Amine Hadj-Youcef

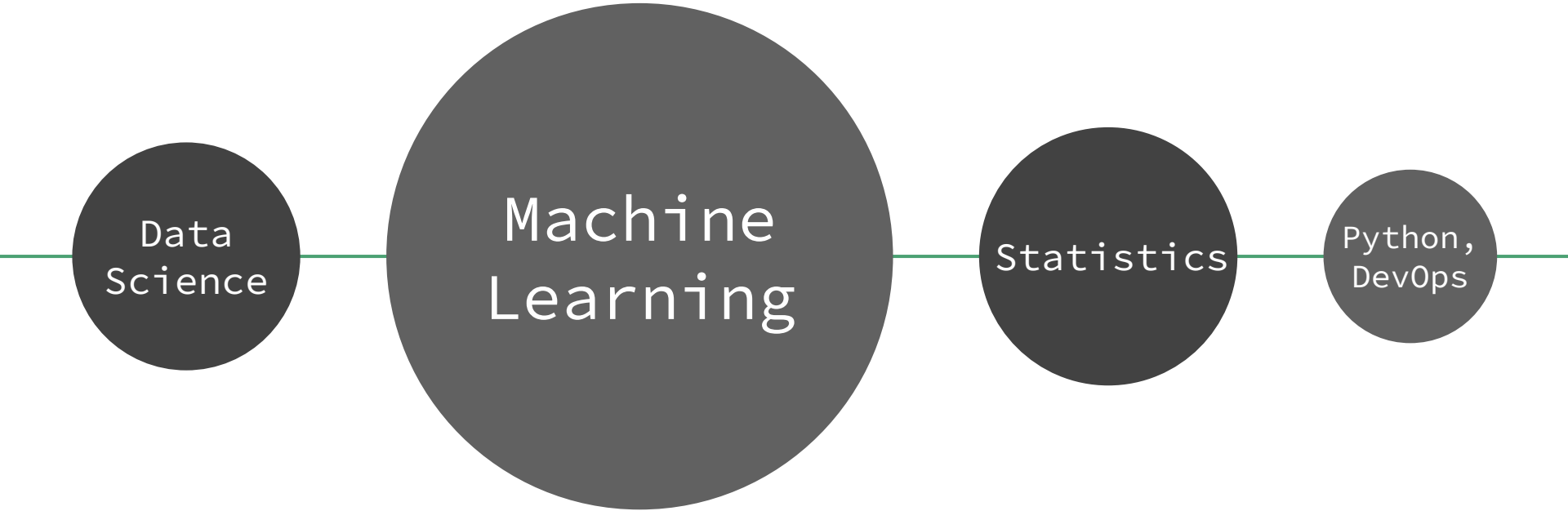
Senior Data Scientist

About me

I am passionate about solving problem to make our life better. I build solutions by processing data and developing computer algorithms. I have over 5 years of cross-sector experience in R&D of AI solution for startups and world's biggest brand - spatial, aerospatial, IoT, EdTech.

I am an avid runner, and I'm excited to partner with you!

Skills & expertise



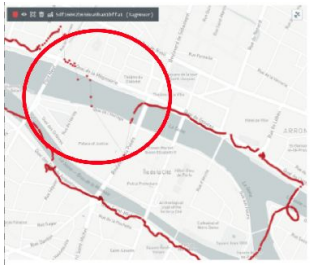
Career highlights

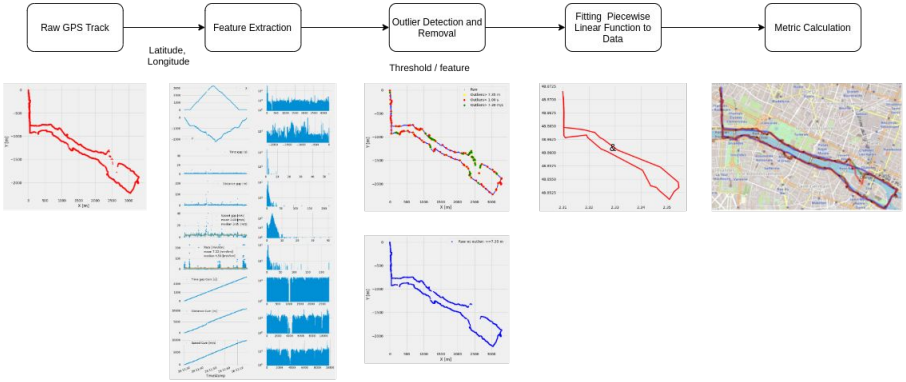
Mentor Data Scientist
Openclassrooms, Paris
September 2020 - Present

Data Scientist / Data Engineer
TAG Heuer, Paris
Marsh 2020 - September 2020

Data Scientist
Drone Volt, Villepinte
January 2019 - December 2019

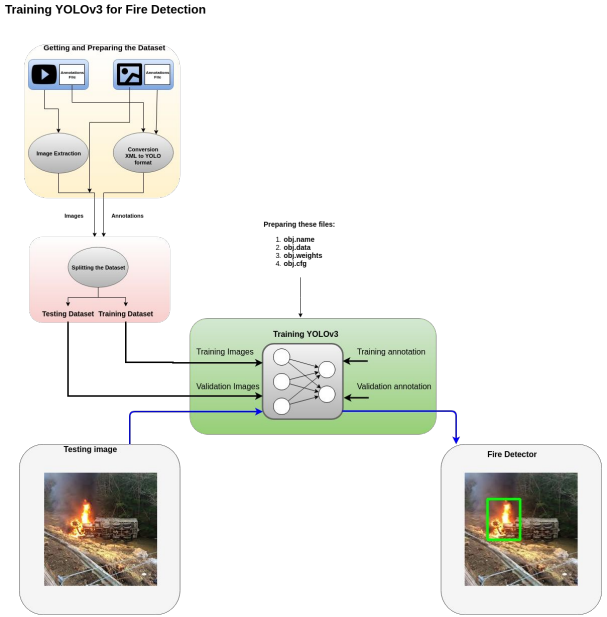
Portfolio





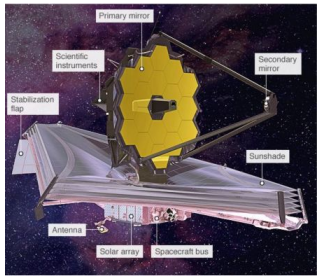
Anomaly Detection in GPS Data

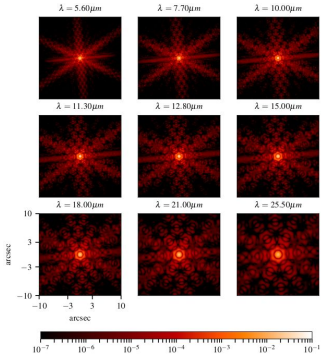
Data Processing Pipeline development for Time series data processing and anomaly detection using machine learning

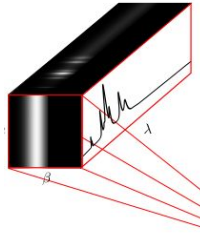


Fire Detection using Deep Learning Deployed on PENSAR

Deep learning model for the detection of fire in a video. The algorithm is embedded in the edge camera and runs in real time. Collecting and annotating data to Training and testing a deep learning model.







(a) Visible

(b) Near-Infrared

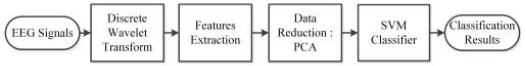


Fig. 1. Block diagram of the proposed method

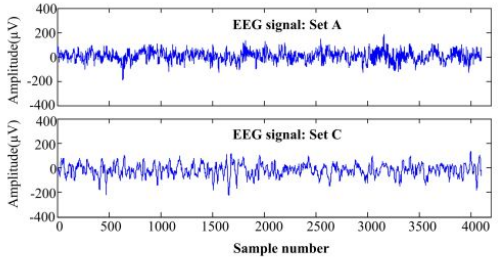


Fig. 2. Example of EEG signal from set A (Healthy) and set C (Epileptic).

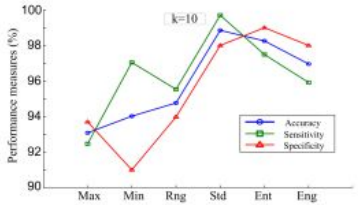


Fig. 8. Performance of classification using different features with 10-fold cross-validation

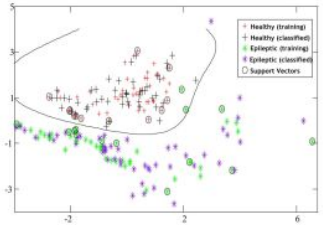


Fig. 7. Example of classification using SVM classifier and standard deviation feature (std) with 10-fold cross-validation

Spatio-spectral reconstruction from multispectral data. Application to the Mid-Infrared instrument of the JWST

In charge of innovating a data processing solution for the JWST / NASA space telescope (14 countries, budget> $ 10 billion)

Detection of epileptics during seizure free periods

The goal is to anticipate the treatment of the epilepsy and protect the individual suffering from the pathology in case of epileptic seizures.

List of Publication

Journal

Hadj-Youcef, M. A., Orieux, F., Abergel, A., & Fraysse, A. (2020). Fast Joint Multiband Reconstruction From Wideband Images Based on Low-Rank Approximation. ***IEEE*** *Transactions on Computational Imaging*, *6*, 922–933.

Boucaud, A., Bocchio, M., Abergel, A., Orieux, F., Dole, H., & Hadj-Youcef, M. A. (2016). *Convolution kernels for multi-wavelength imaging*. *October*, 7. https://doi.org/10.1051/0004-6361/201629080

International conference

Hadj-Youcef, M. A., Bousbia-Salah, A., & Adnane, M. (2018). Feature selection applied to wavelet packet transform for an efficient EEG signal classification. *2018 International Conference on Electrical Sciences and Technologies in Maghreb (****CISTEM****)*, 1–6.

Hadj-youcef, A. (2014). *Reconstruction des Images par des méthodes d'optimisation convexes et non lisses*.

Hadj-youcef, M. A., & Abergel, A. (2017). Restauration d'objets astrophysiques à partir de données multispectrales floues et une réponse instrument non stationnaire. ***Gdr Isis***, *123*(908), 2017.

Orieux, F., Fraysse, A., & Abergel, A. (2018). *Restoration from Multispectral Blurred Data with Non-Stationary Instrument Response*. *ii*, 1–5.

Hadj-Youcef, M. E. (2018). *Spatio spectral reconstruction from low resolution multispectral data: application to the Mid-Infrared instrument of the James Webb Space Telescope*. Université Paris-Saclay (**ComUE**).

Hadj-Youcef, M. A., Orieux, F., Fraysse, A., & Abergel, A. (2018). Spatio-spectral multichannel reconstruction from few low-resolution multispectral data. *2018 26th European Signal Processing Conference (****EUSIPCO****)*, 1980–1984.

Hadj-Youcef, M. A., Adnane, M., & Bousbia-Salah, A. (2013). Detection of epileptics during seizure free periods. *2013 8th International Workshop on Systems, Signal Processing and Their Applications, ****WoSSPA*** *2013*, *May*, 209–213. https://doi.org/10.1109/WoSSPA.2013.6602363

Posters

Restauration d'objets astrophysiques à partir de données multispectrales floues et d'une réponse instrument non stationnaire

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3 rue Joliot-Curie, 91 192 Gif-sur-Yvette, France

[2] Institut d'Astrophysique Spatiale, CNRS, UMR 8617, Univ. Paris-Sud, Université Paris-Saclay,
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Contexte

Ce travail traite la restauration d'objet astrophysique à partir de données multispectrales acquises par l'imageur moyen-infrarouge (MIRI), à bord du prochain télescope spatial James Webb (JWST) [jwst.nasa.gov].

L'objet d'intérêt à l'entrée du système optique est un flux lumineux ayant deux dimensions spatiales et une dimension spectrale. Durant le processus d'observation, l'objet est modifié par la réponse de l'instrument, fournissant une sortie discrète 2D pour chaque filtre [1].

Problématique

- Limitation de la résolution spatiale de données à cause de la diffraction de la lumière [2]
- Variation spectrale importante de la réponse optique entre [5 – 25µm]
- Intégration spectrale de l'objet sur de larges bandes
- Mauvais échantillonnage spectrale de données, seulement 9 filtre pour l'imageur MIRI

Objectif

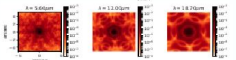
Reconstruction de l'objet atrophysique spatio-spectral original en exploitant l'ensemble de données à différentes bandes spectrales de l'instrument

Méthodologie

1) Modèle de l'Instrument

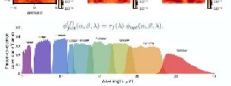
- Optique:

$$\phi_{opt}(\alpha,\beta,\lambda) = \phi(\alpha,\beta,\lambda) \underset{(\alpha,\beta)}{*} h(\alpha,\beta,\lambda).$$



- Filtre:

$$\phi_{det}^{(l)}(\alpha,\beta,\lambda) = \tau_l(\lambda)\,\phi_{opt}(\alpha,\beta,\lambda).$$



- Détecteur:

$$y^{(l)}(i,j) = \int_{\beta_{det}} \int_{\alpha_{det}} \eta(\lambda)\phi_{det}^{(l)}(\alpha,\beta,\lambda)\; h_{det}\left(\frac{\alpha - i\Delta_\alpha}{\Delta_\alpha}, \frac{\beta - j\Delta_\beta}{\Delta_\beta}\right) d\alpha\, d\beta\, d\lambda.$$

- Équation complète:

$$y^{(l)}(i,j) = \int_{\beta_{det}} \eta(\lambda)\tau_l(\lambda) \iint_{\alpha_{det}} \iint_{\beta_{det}} \phi(\alpha',\beta',\lambda) h(\alpha-\alpha',\beta-\beta',\lambda) d\alpha' d\beta' \cdot h_{det}\left(\frac{\alpha - i\Delta_\alpha}{\Delta_\alpha}, \frac{\beta - j\Delta_\beta}{\Delta_\beta}\right) d\alpha d\beta d\lambda.$$

2) Modèle de l'objet

La distribution spectrale de l'objet au pixel (i,j) est modélisée par des fonctions linéaires par morceaux telle que

$$\phi_{i,j}(\lambda) = \sum_{k=1}^{n_b} x_{i,j}^{(k)} g_k^{(k)}(\lambda) + x_{i,j}^{(k-1)} g_{k-1}^{(k)}(\lambda)$$

$g_k^{(k)}(\lambda)$ est une fonction contenant la variation spectral linéaire

3) Modèle directe multi-longueur d'onde

- En combinant les modèles de l'instrument et de l'objet pour un seul filtre :

$$y^{(l)}(i,j) = \sum_{(i,j)}^{n_b} h_{int}^{(l,k)}(i,j) \underset{(i,j)}{*} x^{(k)}(i,j)$$

avec

$$h_{int}^{(l,k)}(i,j) = \int_{\beta_{det}} \eta(\lambda)\tau_l(\lambda)\left(g_k^{(k+1)}(\lambda) + g_k^{(k)}(\lambda)\right) h(i,j,\lambda)\, d\lambda.$$

- Traitement de l'ensemble de données :

$$\begin{bmatrix} y^{(1)} \\ y^{(2)} \\ \vdots \\ y^{(L)} \end{bmatrix} = \underbrace{\begin{bmatrix} H^{(1,1)} & H^{(1,2)} & \cdots & H^{(1,n_b)} \\ H^{(2,1)} & & & H^{(2,n_b)} \\ \vdots & & & \vdots \\ H^{(n_l,1)} & H^{(n_l,2)} & \cdots & H^{(n_l,n_b)} \end{bmatrix}}_{H} \begin{bmatrix} x^{(1)} \\ x^{(2)} \\ \vdots \\ x^{(n_b)} \end{bmatrix} + \begin{bmatrix} \epsilon^{(1)} \\ \epsilon^{(2)} \\ \vdots \\ \epsilon^{(n_l)} \end{bmatrix}$$

4) Problème inverse

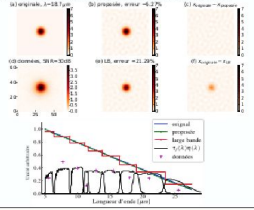
$$\hat{x} = \underset{x}{\operatorname{argmin}} J(x) = \|y - Hx\|_2^2 + \underbrace{\sum_{k=1}^{n_b} \beta_k \|Dx\|_2^2}_{\|Cx\|_2^2}.$$

- Solution du problème:

$$\hat{x} = (H^t H + C^t C)^{-1} H^t y$$

Résultats

- Résultats de restauration d'un objet spatio-spectral synthétique :



Conclusion

- Restauration du contenu spatio-spectral de l'objet original à partir de données multispectral acquises par l'imageur
- Modélisation de la réponse instrumentale décrivant la physique de l'instrument. Elle prend en compte la variation en longueur d'onde de la PSF et l'intégration spectrale sur de larges fenêtres spectrales
- Développement d'un modèle direct linéaire multi-longueur d'onde en modélisant le spectre de l'objet par une fonction continue, choisie linéaire par morceaux
- Calcul de la solution du problème en minimisant le critère des moindres carrés régularisés par l'algorithme du gradient conjugué
- Augmentation significative de résolution spatiale et une meilleure reconstruction de la distribution spectrale par rapport aux approches conventionnelles utilisant une PSF 2D à large bande "LB" [3].

Références

[1] M.A. Hadj-Youcef, F. Orieux, A. Fraysse, A. Abergel; Restoration from Multispectral Blurred Data with Non-Stationary Instrument Response, EUSIPCO 2017

[2] J. W. Goodman, Introduction to Fourier optics, Roberts and Company Pub., 2005.

[3] G. Aniano, B. Draine, K. Gordon, and K. Sandstrom, "Common-resolution convolution kernels for space-and ground-based telescopes," Publications of the Astronomical Society of the Pacific, vol. 123, no. 908, p. 1218, 2011.

XXVIe Colloque GRETSI, Palais des Congrès, Juan-Les-pins, France, 5-8 Semptebre 2017

DETECTION OF EPILEPTICS DURING SEIZURE FREE PERIODS

M.A. Hadj-Youcef[1], M. Adnane[1], A. Bousbia-Salah[2]

[1] Ecole Nationale Polytechnique, Electrical Engineering Department
10 Avenue Hassen Badi, El-Harrach, Algiers, Algeria

[2] University of Sciences And Technology Houari Boumediene, Electrical Engineering Department
BP-32 El-Alia, Bab-Ezzouar, Algiers, Algeria

INTRODUCTION

. In this paper the problematic of epileptic detection is treated. The difference with conventional methods is the use of free seizure epileptic records. The raw EEG signal is decomposed using discrete wavelet transform (DWT), principal component analysis (PCA) is used to reduce the dimensionality of the Data. Several features are extracted and used as input of support vector machine (SVM) classifier. Results show satisfactory classification accuracy comparable or better than those reported in literature.

PROBLEMATIC

. Detection of epileptic during seizure free periods.
. Classification of EEG signal into two classes: *Healthy* and *Epileptic*.

PROPOSED METHOD

. Development of an automatic system for EEG signal classification.
. Choose of an efficient method of EEG signal analysis and classification.

DATA AND METHOD

. A publicly available EEG database [1] was used. A complete description of the database is available in [2], Example given in Figure 1 shows two EEG signals one from set A (Healthy with eyes open) and one from set C (Epileptic during seizure free periods).

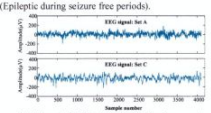
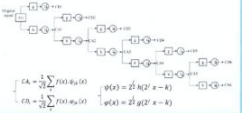


Fig. 1. Example of EEG signal from set A (Healthy with eyes open) and set C (Epileptic during seizure free periods)

. The two Sets of EEG signal are decomposed using Discrete Wavelet Transform (DWT), with level '6' and wavelet 'db2'.



$$cA_k = \frac{1}{\sqrt{2}} \sum_n f(n)\,\varphi_{jk}(n) \qquad \varphi(x) = 2^{\frac{j}{2}} h(2^j x - k)$$

$$cD_k = \frac{1}{\sqrt{2}} \sum_n f(n)\,\psi_{jk}(n) \qquad \psi(x) = 2^{\frac{j}{2}} g(2^j x - k)$$

REFERENCES

[1] EEG time series data, Department of Epileptology University of Bonn,*http://www.meb.uni-bonn.de/epileptologie/science/physik/eegdata.html* (accessed: 21 December 2012).

[2] R. G. Andrzejak, K. Lehnertz, F. Mormann, C. Rieke,P. David, C. E. Elger, Indications of nonlinear deterministic and finite-dimensional structures in time series of brain electrical activity: Dependence on recording region and brain state, *Phys. Rev. E.* 64 (6) (2001) 61907.

RESULTS

. After the execution of the program we obtain the below results:

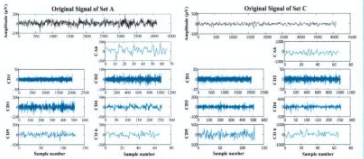


Fig. 2.Approximate and detail coefficients of a sample EEG signal segment taken from a healthy patient with eyes open (set A).

Fig. 3.Approximate and detail coefficients of a sample EEG signal segment taken from a epileptic patient during seizure free periods (set C).

. Several feature are extracted : *Maximum (Max), Minimum (Min), Range (Rng), Standard deviation (Std), Energy (Eng), Entropy of shannon (Ent).*

. These features are reduced using Principal Component Analysis (PCA) and used like an input to the support vector machine (SVM) classifier, the figure below show the classification using SVM classifier using standard deviation feature (Std) with 10-fold cross-validation.

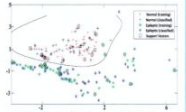


Fig. 4.Classification of EEG data using Std with 10-fold cross-validation

. Method is performed using three parameter measure : Accuracy, Sensibility, Specificity. The figure below show the performance of classification using different feature with 10-fold cross-validation:

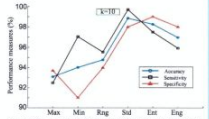


Fig. 5. Performance of classification using different features with 10-fold cross-validation

. Best results (Table 1) are obtained when combining features standard deviation (Std) and entropy (Ent). This result can not be commented without deep investigation about feature selection and feature comparison which is our next research work.

Table 1 Classification results using standard deviation

Performance	K=2	K=5	K=10
ACC (%)	98,84	98,99	99
SE (%)	98,97	99	99
SP (%)	98,89	99	99

CONCLUSION

. In this paper, method for EEG signal classification is described. The two classes' scheme was chosen such as class 1 is healthy EEG records and, class 2 is the epileptic EEG records with no seizures. The method uses the decomposition of the EEG signals using DWT. Then features are extracted. Moreover, PCA is used so vectors of features obtained in this operation are transformed into a new data vectors. The dimension of new data vectors is reduced in comparison to initial data. Finally, Training and Classification are applied to data from mean of SVM classifier. The results are very satisfactory which means that there is possibility to detect epilepsy at an early stage of the pathology using the developed method.

The 8th International Workshop on Systems, Signal Processing and their Applications (WOSSPA), 12-15 May, 2013, Mazafran, Algiers, Algeria

Gallery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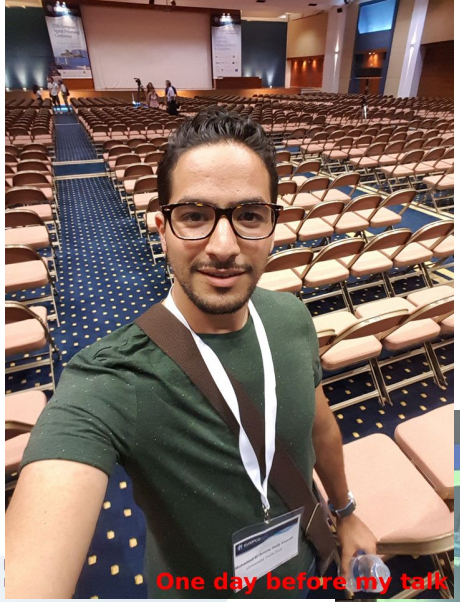
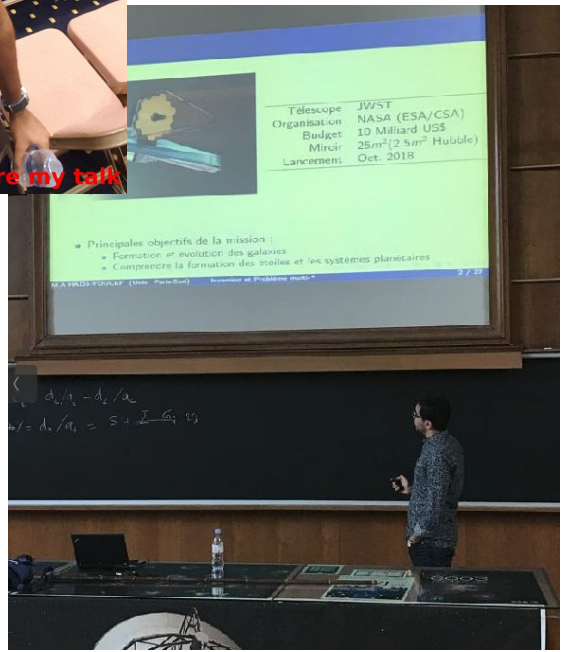

One day before my talk


université
PARIS-SACLAY
Cérémonie de Remise des Diplômes de Doctorat
Vendredi 28 juin 2019 - CentraleSupelec


Télescope JWST
Organisation NASA (ESA/CSA)
Budget 10 Milliard US$
Miroir 25m²(2.5m² Hubble)
Lancement Oct. 2018
Principales objectifs de la mission :
Formation et évolution des galaxies
Comprendre la formation des étoiles et les systèmes planétaires

Contact

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