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Rencontres R 2023 : Report

Jean-François Rey, Anna Melnykova

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Rencontres R: Report

21-23 of June, 2023

Version: 1.0



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Résumé

Les Rencontres R 9e édition ont eu lieu à Avignon du 21 au 23 juin 2023 et ont réuni près de **250** participants pour **81** présentations, **3** tutoriels et **5** invité.e.s.

Elles sont portées par la Société Française de Statistique (SFdS) et ont été co-organisée par l'Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement (INRAE) et Avignon Université (AU) avec le soutien de nombreux sponsors.

Cet événement en présentiel était très attendu par la communauté francophone R après une pause dû à la pandémie de COVID-19, il a permis à la communauté de se retrouver, d'échanger et de partager sur le langage R et son écosystèmes. Il a réuni un public aussi bien débutants que confirmés et expérimentés issus de différents secteurs d'activités privé et public.

Un bilan très positifs

Cette édition a été plus que réussi et a permis de dynamiser la communauté R francophone autour de cette dernière. La qualité des présentations, la bienveillance de la communauté et les nombreux retours des participants sur l'organisation nous permettent d'attester du succès de cette édition.

Les partenaires financiers ont permis d'obtenir un budget équilibré ce qui a grandement joué dans l'organisation et la réussite des Rencontres R. Cela a permis de garantir un prix d'inscription comparable aux éditions précédentes.

La présence des sponsors lors de l'événement a amené de nombreux échanges et découvertes et les livres offerts par les éditeurs (Editions ENI, Editions Technip and Orphrys, Taylor and Francis et Springer) ont susité de la curiosité parmi les participants.

Supports numérique

Toutes les informations sur cette édition sont disponibles sur le site web <https://rr2023.sciencesconf.org>.

Les supports de présentations sont libres d'accès et disponibles sur le dépôt [GitHub](#) et [GitLab](#) ainsi qu'en vidéo sur la chaîne YouTube [@RencontresR](#).

Remerciements

Le comité d'organisation tient à remercier les organisateurs de l'édition de 2021 pour leurs conseils et aides apportés ainsi que les différents comités, les bénévoles et les orateurs impliqués dans la réussite de l'événement.

Nous tenons à remercier nos partenaires financier sans qui l'événement n'aurait pas pu se tenir : Le département MathNum INRAE, l'Institut National de la Statistique et des Etudes Economiques (INSEE), la société

dreamRs, la société CBA informatique, la société ThinkR, la Fédération de Recherche des Unités de Mathématiques de Marseille (FRUMAM), le Laboratoire de Mathématique d'Avignon (LMA), la société METORI, LDLC informatique, la société Datastorm, la société ArData, le département SPE INRAE, la société Makina Corpus, l'IUT de Statistique et Informatique Décisionnelle d'Avignon (STID), le Laboratoire d'Informatique d'Avignon (LIA), et bien sûr le R Consortium.

Un remerciement particulier aux différents participants qui ont fait de cet événement un moment unique et chaleureux.

Le comité d'organisation par l'intermédiaire de son président reste disponible pour de plus amples informations à jean-francois.rey@inrae.fr.



Figure 0.1: Rencontres R 2023 Opening



Figure 0.2: The organizing committee and volunteers



Figure 0.3: Diane Beldame (PC), Jean-François Rey (OC) et Stéphane Dray (SC)

Summary

The "Rencontres R" ("R Meetings") 9th edition took place in Avignon from June 21 to 23, 2023 and brought together nearly **250** participants for **81** presentations, **3** tutorials et **5** guests.

They are affiliated with the French Statistical Society («Société Française de Statistique (SFdS)») and organised jointly by National Research Institut in Agriculture, Food and Enviroment (INRAE) and Avignon University (AU) with the support of many of sponsors. This face-to-face event was eagerly awaited by the French community of R users after a break due to the COVID-19 pandemic. It allowed the French-speaking R community to meet, exchange and share on the R language and its ecosystems. it brought together an audience of beginners and experienced people from different sectors of private and public activity.

A very positive outcome

This edition is more than successful and has made it possible to energize the French-speaking R community. The quality of the presentations, the goodwill of the community and the numerous feedback from participants on the organization allow us to attest to the success of this edition.

The financial partners made it possible to obtain a balanced budget, which played a major role in the organization and success of the Rencontres R, guaranteeing a registration fee comparable to previous editions.

The presence of sponsors during the event sparked numerous discussions and discoveries and the books offered by the publishers (Editions ENI, Editions Technip and Orphrys, Taylor ans Francis and Springer) aroused curiosity.

Digital media

All information on this edition is available on the website <https://rr2023.sciencesconf.org>.

The presentation materials are freely accessible ans available on the [GitHub](#) repository and [GitLab](#) repository as well as viewable on the YouTube chanel [@RencontresR](#).

Thanks

The organizing commitee would like to thank the organizers ot the 2021 edition for their advice ans assistance as well as the various committees, volunteers and speakers involved in the success of the event.

We would like to thank our financial partners without whom the event could not have been held: the MathNum INRAE departement, The National Institute of Statistics and Economic Studies (INSEE), the dreamR compagny, CBA informatique, the ThinkR compagny, the Research Federation of Mathematics Units of Marseille (FRUMAM), the Avignon Mathematics Laboratory (LMA), the METORI compagny, LDLC informatique, the Datastorm compagny, the ArData compagny, the SPE INRAE departement, the Makina Corpus compagny,

the Avignon IUT of statistics and Business Intelligence (STID), the Avignon Computer Science Laboratory (LIA), and of course the R Consortium.

A special thank you to the various participants who made this event a unique and warm moment.

The organizing committee through its president remains available for further information at jean-francois.rey@inrae.fr.

About

Rencontres R

Starting from 2012, the «Rencontres R» («R meetings») represent the biggest conference of French community of R users, affiliated with the French Statistical Society («Société Française de Statistique (SFdS)»). From the very beginning, the «Rencontres R» were held mainly in major French university towns (Bordeaux 2012, Lyon 2013, Montpellier 2014, Grenoble 2015, Toulouse 2016, Anglet 2017, Rennes 2018 and Paris 2021). In 2023, this meeting took place in Avignon, organised jointly by National Research Institut in Agriculture, Food and Environment (INRAE) and Avignon University (AU). It has been organized in five half-days between 21 and 23 of June 2023. It was (and still is) of great honor to accomode this conference (for the first time in Avignon and in Provence-Alpes-Côte-d'Azur region), as it is a sign of recognition of our implication in the R community life, and all the contributions done by Avignon members.

Language R

R is an open-source programming language and an IDE devoted to statistical analysis. It is available for different platforms (OS, Windows, Linux) and is completely free. In recent years, its growing success in public services (university, research centers, governmental agencies, ministers) as well as in the industry (pharmaceutic industry, informatics, energy, online commerce, marketing, food production etc.) made R an undispensible tool in data analysis.

R environment is relying on a wide international and French-speaking community, which has its own journal, national and international conferences and a stack R. It is a language in active development (more 18000 available packages), which attracts people with a very different background (informaticians, statisticians, data scientists, biologists, researchers, economists, doctors...) working in all economical sectors. It is a powerfull and complete software.

The «Rencontres R» is the biggest French event devoted to R, organized by the French Statistical Society. They give a perfect occassion to exchange and share ideas on different problems addressed by the community. Every year this meeting gathers between 200 and 250 participants, attracting both experienced users and beginners.

Organizing committee

Jean-François Rey	Edith Gabriel	Emily Walker
Marine Marjou	Anna Melnykova	Sylvie Jouslin
Tania Jimenez	Denis Allard	Claude Bruchou
Loic Houde	Amélie Lagalisse	

Programm committee

Diane Beldame	Edith Gabriel	Maëlle Salmon
Stephane Dray	Maria Paula Caldas	Marion Louveaux
Elisabeth Morand	Ahmadou Dicko	

Steering committee

Marie Chavent	Stéphane Dray	Rémy Drouilhet
Robin Genuer	Francois Husson	Julie Josse
Benoit Liquet		

Useful Information

The opening of the 9th Rencontres R meetings took place on **Wednesday June 21 at 1:45 p.m.** and closed on **Friday June 23 at 12:05 p.m.** We offered tutorials before the conference on Wednesday, June 21 morning from **10 a.m. to 12 p.m.**

The conference took place in the south building of the Hannah Arendt campus (city center) of Avignon University (the glass building) on the 1st floor. Three rooms were at our disposal:

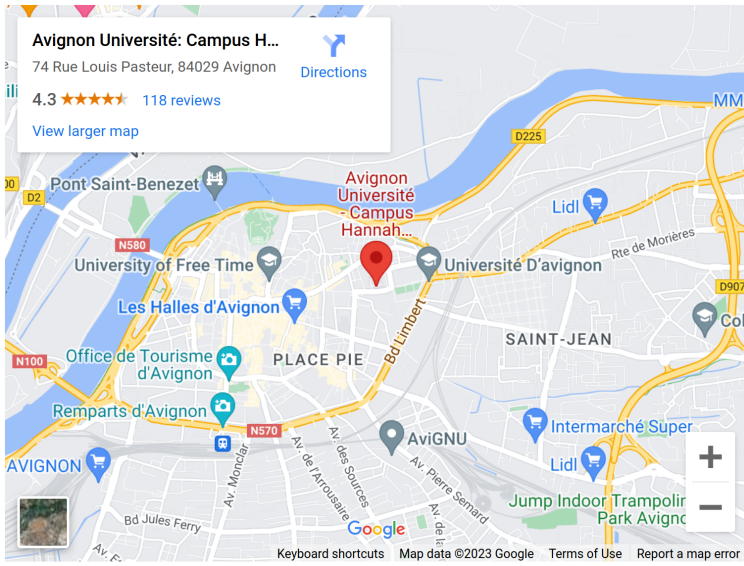
- Amphitheater N°6 #RR203
- Auditorium N°3 #Rstats
- Room 125-129 #Rtuto

As well as the Main Hall between the two amphitheatres where the posters were displayed and some partners had a stand.

Lunches were taken in charge by the conference. They took place in University Restaurant CROUS a few steps from the University (see map below).



Gala diner took place on 22 June at 7 p.m. in the restaurant **Le Bercail**. The restaurant is situated on l'île de Barthelasse (Barthelasse Island) at 162 Chem. des Canotiers, 84000 Avignon. To get there, a ferry boat was privatized for the occasion.



Timetable

Wednesday, June 21, 2023

8:30–13:45	Registration and welcome (main hall)			
10:00–12:00	Tutorials (parallel sessions)			
	Christophe Dervieux	De R Markdown à Quarto sans effort pour aller plus loin avec ses publications		
	Antoine Bichat Julie Aubert	Créer un pipeline de machine learning complet avec tidymodels		
	Kim Antunez Etienne Côme	Statspatial: Analyse spatiale et cartographie avec R		
12:00–13:45	Lunch			
13:45–14:40	Rencontres R Opening (Amphi 6)			
14:00–14:40	Keynote I (Amphi 6)			
	Aurélie Vache OVHcloud	Tips pour combattre le syndrome de l'imposteur		
14:40–15:05	Lightning I (Amphi 6)			
14:40–14:45	Bastien Chassagnol LIP 6	DeCovarT, a R package for a robust deconvolution of cell mixture in transcriptomic samples using a multivariate Gaussian generative framework		
14:45–14:50	Jean Dupin INSEE	CGI - Permettre à de nouveaux utilisateurs de R de créer des graphiques respectant les contraintes de son institut		
14:50–14:55	Thierry Faure LISC	Applications Shiny pour le suivi de systèmes agricoles et environnementaux.		
14:55–15:00	Lisa Nicvert INRIA Lyon	Camtrapviz, une interface Shiny pour visualiser les données de pièges photographiques		
15:00–15:05	Dan Chaltiel Institut Gustave Roussy	crosstable : décrivez vos datasets en quelques lignes		
15:10–16:10	Contributed talks			
	Infra I (Amphi 6)		Shiny/Plumber I (Amphi 3)	
15:10–15:30	Vincent Guyader ThinkR	Comment bien rater votre forge logicielle R ?	Gabrielle Devaux Lincoln, Enedis	Comment Shiny aide Enedis à contribuer à la transition énergétique pour les collectivités territoriales
15:30–15:50	Amélie Vernay IMAG	RKeOps v2: Kernel operations with Symbolic Tensors on the GPU in R	Simon Benateau CESCO	Vigie-Analyse, des applications shiny pour les scol'R
15:50–16:10	Colin Fay ThinkR	MongoDB - J'suis pas venu ici pour souffrir, ok ?	Lise Vaudor Environnement Ville Société	glitter makes SPARQL: glitter, un package R pour explorer et collecter des données du web sémantique

16:10–17:00	Poster session in the main hall			
17:00–18:00	Contributed talks			
	Reporting (Amphi 6)		Education/Teaching I (Amphi 3)	
17:00-17:20	Christophe Dervieux Posit	Se démarquer avec les thèmes HTML Quarto	Murielle Delmotte ThinkR	Initier 2400 personnes à R par enchantement : une histoire de licornes, potion et génie...logiciel
17:20-17:40	Julien Chiquet AgroParisTech	Computo: An academic journal promoting reproductibility via Quarto and Continuous Integration	Lino Galiana INSEE	Diffuser la culture de la reproductibilité par une formation aux bonnes pratiques: de la qualité d'un projet aux pipelines de données
17:40-18:00	Valentin Cadoret, Victor Perrier RTE Paris, dreamR	Synthèse hebdomadaire de la consommation d'électricité française	Marie Vaugoyeau MStats	Où trouver de l'aide quand on apprend R ?

Thursday, June 22, 2023

09:05-09:50	Keynote II (Amphi 6)	
	Rhian Davies Jumping Rivers	Data Science without the data
09:50-10:35	Lightning II (Amphi 6)	
09:50-09:55	Théodore Vanrenterghem Paris Saclay	ShinySbm : une application Shiny pour analyser des réseaux à l'aide de modèles à blocs stochastiques
09:55-10:00	Antoine Languillaume ThinkR	"AHHH #\$\$% ça marche pas !" : Aidez votre père dans sa lutte avec l'informatique et devenez un.e meilleur.e développeur.se
10:00-10:05	François-David Collin IMAG, Montpellier	Pybind11/reticulate comme alternative à Rcpp
10:05-10:10	Antony Pudlicki MERSEN-BIATSS	SABRE (industrial project)
10:10-10:15	Youenn Drouet LBBE, Lyon	MyFamilyRisk: une application R/Shiny pour saisir facilement son histoire familiale de cancer
10:15-10:20	Sébastien Rochette ThinkR	golem et fusen, le combo gagnant pour construire des applications Shiny robustes et faciles à maintenir
10:20-10:25	Maxime Jaunatre INRAE	matreex : Simuler les dynamiques forestières européennes
10:25-10:30	Mouna Belaid ENSAI	R-Ladies Paris, une communauté engagée garantissant la diversité et l'inclusivité
10:35-11:00	Break (Main hall)	
11:00-12:00	Contributed talks	
	Infra II (Amphi 6)	Geospatial I (Amphi 3)
11:00-11:20	Régis Leroy Makina Corpus	7 Méthodes secrètes des informaticiens pour mieux programmer
11:20-11:40	Andre Buskvekster Omega Verksted	R sur OpenBSD
11:40-12:00	Philippe Regnault Univ. de Reims Champagne-Ardenne	meRoo : Un écosystème logiciel pour l'apprentissage des sciences des données installé sur un cluster de Raspberry Pi
11:00-11:20	Laurent SPANU Institut Scientifique de Service Public	Qualité de l'air ambiant en Wallonie (Belgique) - Visualisation des mesures de la pollution via une app' R-Shiny golem dans un environnement ShinyProxy
11:20-11:40	Alexis Fribault Institut Agro Montpellier	Suivi de la réponse des agroécosystèmes au changement climatique. Visualisation sur une application R-Shiny
11:40-12:00	Joël Girès, Hugo Périlleux Observatoire de la Santé et du Social de Bruxelles-Capitale, ULB	phacochr: un géocodeur pour les géocoder tous - Package R pour réaliser le géocodage d'adresses en Belgique
12:00-13:55	Lunch	

13:55-14:40	Keynote III (Amphi 6)	
	Yan Holtz Datadog	R dans l'univers de la Dataviz
14:40-15:10	Lightning III (Amphi 6)	
14:40-14:45	Dan Chaltiel Institut Gustave Roussy	autoimport : gérer l'enfer des imports
14:45-14:50	David Gohel ArData	Réaliser ses tableaux avec flextable
14:50-14:55	Sarah Bauduin Office Français de la Biodiversité	La modélisation individu-centrée sur R avec le package NetLogoR
14:55-15:00	Terence Dechaux DATASTAT	Combien d'animaux dans mon essai ?
15:00-15:05	Paul Carteron	happign : une porte ouverte sur les données IGN
15:05-15:10	Alexis Van Straaten AP-HP	survivalGPU : Analyses de survie sur cartes graphiques

15:15-16:15	Contributed talks	
	Dataviz (Amphi 6)	Education/enseignement II (Amphi 3)
15:15-15:35	David Gohel ArData	ggiraph et shiny
15:35-15:55	Charlotte Cheinin Sanofi	Visualisations interactives de données au service de la prise de décision sur les études cliniques de phase précoce en oncologie
15:55-16:15	Mickaël Carlos Makina Corpus	Utiliser R et Python pour le traitement de données : exploration des avantages de Python en matière de visualisation
	Hugues Pecout Géographi-cités	Rzine : pour la diffusion et le partage de ressources sur la pratique de R en SHS
	Guyliann Engels Univ. de Mons	Application shiny de correction de projets individuels utilisant R, RStudio, GitHub
	Philippe Grosjean Univ. de Mons	fRench : R en français
16:15-16:40	Coffee break	

16:40-17:40	Contributed talks	
	Shiny/plumber II (Amphi 6)	Stats/ML/AI (Amphi 3)
16:40-17:00	Cervan Girard ThinkR	Et si shiny n'existait pas...?
17:00-17:20	Arthur Bréant ThinkR	Construiriez-vous votre cuisine sans en avoir fait des plans ?
17:20-17:40	Antoine Languillaume ThinkR	mariobox: des APIs plumber à toute épreuve
	Christophe Regouby Airbus	tabnet : Un package de deep-learning pour données tabulaires entièrement intégré à tidymodels
	Aymeric Stamm Lab. de Math. Jean Leray	fdacluster: Clustering for Functional Data
	Alain Quartier-la-Tente Insee	Manipuler les moyennes mobiles avec R et JDemetra+
19:00-23:55	Gala dinner: at Bercail restaurant https://www.restaurant-lebercail.fr/	

Friday, June 23, 2023

09:05-09:50	Keynote IV (Amphi 6)			
	Timothée Giraud UAR RIATE	L'écosystème spatial de R		
09:50-10:35	Keynote IV (Amphi 6)			
	Lise Vaudor Environnement Ville Société	Pastels, paillettes et packages pour accompagner la recherche avec R		
10:35-11:00	Coffee break (Main hall)			
11:00-12:00	Contributed talks			
	Geospatial II (Amphi 6)		Workflow (Amphi 3)	
11:00-11:20	Kim Antunez, Julien Pramil INSEE	Lissage spatial avec le package btb	Bruno André Rodrigues Coelho MESR	La reproductibilité avec R, ou pourquoi celle-ci est située sur un continuum
11:20-11:40	Marc Grossouvre Institut Henri Fayol	Quelle géostatistique pour des DPE à la localisation incertaine ?	Florence Mounier ThinkR	Faire un package R documenté, testé, versionné et intégré en quelques minutes ? Challenge accepted !
11:40-12:00	Sébastien Coube Univ. de Pau	Modèle hiérarchique de processus gaussien des plus proches voisins non stationnaire, multivarié, et non séparable, pour la modélisation des polluants atmosphériques	Yohann Mansiaux ThinkR	lozen, le thermomix de vos projets de développement R
12:05-12:20	Closing of "Rencontres R" (Amphi 6)			
12:30-13:30	Lunch			

List of Abstracts – Tutorials

Quarto : Publishing a document with Quarto

Christophe Dervieux

Software Engineer - Posit

This tutorial proposes to discover how Quarto takes over and redesigns the functionalities of the R Markdown ecosystem, by moving from several R packages to a single and unique tool.

Quarto offers the revamped R Markdown features (cross references, article layout, figure management, ...) as well as multiple formats (HTML & PDF document, website, HTML presentation, ...). While adding new features for better flexibility and collaboration (easy modification of an HTML theme, extension mechanism, easier collaborative project, ...)

In which case and why switch from R Markdown to Quarto? How to make the transition on existing projects? How to start a new project with Quarto? This is what we will cover in this 2 hour tutorial.

Build a complete machine learning pipeline with `tidymodels`

Antoine Bichat^[1], *Julie Aubert*^[2]

[1]: Head of R&D project - Servier, [2]: Research Engineer - INRAE

`Tidymodels` brings together a set of packages facilitating the use of statistical learning methods (such as random forests, Bayesian linear models or not...) in a unified and “tidy” framework. This tutorial will show you how to use these packages to preprocess data, build, train and evaluate a model, optimize hyperparameters, and everything you need to know to complete a supervised statistical learning project from start to finish.

Statspatial : Spatial Analysis and Cartography with R

Kim Antunez^[1], *Etienne Côme*^[2]

[1]: Statistician at INSEE, [2]: CR at Université Gustave Eiffel

This tutorial offers an introduction to the main packages and tools available in the R ecosystem for manipulating spatial data and making thematic maps, with a focus on vector data.

A large place will be devoted to the handling of the `sf` package and the realization of simple geoprocessing. We will also cover making static thematic maps with `ggplot2` and `mapsf` as well as using `mapview` to easily make interactive data mining maps. Finally, a short introduction to more specific tools and questions will complete this introduction: raster data, spatial smoothing, geocoding, Open Street Maps data, geographic networks, etc.

The majority of the workshop will be devoted to the application of the various concepts and tools on the annual database of road traffic injury accidents.

List of Abstracts – Keynote talks

Tips pour combattre le syndrome de l'imposteur

Aurélie Vache

OvHcloud

Who has not once said the sentence: I feel like an impostor? I don't feel entitled to do this or do that?

Some people are convinced that they do not deserve their success, despite the efforts they make to succeed. They often convince themselves that their success is not linked to their work, their personal accomplishment, but simply to luck or the work of others. In fact, they live permanently with a feeling of deception and constantly fear that someone will unmask them from one day to another.

In this talk we will return to what the impostor syndrome is, how it is reflected on a daily basis and we will see that it is not inevitable, on the contrary, that there are tips and tricks for the fight, overcome and improve.

Data science without the data

Rhian Davies

Jumping Rivers

As data scientists, we sometimes find ourselves faced with the daunting task of writing code without actually seeing the data we are working with. Whether it's due to data privacy concerns, limited access, or simply data that has not yet been collected, we often have to rely on incomplete or synthetic data to develop and test our code.

In a recent project, we worked on patient-level data. As such, the controls around the data and analysis (were rightfully) tightly controlled. We'll share how we used dummy data and mock-ups to inform code development, maintaining flexibility and adaptability in the face of changing data requirements. We'll also discuss the importance of and collaboration between developers and subject experts to ensure that code is developed with a deep understanding of the data domain

By understanding these challenges and developing effective strategies for overcoming them, we can ensure that our code is robust, reliable, and effective, even in the absence of direct data access.

R dans l'univers de la Dataviz

Yan Holtz

Datadog

With a vast array of tools, use cases, and plot types available, it can be difficult to navigate the world of data visualization (dataviz). In this presentation, we'll explore how dataviz is used by various professions: research, data journalism, business intelligence, and others. We'll look at the different tools available, with a focus on R.

Although each tool has its strengths and weaknesses, R has become a popular choice among data scientists and analysts. We will explore R's position in the dataviz ecosystem, highlighting its advantages and limitations. We'll also look at d3.js, a popular JavaScript library for creating graphics, and compare it to R in terms of its capabilities and limitations.

Whether you are new to data visualization or an experienced practitioner, this presentation will provide you with valuable insights into the world of dataviz and equip you with the knowledge to choose the right tool for your needs.

Pastels, paillettes et packages pour accompagner la recherche avec R

Lise Vaudor

CNRS

For the last 12 years, I work as a research support engineer in a geography laboratory.

To support my fellow researchers, teachers, students in their research and help them in their data analysis with R, I use various tools. The first and the one that benefits the greatest number consists in creating and offering educational materials (the pastels): blog, online tutorials, illustrations, and a regular internal training offer for the members of my laboratory. In certain specific cases, when the level of technicality required by an analysis is too high or when the need to explore the data in a user-friendly way is strong, I prefer to offer more "turnkey" tools such as shiny apps (glitter). Finally, in other cases, my contact is a more confirmed R user with a specific need and I analyze this need with him to develop a certain number of dedicated functions (packages).

I will explain what my job consists of on a daily basis, by presenting my personal background and enameling it with examples of collaborations.

Spatial Ecosystem in R

Timothée Giraud

CNRS

R language has long been used to process spatial data. Several fairly recent packages (sf, terra, stars, etc.) have renewed the base allowing the implementation of spatial data processing.

Most of the current developments are forming a robust ecosystem which offers users most of the functionalities formerly reserved for Geographic Information Systems. During this presentation we will show a panorama of the spatial ecosystem of R.

We will illustrate this panorama through a series of examples mobilizing data of different natures (vector data and raster or raster data) from the free geographical database OpenStreetMap.

We will address in particular the acquisition, manipulation and mapping of geographic data, traditional geoprocessing operations as well as more advanced spatial analysis processing.

Poster List

VMR to manage Virtual Machines for/with R

Jean-François Rey, *BioSP, INRAE Avignon*

Packages `mggd` et `mcauchy` - Distribution gaussienne généralisée multivariée, distribution de Cauchy multivariée

Pierre Santagostini, *IRHS - Équipe ImHorPhen (Imagerie pour l'Horticulture et le Phénotypage)*

Modelling plant resistance deployment: the R package `landsepi`

Loup Rimbaud¹, Julien Papaïx², 1: *Pathologie Végétale, INRAE Avignon*, 2: *BioSP, INRAE Avignon*

Welcome to the `golem`verse

Colin Fay, *ThinkR*

Une application R Shiny pour la simulation du bilan hydrique des sols viticoles (modèle `WaLIS`)

Xavier Delpuech, *Institut français de la vigne et du vin*

Enseigner les statistiques avec YouTube et la pop culture

Nancy Rebout, *VetAgro Sup - Institut national d'enseignement supérieur et de recherche en alimentation, santé animale, sciences agronomiques et de l'environnement, Département Territoires et Société*

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