An environment where a “traditional” communication paradigm is difficult (e.g., environments too noisy with too many interferences);

2) Data rate could be higher than traditional communication (e.g., as in the case of the VLC paradigm);
3) The possibility to design and implement “smart” devices, that could adaptively select the best way to communicate based on their proper current status, the status of the neighbors and the surrounding conditions.

**Topic:** The objective of this PhD course is to study and derive alternative communication paradigms among mobile devices. At the beginning, the PhD student will review the literature, by focusing on different and alternative (in respect of traditional techniques), such as computer vision techniques. The candidate will be supported in the definition of the requirements of the system as system supporting a new communication paradigm and can exploit the background and expertise of the team in this context acquired in the last years and that dealt to the implementation of two test-beds.

The first one is concerning a VLC communication system where an Artificial Intelligence (AI) approach has been developed on top of the receiver (a photodiode) in order to manage control parameters to reduce the Bit Error Ratio (BER) [2].

The other test-bed is implementing an indoor geo-localization system with a mobile user (i.e. the transmitter) that has to be geo-localized.

The final part of the doctoral program will be devoted to the design and implementation of a communication protocol based on a specific novel communication paradigm. The PhD candidate will be asked to analyze and identify some specific evaluation parameters, in order to define the goodness of the protocol.

Moreover, the candidate will be asked to investigate and study the learning techniques, in order to develop effective and efficient cooperation mechanisms among the nodes.


**Project Team Link:** [http://team.inria.fr/fun/](http://team.inria.fr/fun/)

*For more details on VLC publications:* [http://researchers.lille.inria.fr/~loscri/publications.html](http://researchers.lille.inria.fr/~loscri/publications.html)

**Main activities**

**Main activities:**

1) Acquisition of theoretical background and knowledge to design communication techniques based on a different communication paradigm;

2) Design of cooperation techniques based on a new communication paradigm and capacity to identify the criticism of the communication system;

3) Revision of Artificial Intelligence techniques and identification of a suitable AI approach to be applied to the communication system in order to improve the communication performance of the system (e.g. its capability to react to the interference);

4) Identification of target scenarios for testing the developed techniques;

5) Validation of the proposed solutions.

**Skills**

**Skills**

**Technical skills and level required:**

- Very good programming skills in C/C++/Python, Experience using Linux systems
- Ability to implement code on real devices
- The willingness to contribute to interdisciplinary scientific project
- Strong mathematical and physical background

**Languages:**

- English

**Relational skills:**

- The willingness to contribute to interdisciplinary scientific project
- Sense of organization, autonomy, rigor
- Teamwork taste
- Listening and communicating with non-technical contacts;

**Other valued appreciated:**

- Know write notes / reports
Benefits package

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

Remuneration

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