by decreasing fingerprint uniqueness. The goal of this Ph.D. project is to reduce the capacity of fingerprints, as well as recommender systems to suggest configuration changes that improve privacy that will allow creating tight-knit groups of users that share the same fingerprint or similar proof-of-concept tools. We are particularly interested in the use of advanced classification algorithms approaches to enhance users' privacy, and is expected to empirically assess theoretical results with transcripts from previous years. These datasets will leverage the study of browser fingerprint diversity and infrastructure, and associated datasets we collected through the AmIUnique.org website and browser extensions for over 3 years. The Ph.D. student will therefore explore algorithmic and mathematical the way fingerprints evolve over long periods of time.

A propos du centre ou de la direction fonctionnelle

About the research center or the Inria department:

The Inria Lille – Nord Europe Research Centre was founded in 2008 and employs a staff of 360, including 300 scientists working in sixteen research teams. Recognised for its outstanding contribution the socio-economic development of the Nord - Pas-de-Calais Region, the Inria Lille – Nord Europe Research Centre undertakes research in the field of computer science in collaboration with a range of academic, institutional and industrial partners.

The strategy of the Centre is to develop an internationally renowned centre of excellence with a significant impact on the City of Lille and its surrounding area. It works to achieve this by pursuing a range of ambitious research projects in such fields of computer science as the intelligence of data and adaptive software systems. Building on the synergies between research and industry, Inria is a major contributor to skills and technology transfer in the field of computer science.

Contexte et atouts du poste

Job environnements:

Browsers and web technologies, such as HTML 5, are redefining the limits of what web applications can do. At the same time, concerned web users are becoming aware of practices that jeopardize their privacy, security and comfort, as it can be seen by the immense popularity of browser extensions, like AdBlock and Ghostery, as well as new legislation concerning the use of cookies and tracking technologies. However, a new threat to privacy that leaves no trace on users’ devices has emerged. Browser fingerprinting [Eckerseley10, Laperdrix16] exploits modern web technologies, protocols and APIs to uniquely identify users. The leaked data is stored on remote servers the user has no control over it. Encryption does little to limit browser fingerprinting as it is performed by the website you visit: it is not a sniffing nor man-in-the-middle attack. Moreover, browser fingerprinting is becoming widespread [Englehardt16], and is used to complement or even replace cookies for tracking purposes. And new research shows it can be used to track people for extended periods of time [Vastel18].

Browser fingerprinting is therefore an important threat to privacy.

Browser fingerprinting techniques evolve with the addition and deprecation of APIs, web standards and new technologies. To protect users from long term tracking, we need countermeasures that can easily be maintained to adapt to new fingerprinting vectors. To address as many users as possible, not only effectiveness but also usability should be an important objective.

https://www.inria.fr/equipes/spirals

Mission confiée

Assignments:

Positioned in the context of online privacy and web tracking, this Ph.D. topic will focus on developing effective browser fingerprinting countermeasures. The PhD will benefit from our fingerprint research infrastructure, and associated datasets we collected through the AmIUnique.org website and browser extensions for over 3 years. These datasets will leverage the study of browser fingerprint diversity and the way fingerprints evolve over long periods of time.

This Ph.D. will address the design and experimentation of collaborative strategies to protect users from browser fingerprinting. The Ph.D. student will therefore explore algorithmic and mathematical approaches to enhance users' privacy, and is expected to empirically assess theoretical results with proof-of-concept tools. We are particularly interested in the use of advanced classification algorithms that will allow creating tight-knit groups of users that share the same fingerprint or similar fingerprints, as well as recommender systems to suggest configuration changes that improve privacy by decreasing fingerprint uniqueness. The goal of this Ph.D. project is to reduce the capacity of
nowadays and upcoming browser fingerprinting techniques to uniquely identify browsers.

The objective of this Ph.D is to define and implement new strategies to protect against browser fingerprinting, in particular by reducing fingerprint uniqueness, while ensuring that the proposed solutions are acceptable by non-technical users.

**Principales activités**

**Main activities**

In order to do so, we propose to apply the following methodology:

1. Evaluate and classify the state of the art of browser fingerprinting techniques, including academic and those found in-the-wild (e.g., by reverse engineering commercial fingerprinting scripts and inferring their tracking strategies);

2. Evaluate the impact of current browser fingerprinting countermeasures. One of the ways to detect the presence of fingerprinting countermeasures is to look at inconsistencies they introduce in the fingerprint. Indeed, when these countermeasures alter attributes to spoof the browser's identity, they may introduce impossible combination of attributes;

3. Model the distance between fingerprinted attribute values and between browser fingerprints.

4. Build a countermeasure that generates consistent fingerprints, and takes into account the strategies used by fingerprinters. One possible strategy to investigate would be to find users with similar fingerprints, and to apply minimal changes so that altered browser fingerprints look the same to fingerprinters.

5. Analyze the usability and the impact of the proposed countermeasure.

This Ph.D. builds upon our previous work, Blink [Laperdrix15], a countermeasure that relies on virtualization (virtual machines or containers) and random reconfiguration to break fingerprint linkability. Although effective against tracking, Blink’s has overhead has shown to be a deterrent to its use and a new approach is needed. This Ph.D. also benefits from our studies regarding fingerprint statistical analyses [Laperdrix16], as well as advanced machine learning techniques to track browsers over long periods of time [Vastel18].

**References**


**Compétences**

**Skills**
The Ph.D. candidate will develop her/his skills in Web technologies, in particular Javascript. Moreover, the candidate will also develop skills in Python, as well as machine learning and statistical data analysis, among many other technologies.

As is a common practice in the Spirals research team, all source code is expected to be open sourced. The student should publish high-level academic papers, as well as participate in related open source communities. This should assist in the technological transfer from academic prototypes to industry-ready tools.

**Avantages sociaux**

**Benefits**

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Sports facilities
- Flexible working hours

More information about Lille:

http://www.lille3000.eu/portail/
http://www.lillemetropole.fr/mel.html

**Rémunération**

**Remunerating**

The gross monthly salary is 1982€ for the 1st and 2nd year and 2085€ for the 3rd year.