

**InfraTech 2024 Call:
some topics of interest
as seen by JMMC**

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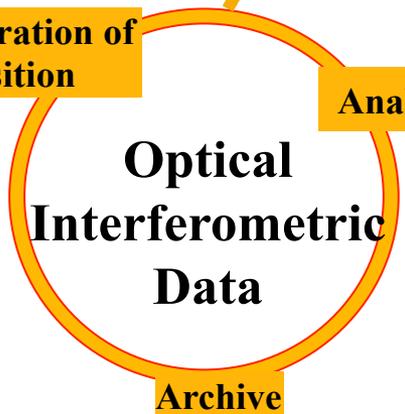
JMMC = French VLTI Expertise Center
→ **User support for:**

- preparing observations
- **reducing the data (DRS from instr. consortia)**
- analysing the data

SearchCal

Aspro2

Amhra



View / Filtering

OIFits Explorer

Model Fitting

LITpro

Image Reconstruction

OImaging

CDS Catalogs

JSDC2

JMDC

JMMC - OiDB

OiDB

L0 to L3 DataBases

+ Valorization

- Communication / Information
- Management of data bases:
reference stars catalogues, Oi(fits)DB, OLBIN Publications

JMMC offers **services on optical interferometric data** thanks to:

- softwares development and maintenance for all the steps of the *data life cycle*:
 - preparation of data acquisition: choice of instrumental configuration, observation scheduling
 - data analysis: inspection & selection, model fitting, image reconstruction
 - data archive: OIData Base
 - people involved from 4 French observatories
 - ~ 12 researchers & 2 engineers & 0.3 FTC working at partial time
 - ~ total 3.3 FTE
 - indirect funding corresponding to the salary of these people
 - direct funding from INSU for operating costs ~12k€ /year
 - interaction with the Users Community, ESO, other VLTI-EC and instrumental consortia
- some vision of
- missing functionalities
 - upstream R&D needed on data processing
- for a better exploitation of the interferometers

3 topics:

- Easier image reconstruction with diluted pupils
- Polychromatic imaging reconstruction
- Infrastructure simulator

- needs:
 - automatic initial guess (for the best solution)
 - automatic tuning of hyperparameters (they depend on the priors and the algorithms)
 - reliable (standard) assessment of the image quality
- work to be done – examples:
 - **unsupervised approaches** (hot topic in other domains)
 - **machine learning** for first guess (in replacement of model fitting)
 - need of a data simulator for training...
 - **machine learning** for priors
 - **machine learning** as a preconditioner
 - need of a data simulator for training...
 - various approaches for image quality assessment (e.g. resampling)
- applications / benefits
 - VLTI, SAM, (ELT during the integration of the mirror's segments?)
 - unsupervised approaches in AO (PSF reconstructions, deconvolution, etc.)
 - image quality assessment or reliability of the result (e.g. deconvolution, planet detection)
 - **OImaging++**

- needs:
 - easy-to-use tool for polychromatic reconstruction (i.e. image cube)
 - all instruments are polychromatic
 - objects are polychromatic (lines, velocities)
 - automatic tuning of hyperparameters, more numerous
 - reliable (standard) assessment of the image quality
 - generalize coupling of model-fitting and image reconstruction (**SPARCO++**)
- work to be done – examples:
 - fast algorithms (cube of images)
 - **unsupervised approaches** are critical (added hyperparameters)
 - **priors along the spectral axis (machine learning)**
 - similar to high contrast imaging for exoplanets (and disks)
 - **machine learning** for priors & for first guess
 - [need of a data simulator for training](#)
- applications / benefits
 - VLTI, SAM, (ELT during the integration of the mirror's segments?)
 - high contrast imaging (ASDI on VLT, ELT)
 - **(OImaging++)++**

- needs:
 - assessment of the instruments: understand in order to optimize
 - current achieved contrast lower than expectations: why?
 - error bars badly estimated: why?
 - is data statistic correct? not really (Schutz et al. 2016)
 - **machine learning**
 - data simulator needed for training
 - **tools for co-design new instruments** (instrument + data processing)
- work to be done – examples:
 - better model of the instruments
 - common formalism?
 - develop (or gather?) software modules for an infrastructure simulator
 - AO, fringe tracker, detector
 - not necessarily end-to-end modeling
 - parts may use **machine learning trained on data?**
- applications / benefits
 - modules may be common with other instruments (VLT, ELT)
 - **ASPRO++** (better computation of SNR)

JMIMC = set of **services on OI data** for the community

- not a structure of research
 - JMIMC as a PI of a Work Package not really possible
- but interested by InfraTech 2024 with two purposes:
 - be aware of the research that will impact the present offer
 - necessity to anticipate for prospective roadmap
 - be potentially partner in projects that lead to tools upgrade
 - e.g. post-doc or FTC engineer co-supervision for Aspro++, OImaging++
→ means to have more human resources
- Identified research topics also relevant to other fields