labeled data regarding known behaviors from the past, to detect drifts (or changes) in unlabeled data made available in the future. And more particularly on two key problems: the *online change detection* and the *adaptation of classifiers under concept drifting*.

### Specific Requirements

Ideal candidates should have a Master degree in Telecommunications, Computer Science, or Applied Mathematics from a University or a Grande Ecole. They should have a solid background in Machine Learning. Knowledge of telecommunications will be appreciated.

**English:** Operational

### Contacts

- Huawei FRC: and Dr. Jeremie LEGUAY (jeremie.leguay@huawei.com)
- INRIA: Dr. Renata Teixeira (renata.teixeira@inria.fr) and Prof. Vassilis Christophides (vassilis.christophides@inria.fr)

### Application

To apply please send a complete CV, a motivation letter, grades of University/Grande Ecole studies, and references.

### Huawei

The Huawei France Research Center (FRC) located in Boulogne-Billancourt, Paris area, is responsible for advanced research in the fields of Algorithm and Software design, Aesthetics, MBB & Home devices and Parallel Computing, to create and design the innovative technologies and software platforms for our Brand.