



## Selection process - AAPG 2026 Step 1

SCATE

### Project Coordinator

Name : KUMAR

First name : Suraj

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## PROJECT SYNTHESIS

### Funding instrument

Funding instrument (mandatory) : JCJC - young researchers

### Project identity

Acronym : SCATE

Title of the project in French : Décompositions de tenseurs évolutives pour l'analyse de données

Title of the project in English : Scalable tensor decompositions for data analytics

Duration of the project : 48 months

Research type : Fundamental research

Scientific evaluation panel (CES) : Axe E.05 - Modelling, simulation and optimization, High-performance computing, digital sobriety, applications - CE46

### Memory effect

Was the project submitted during the last edition of the call (AAPG 2025) ? : Yes

Would you like the evaluation committee to have access to the previous version of your project and to the final report of the committee sent the previous edition to assess the evolution of your project? : No

### Abstracts

**Abstract (non confidential) in French :**

Les tenseurs sont des tableaux multidimensionnels utilisés pour stocker des données dans plusieurs domaines, par exemple l'exploration de données, les neurosciences, l'astrophysique, les simulations scientifiques et la vision par ordinateur. Les décompositions de tenseurs permettent d'identifier la structure intrinsèque des données, de les compresser et de les analyser de diverses manières. Les besoins en calcul et en mémoire des opérations tensorielles augmentent de manière exponentielle avec le nombre de dimensions. Il est primordial de concevoir des algorithmes parallèles de décomposition de tenseurs qui utilisent efficacement les systèmes informatiques modernes. Les principaux défis sont les coûts de transfert de données des opérations tensorielles et le parallélisme limité exposé par la plupart des algorithmes existants. Ce projet vise à résoudre ces défis et à proposer de nouveaux algorithmes de décomposition qui s'adaptent bien aux systèmes informatiques actuels et futurs. Enfin, les algorithmes proposés seront implémentés et testés sur des systèmes distribués à grande échelle et évalués sur des tenseurs réels issus de la neuroscience et de simulations de combustion. L'implémentation sera également utilisée pour accélérer l'analyse des données hyperspectrales en astrophysique.

**Abstract (non confidential) in English :**

Tensors are multi-dimensional arrays and used to store data in several domains, e.g., data mining, neuroscience, astrophysics, scientific simulations and computer vision. Tensor decompositions help to identify inherent structure of data, achieve data compression and enable various ways of data analysis. The computational and memory requirements of tensor operations grow exponentially with the number of dimensions. It is paramount to devise parallel tensor decomposition algorithms that make effective utilization of the modern computing systems. The principal challenges are data transfer costs of tensor operations and limited parallelism exposed by most existing algorithms. This project aims at solving these challenges and proposing new decomposition algorithms which scale well on current and future computing systems. Finally, the proposed algorithms will be implemented for large scale distributed systems and evaluated on real-world tensors from neuroscience and combustion simulations. The implementation will also be used to accelerate hyperspectral data analysis in astrophysics.

**ERC keywords****ERC keywords**

PE06\_06 - Algorithms and complexity, distributed, parallel and network algorithms, algorithmic game theory

**Panel keywords****French term****English term**

algèbre linéaire

linear algebra

architecture hétérogène, hybride, CPU, GPU, FPGA, multi-coeurs

heterogeneous architectures, hybrid, CPU, GPU, FPGA, multi-core

HPC

HPC

## Open keywords

French term	English term
Coûts de communication	Communication costs
Compromis communication-calcul	Communication-computation tradeoff
Décompositions tensorielles	Tensor decompositions

## Sustainable Development Goals (SDG)

French term	English term
Aucun objectif de développement durable ne correspond à mon projet	No SDG matches to my project

## Additional information

**Would you like your project to be labelled by one or more competitiveness clusters?**

No

**Does the project involve one or more research infrastructures?**

No

**Do you plan to apply for co-funding with an ANR partner?**

No

## Partnership

Category	Organisation	Laboratory	Scientific leader	Amount of funding
French partner - by RNSR number	INSTITUT NATIONAL DE LA RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE	Centre Inria de Lyon	KUMAR Suraj	€313,033.00

Category	Organisation	Laboratory	Scientific leader	Amount of funding
Full name	Email			
KUMAR Suraj	suraj.kumar@inria.fr			
Unit Director : UBEDA Stéphane (stephane.ubeda@inria.fr)				
<p>RNSR number : 202224236C</p> <p><b>Name of the laboratory :</b> Centre Inria de Lyon      <b>Mailing address :</b> 56 BOULEVARD NIELS BOHR</p> <p><b>Name of the hosting authority :</b> INSTITUT NATIONAL DE LA RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE</p> <p><b>SIRET, RIDET or TAHITI number of the hosting authority :</b> 18008904700161      <b>Additional address :</b> BAT CEI-2</p> <p><b>Name of the delegation :</b> INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE (INRIA) CENTRE LYON - CENTRE DE RECHERCHE INRIA DE LYON VILLEURBANNE (69100)      <b>Zip code :</b> 69100</p> <p><b>City :</b> VILLEURBANNE      <b>Country :</b> France</p> <p><b>Partner category :</b> Research organization</p>				

## CV of scientific leaders

I confirm that the CV are complete. October 14, 2025 at 1:28 PM

## Pre proposal

Pre-proposal : proposal-68ee42b824e3a0.85719948.pdf

## Project overview

I confirm the choice of the instrument "young researchers" and the scientific evaluation committee "Axe E.05 - Modelling, simulation and optimization, High-performance computing, digital sobriety, applications - CE46". I understand that these two pieces of information cannot be modified during

the selection process of the call. : Yes

## Commitments

We, the participants in this project - whether applying for funding or not - undertake to have sought and obtained the agreement of our superiors to participate in this project.

We, participants in this project - requesting funding or not - undertake to consider the sex and/or gender dimension in our research project, in terms of scientific and methodological approach, whatever the field for a production. quality knowledge.

Each principal investigator or applicant of each French partner requesting funds (does not concern foreign partners) formally undertakes to: - Have communicated all the information concerning his/her application procedure (in particular administrative and financial information) to his/her hierarchy and/or to the persons empowered to legally engage the institution managing the aid (that is to say the future Beneficiary, recipient of the aid and contracting partner of the ANR where applicable), or their representatives/delegates - Have obtained their prior agreement before submitting the project proposal to the ANR.

We, the participants in this project - whether applying for funding or not - undertake, in case of funding, to guarantee immediate open access to peer-reviewed scientific publications and to adopt a FAIR (easy to Find, Accessible, Interoperable, Reusable) approach to research data in line with the principle of "as open as possible, as closed as necessary".

We, the participants in this project - whether applying for funding or not - undertake to actively promote scientific, technical and industrial culture through knowledge transfer activities towards citizens and decision makers.

We, the participants in this project - whether or not we are applying for funding - undertake, together with all the participants in the project, to abide by the mechanism for the protection of the nation's scientific and technical potential (PPST in french).

I have checked that I and the scientific leaders of any partners meet the call's eligibility criteria.

I have checked that I have uploaded the latest version of the requested documents.

We, the participants in this project - whether applying for funding or not - undertake to abide by the national charter of ethics for research professions and the ANR's charter of ethics and scientific integrity.