



Offre n°2024-08378

## Software development engineer for causal machine learning

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

Type de contrat : CDD

Contrat renouvelable : Oui

Niveau de diplôme exigé : Bac + 5 ou équivalent

Fonction : Ingénieur scientifique contractuel

Niveau d'expérience souhaité : De 3 à 5 ans

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

The Inria center at Université Côte d'Azur includes 42 research teams and 9 support services. The center's staff (about 500 people) is made up of scientists of different nationalities, engineers, technicians and administrative staff. The teams are mainly located on the university campuses of Sophia Antipolis and Nice as well as Montpellier, in close collaboration with research and higher education laboratories and establishments (Université Côte d'Azur, CNRS, INRAE, INSERM ...), but also with the regional economic players.

With a presence in the fields of computational neuroscience and biology, data science and modeling, software engineering and certification, as well as collaborative robotics, the Inria Centre at Université Côte d'Azur is a major player in terms of scientific excellence through its results and collaborations at both European and international levels.

### Contexte et atouts du poste

The Experimentation and Development Service (SED) of the Inria research center at Université Côte d'Azur consists of research engineers who develop, maintain, and disseminate multidisciplinary software platforms in close collaboration with the research teams at the center.

The PREMEDICAL project team, which you will join, is a mixed Inria and Inserm (Idesp) team located in Montpellier. It is composed of researchers in statistics, machine learning, AI, as well as clinicians. A distinctive feature of this team is the presence of doctoral students in applied mathematics who also hold a medical degree, combining medical expertise and AI research. These profiles are essential to improve the adoption, use, and transfer of new technologies, as well as to foster innovation development.

PREMEDICAL specializes in developing precision medicine methods through causal learning and federated learning, ensuring the confidentiality of medical data. Its objectives include accelerating the availability of targeted drugs on the market and deploying decision support algorithms with highly precise confidence quantification in predictions. It aims to bridge the gap between fundamental research and its effective use, particularly through software development and involving all stakeholders (patients, clinicians, regulators, companies, etc.).

The innovative project you will participate in, TRAUMATRIX, will enable the acquisition, processing, storage, and exploitation of data from "traumatized" patients. These patients, who have road accidents, fall from trees, etc., often suffer from traumatic brain injuries and hemorrhagic shocks. Very granular information is collected from the moment the patient is taken care of at the accident site until their discharge from the hospital. These data have been used to develop causal machine learning algorithms to evaluate the effectiveness of interventions or treatments and recommend therapeutic strategies (transfusion dose, what treatment to give to whom and when, which center to direct patients to, etc.). The statistical challenges include managing missing information and quantifying uncertainty to direct patients to an appropriate structure (Traumacenter) in a very uncertain framework with multiple stakeholders where every minute counts.

We are starting the real-time evaluation of our models in collaboration with the SAMU to quantify the improvement in patient care. The objective is to develop an application that will be used at the SAMU control center to collect patient information and deploy predictive models in real-time.

There are many scientific challenges associated with the projects: Are the predictive models robust to changes in practices and patients? Are the algorithms fair? How to present the results to doctors? How to integrate data from European counterparts?

At the end of this experience, you will have consolidated a wide range of skills in software engineering applied to a high-level scientific context. This experience will enable you to consider careers as a research and development engineer in national organizations (Inria, INRAE, CNRS, CEA), industrial research centers, SMEs, and digital start-ups.

## Mission confiée

In the context of this project, you will participate in:

### Development of the TRAUMATRIX Backend:

- Consolidating the Traumabase data and verifying data quality to achieve a single usable dataset for statistical studies and the development of artificial intelligence algorithms.
- Consolidating/extending existing causal machine learning algorithms.
- Generalizing their implementation by addressing the specific case of application frameworks.
- Creating documentation for the predictive models.
- Creating documentation for data formalization.
- Implementing a proof of concept on federated learning with the academic and industrial collaborators of the project team.

### Development of the TRAUMATRIX Frontend:

The frontend will come in various forms: web application and mobile applications that will be primarily deployed by clinical partners.

- For the first part, this involves evolving and maintaining a web application that allows real-time patient regulation and displays the result of a predictive model (estimation). The mockups and backlog are ready. The application will be deployed as part of a clinical research project, used by more than 30 regulation centers.
- Creating an interactive dashboard for clinicians to visualize data from each center. Participating in the deployment within the OVH environment of APHP.
- For the second part, this will eventually involve turning visual mockups into cross-platform mobile applications that interact with the backend via the same APIs as the web frontend.

## Principales activités

The recruited engineer will work 100% of their time on the development of the software platform. The work will be conducted using agile methodologies (SCRUM or simplified agile depending on the context).

## 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 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
- Contribution to mutual insurance (subject to conditions)

## Rémunération

From 2692 € gross monthly (according to degree and experience)

## Informations générales

- **Thème/Domaine** : Neurosciences et médecine numériques  
Instrumentation et expérimentation (BAP C)
- **Ville** : Montpellier
- **Centre Inria** : [Centre Inria d'Université Côte d'Azur](#)
- **Date de prise de fonction souhaitée** : 2024-10-01
- **Durée de contrat** : 1 an, 11 mois
- **Date limite pour postuler** : 2024-12-31

## Contacts

- **Équipe Inria** : [PREMEDICAL](#)
- **Recruteur** :  
Josse Julie / [julie.josse@inria.fr](mailto:julie.josse@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.

## L'essentiel pour réussir

### Common Software Skills

- Agile Methodology
- Agile Terminology
- Agile Development
- Artificial Intelligence Techniques
- Machine Learning
- Data Science
- Data Analysis
- Data Engineering
- Data Visualization
- Software Development
- DevOps
- Fullstack Development
- Relational Databases
- Technical Documentation
- MVC (Model View Controller)
- Object-Oriented Programming
- RESTful API
- Database
- Structured Query Language (SQL)
- Programming Languages
- Bash Scripting
- HTML
- Python
- JavaScript
- R
- User Interface Design

### Specific Skills

#### AI Frameworks

- scikit-learn
- TensorFlow
- PyTorch

#### Web Development Frameworks

- Django
- Flask
- React.js

### Additional Skills

- Software development expertise, particularly in the following areas:
  - Understanding object-oriented design and programming paradigms, especially Design Patterns.
  - Implementing methods and tools for compilation, version control, continuous integration, and testing in an agile context.
  - Ability to communicate with stakeholders from various communities.
  - Working effectively in a multidisciplinary team.
  - Autonomy in personal organization and initiative. Good command of written and spoken English.
  - Strong writing skills in both English and French.
  - Interest in health applications and knowledge in statistics are appreciated.

**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

Applications must be submitted online on the Inria website. Collecting applications by other channels is not guaranteed.

#### 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.