



Offre n°2024-07593

## PhD Position F/M Uncoordinated Multi-User Wireless Communications

*Le descriptif de l'offre ci-dessous est en Anglais*

Type de contrat : CDD

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Doctorant

### A propos du centre ou de la direction fonctionnelle

The Inria research centre in Lyon is the 9th Inria research centre, formally created in January 2022. It brings together approximately 300 people in 16 research teams and research support services.

Its staff are distributed at this stage on 2 campuses: in Villeurbanne La Doua (Centre / INSA Lyon / UCBL) on the one hand, and Lyon Gerland (ENS de Lyon) on the other.

The Lyon centre is active in the fields of software, distributed and high-performance computing, embedded systems, quantum computing and privacy in the digital world, but also in digital health and computational biology.

### Contexte et atouts du poste

Inria is the French national research institute for digital science and technology. At Inria, more than 3900 researchers and engineers organized in 215 project-teams, most of which are shared with major research universities, explore new paths, often in an interdisciplinary manner and in collaboration with industrial partners to meet ambitious challenges. As a technological institute, Inria supports a diversity of innovation pathways, ranging from fundamental research to the creation of technological startups.

Inria's Models and Algorithms for Reliable Communication Systems (MARACAS, <https://team.inria.fr/maracas/fr/>) team combines communication theory and information theory with statistical signal processing, control theory, and game theory to develop methods, algorithms, and experimentation for reliable communication systems. MARACAS is hosted by the CITI Lab (<https://www.citi-lab.fr/>), at the heart of the INSA Lyon (<https://www.insa-lyon.fr/en/>) campus.

Funding for this 3-year PhD position is available within the "Future Networks" national stimulus funding plan (PEPR).

### Mission confiée

The offered position focuses on the design of waveforms and channel codes for uncoordinated wireless communications, with applications to future terrestrial (6G) and non-terrestrial (satellite, UAVs) networks. An emergent class of network traffic arises from connected devices (such as autonomous cars, environmental sensors, healthcare monitoring and delivery, smart watches, connected robots) with sporadic communication needs. The development on an unprecedented scale of such traffic — characterized by small packets, sent at unpredictable times, but with strong reliability requirements — pushes the limits of current designs since the mechanisms and protocols classically used to mitigate transmission collision between simultaneously active transmitters are not efficient in the regime of many users and small payloads. The successful candidate will contribute to the design of waveforms and forward-error correction codes for wireless systems with massive-scale over-the-air contention between uncoordinated radio devices.

### Principales activités

The goal is to create efficient approaches (in terms of spectrum and energy use, as well as decoding computational complexity) while minimizing the protocol overhead. The design methodology will start with the design of a new theoretical framework relying on probability theory, tensor algebra, and information theory. In this framework, new joint code and modulation techniques will be introduced, and robust multi-user decoding algorithms leveraging message-passing will be developed.

The role will involve devising the mathematical representation of the involved waveforms, deriving analytical performance metrics, algorithmic development, as well as writing up scientific articles and presenting the results in academic conferences.

### Compétences

Required skills:

- a strong background (MSc level) in applied mathematics (probabilities, statistical signal processing, information theory), digital communications, or equivalent
- a taste for theoretical results
- fluent spoken and written technical english

- familiarity with scientific programming (Matlab or Python)

## Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (90 days / year) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Complementary health insurance under conditions

## Rémunération

1st and 2nd year: 2 100 euros gross salary /month

3rd year: 2 190 euros gross salary / month

## Informations générales

- **Thème/Domaine** : Réseaux et télécommunications
- **Ville** : Villeurbanne
- **Centre Inria** : [Centre Inria de Lyon](#)
- **Date de prise de fonction souhaitée** : 2024-09-01
- **Durée de contrat** : 3 ans
- **Date limite pour postuler** : 2024-07-19

## Contacts

- **Équipe Inria** : [MARACAS](#)
- **Directeur de thèse** :  
Guillaud Maxime / [maxime.guillaud@inria.fr](mailto:maxime.guillaud@inria.fr)

## A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

**Attention:** Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

## Consignes pour postuler

Defence security: This position is likely to be assigned to a restricted area (ZRR), as defined in decree no. 2011-1425 relating to the protection of the nation's scientific and technical potential (PPST). Authorisation to access a zone is issued by the head of the establishment, following a favourable ministerial opinion, as defined in the decree of 03 July 2012 relating to the PPST. An unfavourable ministerial opinion for a post assigned to a ZRR would result in the recruitment being cancelled.

### Sécurité défense :

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

### Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.