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# **L'automatisation des processus de curation sur des métadonnées de provenance : tests d'ingestion et de manipulation de données massives et hétérogènes au sein de l'écosystème numérique de NDame**

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Violette Abergel, Livio De Luca

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# L'automatisation des processus de curation sur des métadonnées de provenance :

Tests d'ingestion et de manipulation de données massives et hétérogènes au sein  
de l'écosystème numérique de NDame

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12/06/2025, TAIC 2025, Les Journées « Archéologie, Architecture et HBIM : nouvelles perspectives pour  
le patrimoine bâti », MMSH Aix-En-Provence

# Automatisation des processus de curation sur des métadonnées de données massives et hétérogènes

Simon Paolorsi :

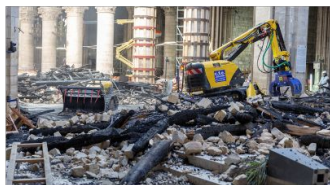
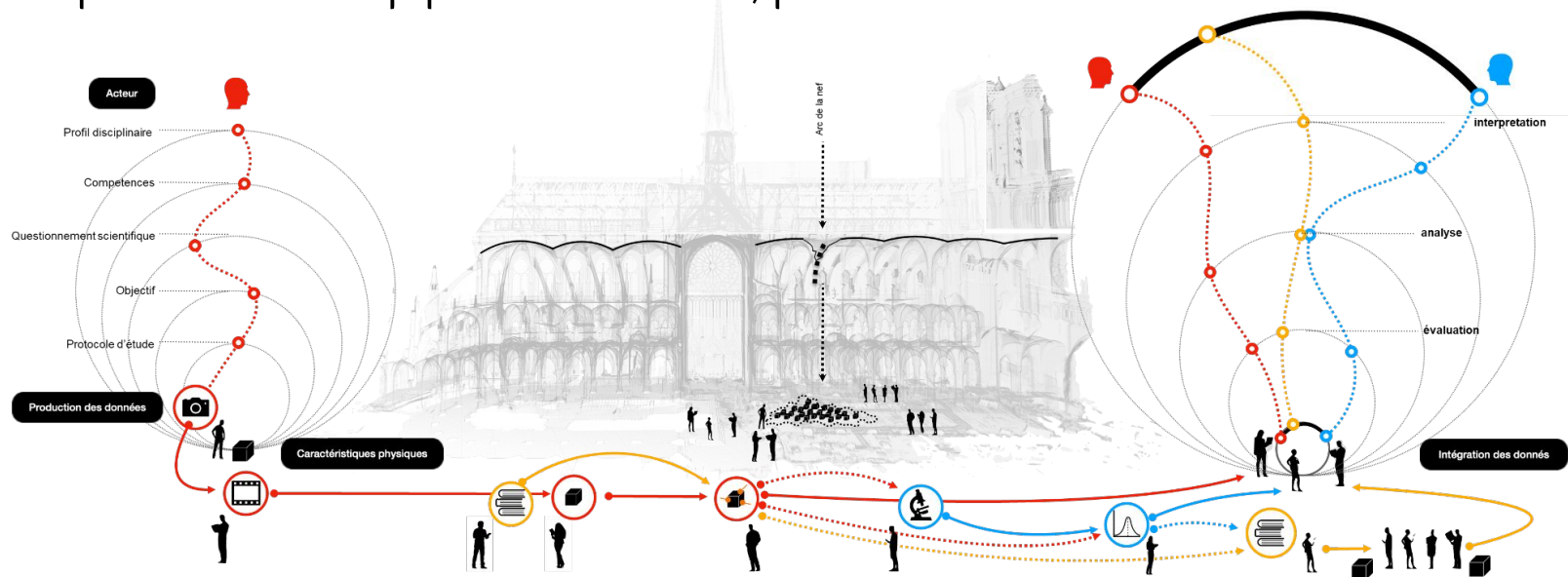
- Master 2 Humanités Numériques - CESR - Tours
- Stage de fin de master au CNRS MAP UPR 2002, supervision A. Guillem, L. De Luca



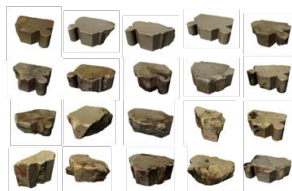
European Research Council  
Established by the European Commission



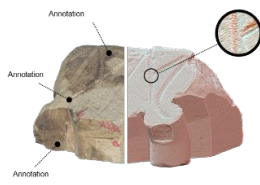
# Contexte: NDP : chantier scientifique (2019-2024), des questions scientifiques aux données, puis aux connaissances



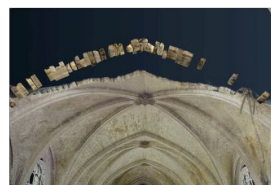
Collecte des données



Sélection d'un corpus d'éléments



Étude des caractéristiques

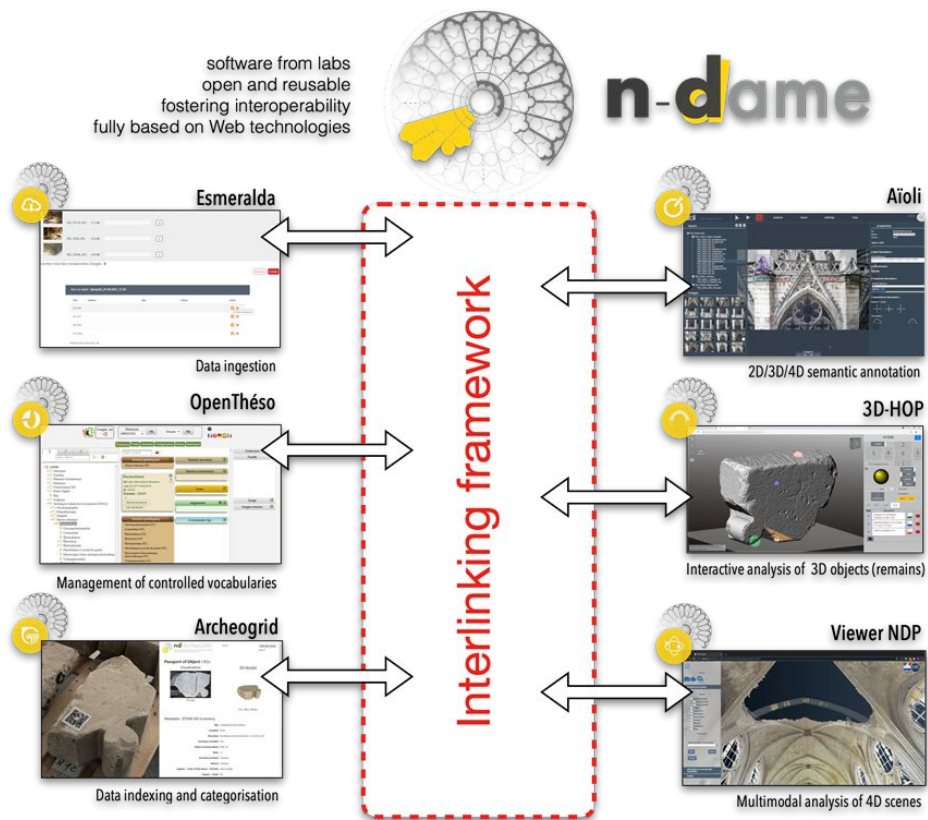


Modélisation numérique d'une hypothèse



Remontage à blanc

# Ecosystème numérique et outils

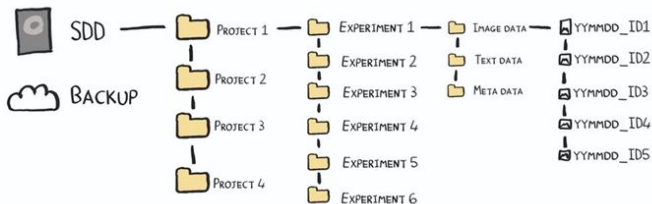


Ariane Néroulidis, Thomas Pouyet, Sarah Tournon, Violette Abergel, Miled Rousset, et al. A digital platform for the centralization and long-term preservation of multidisciplinary scientific data belonging to the Notre Dame de Paris scientific action. *Journal of Cultural Heritage*, 2023, Special issue "Notre-Dame de Paris"



# Données hétérogènes et maïeutique numérique

## How DATA SHOULD BE ORGANISED



## How MOST DATA IS ACTUALLY ORGANISED



ERRANTSCIENCE.COM

Raw data

vs.

Data pre-processing

vs.

Data processing

vs.

Data visualization

vs.

Data analysis/interpretation

DATA

1



SORTED

2



ARRANGED

3



PRESENTED VISUALLY

4



EXPLAINED WITH A STORY

5



# Problématique

- Données hétérogènes
- Données massives (env.32 To)

**-> Comment automatiser la curation de métadonnées hétérogènes pour faciliter leur manipulation dans un écosystème numérique ?**

# Cas d'étude présenté

Description du jeu de données:

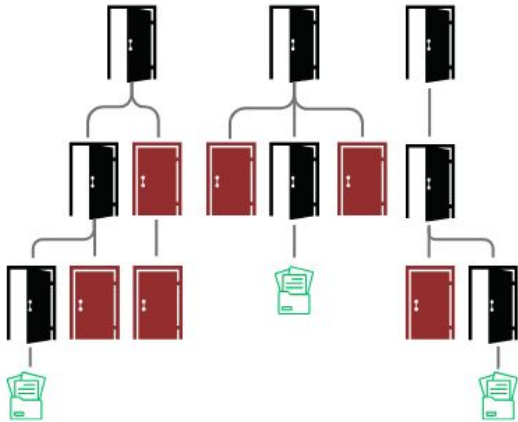
- Objectif: Numérisation massives NDP
- Volume: 1200 objets
- Type: photogrammétrie
- Objets numérisés: artefacts/architecture





# Les métadonnées

- *données vs. métadonnées*
- fichier json en arborescence



```
"Activity": {
  "Type": "NDScanner",
  "WHO": {
    "Operator": "Comte Florent",
    "Affiliation": "CNRS - ERC nDame_Heritage"
  },
  "WHERE": {
    "Location": "St-Witz, réserves"
  },
  "WHEN": {
    "Date": "03/09/2022",
    "StartTime": "06:44:49",
    "EndTime": "16:53:05"
  },
  "WHAT": {
    "Appellation": "NDP_4037C",
    "Comment": "made with 'Enjambeur'"
  },
  "HOW": {
    "Modality": {
      "Technique": "Photogrammetry",
      "SubTechnique": "NDScanner Enjambeur",
      "NbCam": 175,
      "Protocol": {
        "Automation": "False",
        "AcquisitionType": "Circular",
        "NbFaces": 2,
        "NbImgPerFaces": [
          91,
          84
        ],
        "ColorCalib": "False"
      }
    }
  }
},
```

```
"Activity": {
  "WHO": {
    "Operator": "FLORENT COMTE",
    "Affiliation": "GT NUMERIQUE"
  },
  "WHERE": {
    "Location": "ST-WITZ"
  },
  "WHEN": {
    "Date": "14/09/2023",
    "StartTime": "14:26:09",
    "EndTime": "14:30:04"
  },
  "WHAT": {
    "Appellation": "4037D",
    "Comment": ""
  },
  "HOW": {
    "Modality": {
      "Technique": "Photogrammetrie",
      "SubTechnique": "Multicamera-rig",
      "NbCam": 3,
      "Protocol": {
        "Automation": "True",
        "AcquisitionType": "Circular",
        "NbFaces": 2,
        "NbImgPerFaces": 25,
        "ColorCalib": false,
        "BreakTime": 0.1
      }
    }
  }
},
```

# Données hétérogènes vers données nettoyées et alignées

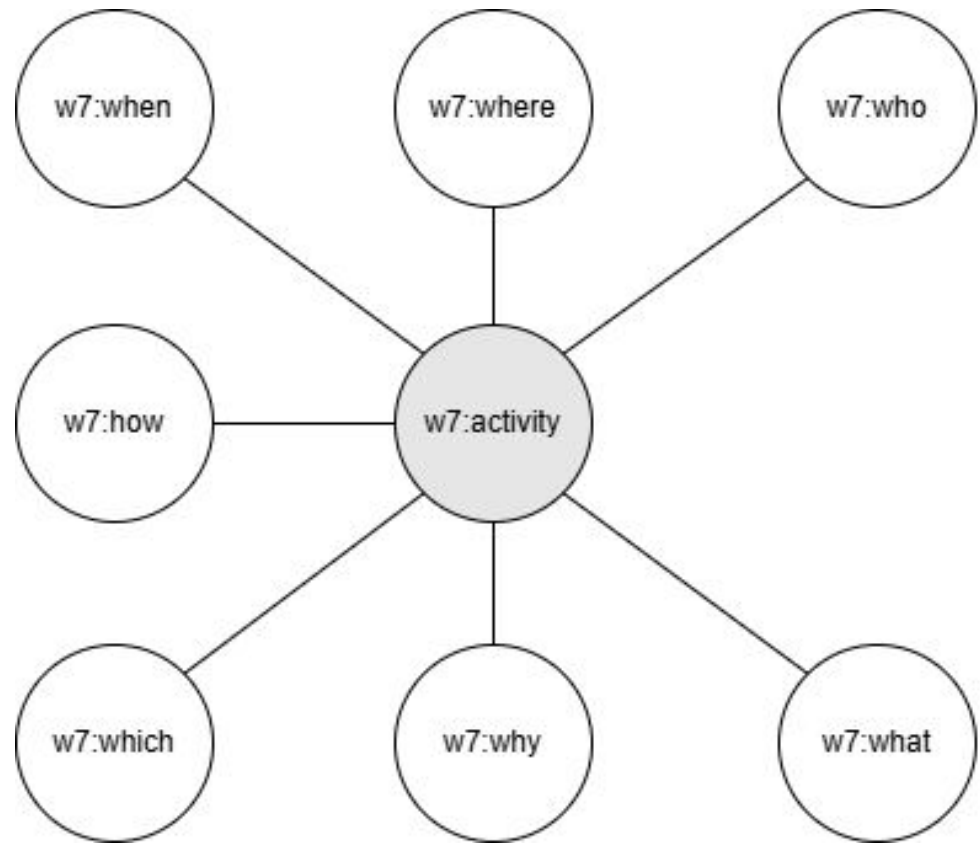
- *Schéma de métadonnées* : si la structure des données ne correspond pas au schéma, insertion des données impossible
- Solution : Comparer les différences et mettre en place un alignement.

*Alignement* : structuration des métadonnées à partir d'un schéma



# Le modèle du W7

- W7 - what, who, where, when, how, which, why - utilisation pour la documentation des activités de recherche en l'adaptant à chaque activité spécifique (photogrammétrie, annotation, inventaire etc)

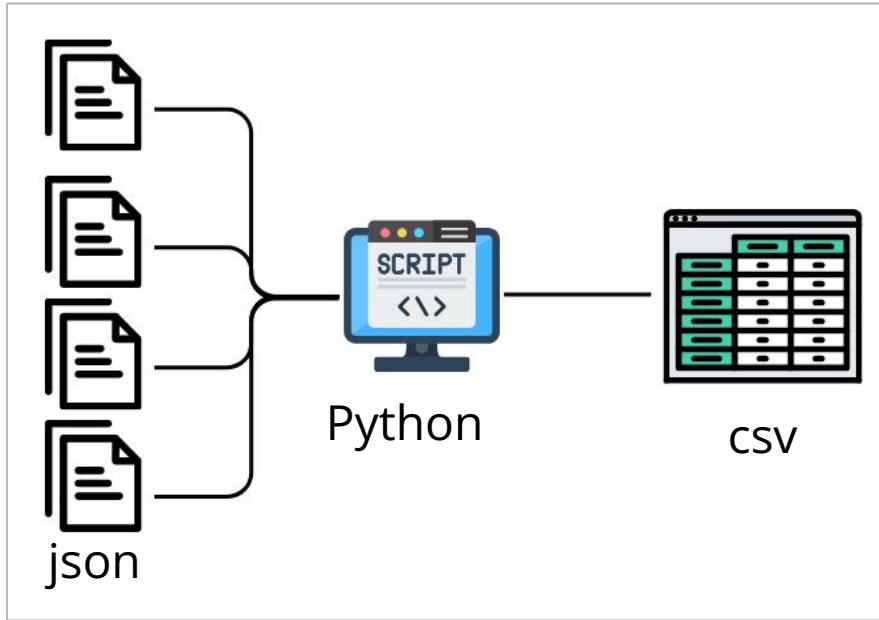


Guillem, Anaïs, Violette Abergel, Roxane Roussel, Florent Comte, Anthony Pamart, and Livio De Luca. n.d. "Provenance as the Missing Link in Digital Heritage Data from 3D Digitization to Semantic Enrichment (under Review)." *Heritage*, no. Advanced Data Environment in Current Cultural Heritage 3D Digitization Practices.

# (Meta)Data workflow: étapes et scripts

- 1/ compilation des métadonnées: fichiers de métadonnées -> csv
- 2/ contrôle des métadonnées -formats, valeurs- (csv)
- 3/ générer un schéma de métadonnées cohérent en json PAW\* (Paradata Adaptor W7\*) (json)
- 4/ alignement entre schéma de métadonnées (json) et jeu de métadonnées (csv)

# 1/ compilation des métadonnées: fichiers de métadonnées -> csv



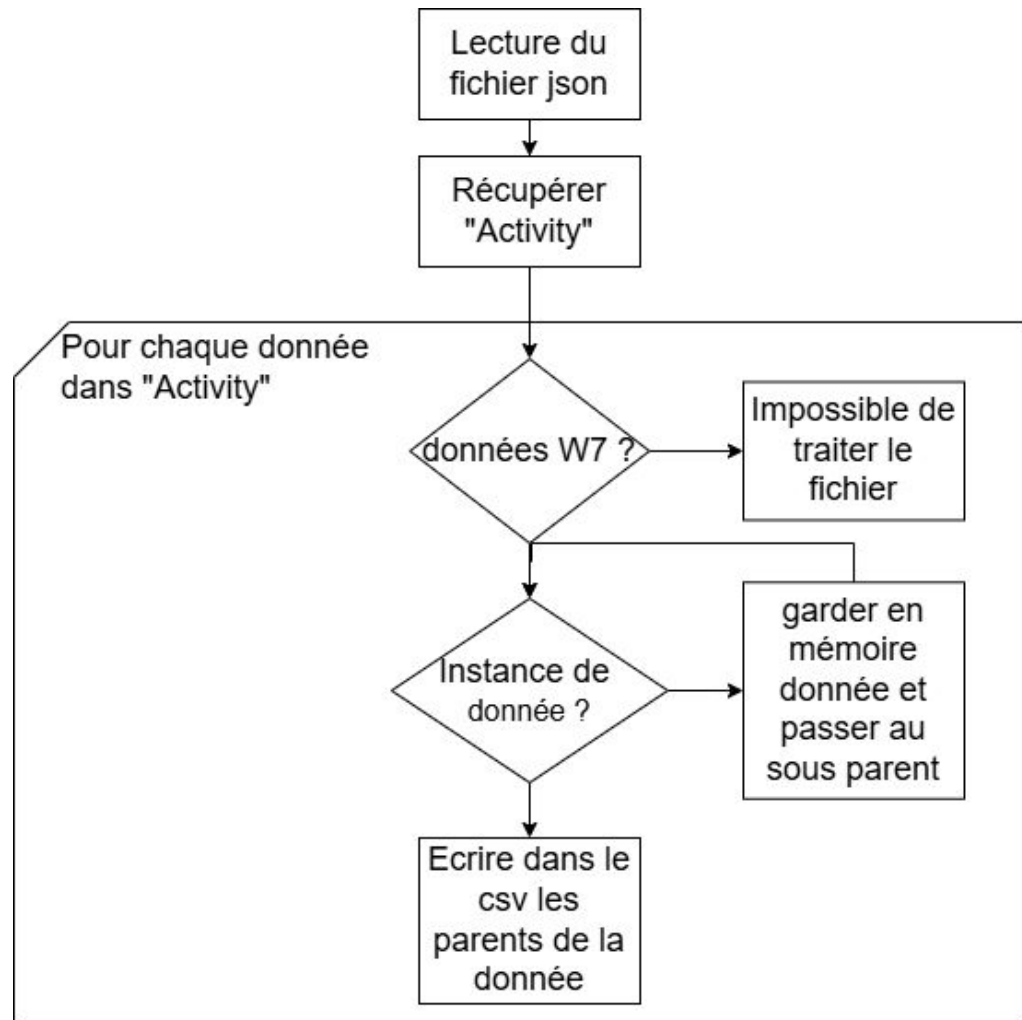
Script 1

Pourquoi le csv :

- permet une visualisation des métadonnées
- format communément utilisé
- facilement modifiable
- meilleure visualisation des modifications à prévoir

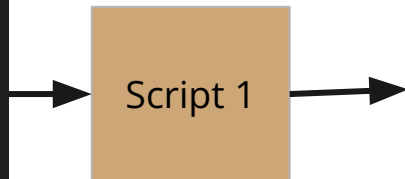
# 1/ Script 1

Pour chaque fichier json :  
basé sur le w7



# input

```
{
  "Activity": {
    "WHO": {
      "Operator": "Comte Florent",
      "Affiliation": "CNRS - ERC nDame_Heritage"
    },
    "WHERE": {
      "Location": "St-Witz, réserves"
    },
    "WHEN": {
      "Date": "25/01/2023",
      "StartTime": "12:28:38",
      "EndTime": "12:40:38"
    },
    "WHAT": {
      "Appellation": "NDP_3065",
      "Comment": "made manually"
    },
    "HOW": {
      "Modality": {
        "Technique": "Photogrammetry",
        "SubTechnique": "Manual acquisition",
        "NbCam": 80,
        "Protocol": {
          "Automation": "False",
          "AcquisitionType": "Circular",
          "NbFaces": 2,
          "NbImgPerFaces": [
            42,
            38
          ],
          "ColorCalib": "False"
        }
      }
    }
  }
}
```

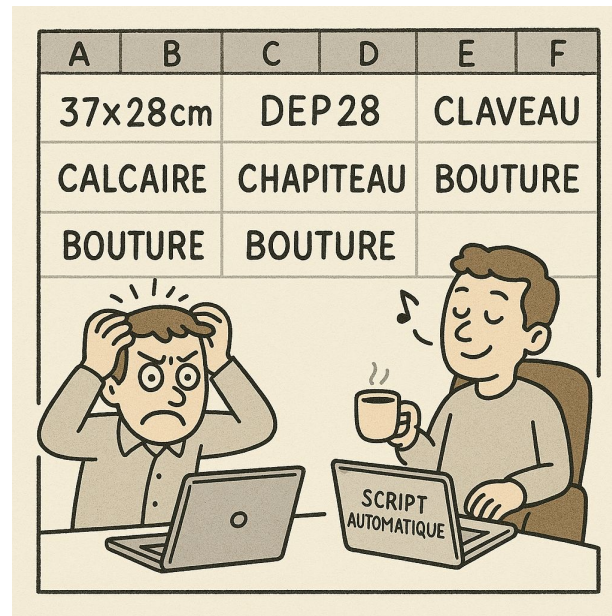


# output

Level1	Level2	Level3	Level4	Level5	Value
Activity	WHO	Operator			Comte Florent
Activity	WHO	Affiliation			CNRS - ERC nDa
Activity	WHERE	Location			St-Witz, réserves
Activity	WHEN	Date			25/01/2023
Activity	WHEN	StartTime			12:28:38
Activity	WHEN	EndTime			12:40:38
Activity	WHAT	Appellation			NDP_3065
Activity	WHAT	Comment			made manually
Activity	HOW	Modality	Technique		Photogrammetry
Activity	HOW	Modality	SubTechnique		Manual acquisition
Activity	HOW	Modality	NbCam		80
Activity	HOW	Modality	Protocol	Automation	FALSE
Activity	HOW	Modality	Protocol	AcquisitionType	Circular
Activity	HOW	Modality	Protocol	NbFaces	2
Activity	HOW	Modality	Protocol	NbImgPerFaces	[42, 38]
Activity	HOW	Modality	Protocol	ColorCalib	FALSE
Activity	WHICH	Setup			None
Activity	WHICH	Camera	Type		Canon
Activity	WHICH	Camera	Model		Canon EOS 6D
Activity	WHICH	Camera	Lens		EF50mm f/1.8 STI
Activity	WHICH	Camera	Settings	Shutterspeed	0
Activity	WHICH	Camera	Settings	Whitebalance	Contextual
Activity	WHICH	Camera	Settings	Aperture	8.375
Activity	WHICH	Camera	Settings	Iso	200
Activity	WHICH	Camera	Settings	Focal	50
Activity	WHICH	Camera	Settings	RAW	TRUE
Activity	WHICH	Camera	Settings	JPG	FALSE
Activity	WHICH	Camera	Settings	ColorProfile	FALSE
Activity	WHICH	Light	SourceType		Contextual
Activity	WHICH	Light	Number		Contextual
Activity	WHICH	Light	Natural		FALSE
Activity	WHY	Project			nDame_Heritage
Activity	WHY	Context			Chantier Scientifiq

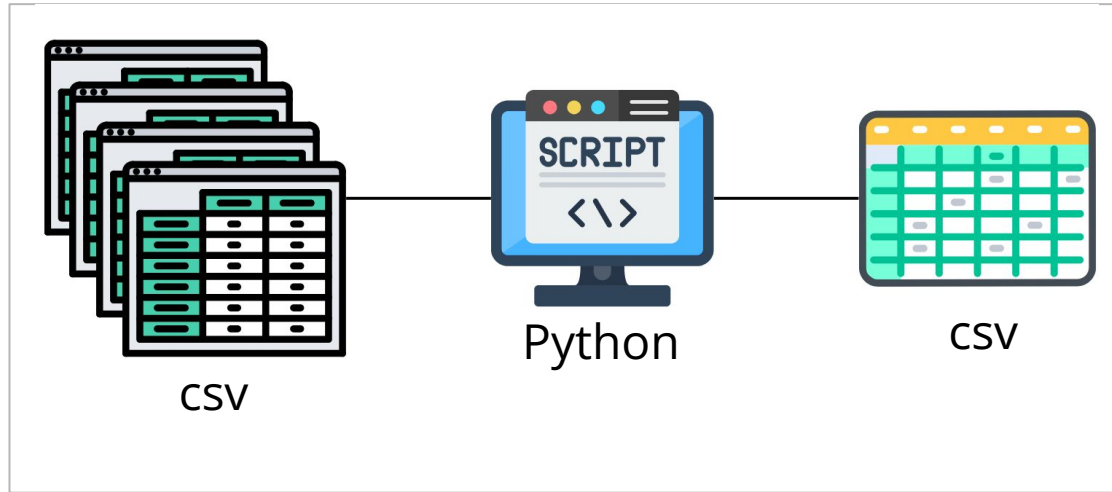
# Compiler les métadonnées pour la curation des données

- Vérifier les métadonnées avant création d'un alignement : le nombre d'images, les erreurs d'écritures.
- Vérification des métadonnées avec les personnes qui ont créées les données.
- Mise en place d'un csv de comparaison des métadonnées





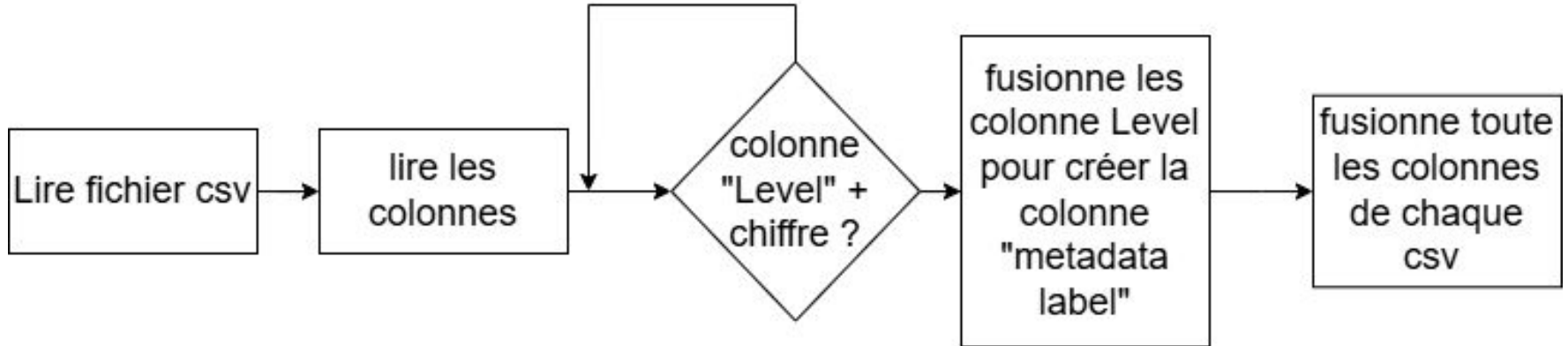
## 2/ contrôle des métadonnées -formats, valeurs- (csv) : Comparaison des fichiers csv



Script 2

# Script 2

Ce script peut être fusionné avec le script 1. Pour des raisons de suivi des modifications et un **contrôle de qualité des métadonnées**, ces deux parties sont séparées.



# Script 2

input

Level1	Level2	Level3	Level4	Level5	Value
Activity	WHO	Operator			Comte Florent
Activity	WHO	Affiliation			CNRS - ERC nD
Activity	WHERE	Location			St-Witz, réserves
Activity	WHEN	Date			25/01/2023
Activity	WHEN	StartTime			12:28:38
Activity	WHEN	EndTime			12:40:38
Activity	WHAT	Appelation			NDP_3065
Activity	WHAT	Comment			made manually
Activity	HOW	Modality	Technique		Photogrammetry
Activity	HOW	Modality	SubTechnique		Manual acquisiti
Activity	HOW	Modality	NbCam		80
Activity	HOW	Modality	Protocol	Automation	FALSE
Activity	HOW	Modality	Protocol	AcquisitionType	Circular
Activity	HOW	Modality	Protocol	NbFaces	2
Activity	HOW	Modality	Protocol	NblmgPerFaces	[42, 38]
Activity	HOW	Modality	Protocol	ColorCalib	FALSE
Activity	WHICH	Setup			None
Activity	WHICH	Camera	Type		Canon
Activity	WHICH	Camera	Model		Canon EOS 6D
Activity	WHICH	Camera	Lens		EF50mm f/1.8 S
Activity	WHICH	Camera	Settings	Shutterspeed	0
Activity	WHICH	Camera	Settings	Whitebalance	Contextual
Activity	WHICH	Camera	Settings	Aperture	8.375
Activity	WHICH	Camera	Settings	Iso	200
Activity	WHICH	Camera	Settings	Focal	50
Activity	WHICH	Camera	Settings	RAW	TRUE
Activity	WHICH	Camera	Settings	JPG	FALSE
Activity	WHICH	Camera	Settings	ColorProfile	FALSE
Activity	WHICH	Light	SourceType		Contextual
Activity	WHICH	Light	Number		Contextual
Activity	WHICH	Light	Natural		FALSE
Activity	WHY	Project			nDame_Neritage
Activity	WHY	Context			Chantier Scientifi

Script 2

output

metadata field	'MOBILIER'GT É	'MOBILIER'GT É	'MOBILIER'GT É	'MOBILIER'GT É
Activity_HOW_BreakTime				
Activity_HOW_Modality_NbCam	80	114	106	314
Activity_HOW_Modality_Protocol_AcquisitionType	Circular	Circular	Circular	Circular
Activity_HOW_Modality_Protocol_Automation	False	False	False	False
Activity_HOW_Modality_Protocol_ColorCalib	False	False	False	False
Activity_HOW_Modality_Protocol_NbFaces	2	2	2	2
Activity_HOW_Modality_Protocol_NblmgPerFaces	[42, 38]	[62, 52]	[52, 54]	[159, 155]
Activity_HOW_Modality_SubTechnique	Manual acquisiti	Manual acquisiti	Manual acquisiti	Manual acquisiti
Activity_HOW_Modality_Technique	Photogrammetry	Photogrammetry	Photogrammetry	Photogrammetry
Activity_HOW_Protocol_AcquisitionType				
Activity_HOW_Protocol_Automation				
Activity_HOW_Protocol_BreakTime				
Activity_HOW_Protocol_ColorCalib				
Activity_HOW_Protocol_NbFaces				
Activity_HOW_Protocol_NblmgPerFaces				
Activity_WHAT_Appelation	NDP_3065	NDP_4019A	NDP_4063	NDP_4082
Activity_WHAT_Comment	made manually	made manually	made manually	made manually
Activity_WHEN_Date	25/01/2023	25/01/2023	25/01/2023	23/01/2023
Activity_WHEN_EndTime	12:40:38	18:40:05	17:45:49	16:06:07
Activity_WHEN_StartTime	12:28:38	18:22:14	17:16:30	15:58:09
Activity_WHERE_Location	St-Witz, réserves	St-Witz, réserves	St-Witz, réserves	St-Witz, réserves
Activity_WHICH_Camera_Aperture				
Activity_WHICH_Camera_Iso				
Activity_WHICH_Camera_Lens	EF50mm f/1.8 S	EF50mm f/1.8 S	EF50mm f/1.8 STM	
Activity_WHICH_Camera_Model	Canon EOS 6D	Canon EOS 6D	Canon EOS 6D	DSC-RX100M3
Activity_WHICH_Camera_Settings_Aperture	8.375	8.375	8.375	
Activity_WHICH_Camera_Settings_ColorProfile	False	False	False	False
Activity_WHICH_Camera_Settings_Focal	50	50	50	13.34
Activity_WHICH_Camera_Settings_Iso	200	200	200	1000
Activity_WHICH_Camera_Settings_JPEG				
Activity_WHICH_Camera_Settings_JPG	False	False	False	False
Activity_WHICH_Camera_Settings_RAW	True	True	True	True
Activity_WHICH_Camera_Settings_Shutterspeed	0	0	-0.6875	
Activity_WHICH_Camera_Settings_Whitebalance	Contextual	Contextual	Contextual	Contextual
Activity_WHICH_Camera_Shutterspeed				

# Curation des données

récupérer toutes les métadonnées et pouvoir comparer les différences

metadata field	F E \ MOBILIER \ GT E	MOBILIER \ GT E	MOBILIER \ GT E	MOBILIER \ GT E	MOBILIER \ GT E	MOBILIER \ GT E
Activity_HOW_BreakTime					0.9999999999999999	0.9999999999999999
Activity_HOW_Modality_NbCam	198	215	173	367	3	3
Activity_HOW_Modality_Protocol_AcquisitionType	Circular	Circular	Circular	Circular		
Activity_HOW_Modality_Protocol_Automation	False	False	False	False		
Activity_HOW_Modality_Protocol_ColorCalib	False	False	False	False		
Activity_HOW_Modality_Protocol_NbFaces	2	2	2	2		
Activity_HOW_Modality_Protocol_NbImgPerFaces	[101, 97]	[102, 113]	[88, 85]	[196, 171]		
Activity_HOW_Modality_SubTechnique	nje NDSscanner Enje	NDSscanner Enje	NDSscanner Enje	NDSscanner Enje	Multicamera-rig	Multicamera-rig
Activity_HOW_Modality_Technique	try Photogrammetry	Photogrammetry	Photogrammetry	Photogrammetry	Photogrammetry	Photogrammetry
Activity_HOW_Protocol_AcquisitionType					Circular	Circular
Activity_HOW_Protocol_Automation					True	True
Activity_HOW_Protocol_BreakTime					0.1	0.1
Activity_HOW_Protocol_ColorCalib					False	False
Activity_HOW_Protocol_NbFaces					2	2
Activity_HOW_Protocol_NbImgPerFaces					20	20
Activity_WHAT_Appellation	NDP_5006-1	NDP_5006-2	NDP_5011-A	NDP_5120-A	2024_10_22_51	2024_10_22_51

# 3/ générer un schéma de métadonnées cohérent en json PAW\* (json)

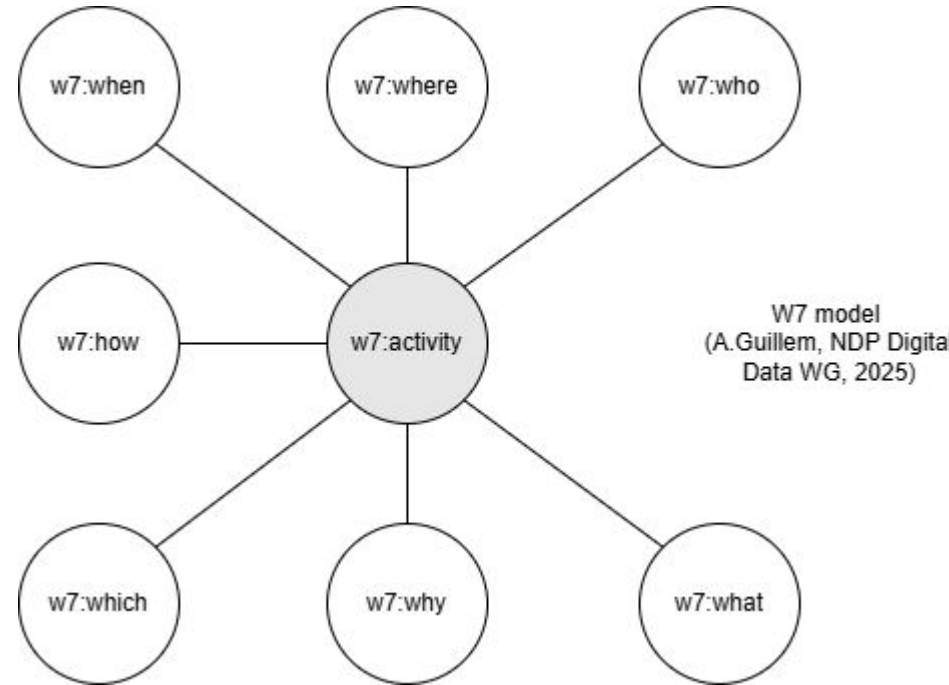
les données sont maintenant vérifiées mais toujours aucun alignement avec un schéma

Problématique : chaque personne n'a pas la même granularité dans ses métadonnées : comment le prendre en compte ?

Pouvoir remplir les données à différents niveaux :

- (Nom de l'objet numérisé : Material Entity "ME")  
What\_ME\_appelation : "NDP\_3065"
- (Décrit simplement ce qui à été numérisé)  
What : "Poutre en bois"

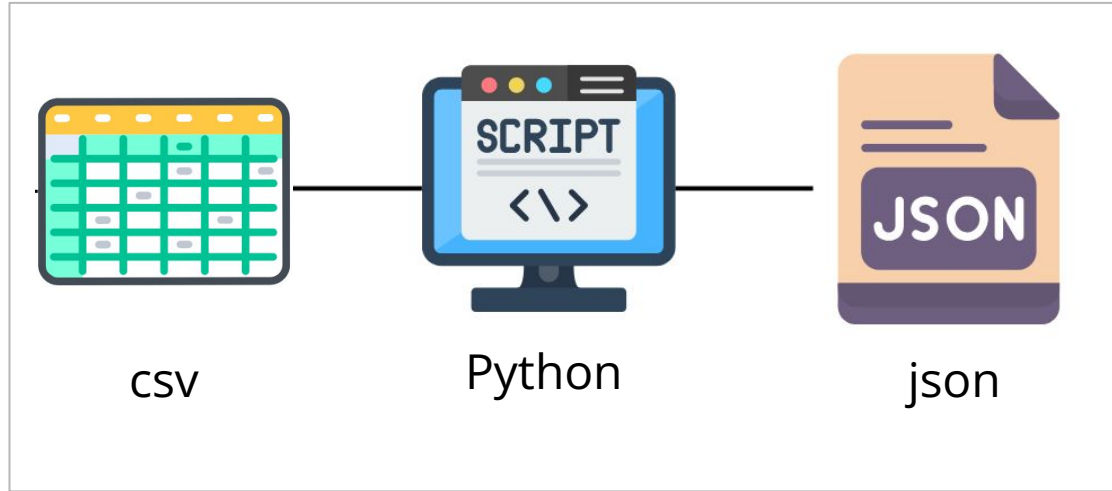
On récupère des informations sur le WHAT mais pas au même niveau de précision, possible seulement avec un schéma à plat



# Création d'un fichier csv

Informations relative au schéma de métadonnées		Mandatory	Metadata description	
domain	Digital Cultural heritage		domaine pour lequel le schéma est créer	
Activity type	Photogrammetry acquisition	required	le type d'activité qui est couvert pas ce schéma	
institution	NDP_Digital_Data_WG	required	l'institution qui créé le schéma	
year	2025	required	l'année de création du schéma	
version	0		La version sera re la version du schéma	
description	metadata schema for data acquisition based on W7	required	description du schéma pour indiquer son utilisation	
author	Anthony Pamart, Florent		le ou les auteurs du schéma	
contributor	Simon Paolorsi, Livio De Luca		le ou les contributeurs	
format	Json		le format (normalement toujours json schema)	
schema_reference	PAW			
date	04/30/2025		la date au format AAA/MM/JJ	
URI			l'URI du schema json	
ARK identifier			iden	
Liste des métadonnées				
metadata label			Metadata description	metadata type
w7_appellation			It describes the appellation or the title of the activity.	
w7_type			It describes the type of activity, in this case it is an activity of photogrammetry acquisition.	
w7_unique_identifier			It describes the unique identifier that identifies this recorded activity.	
w7_schema			It describes the W7 schema used to document this recorded activity.	
w7_comment			This field allows to add complementary information regarding the activity.	
What			It describes information on the objects associated with the activity, either material objects or digital objects. It answers the question What, in the sense of what object, what thing, what digital result or digital resources.	
	ME		It describes the material object, artefact, structure, object (ME, i.e. material entity) that the activity is focussing about.	
		appellation	It describes the name or appellation used to identify the artefact, structure, object (ME, ie. material entity) that the activity is focussing about.	
		identfier	It describes the identifier that allows the identification of the object, artefact, structure (ME, ie. material entity) that this activity is focussing about.	

# Comparaison des fichiers csv



csv

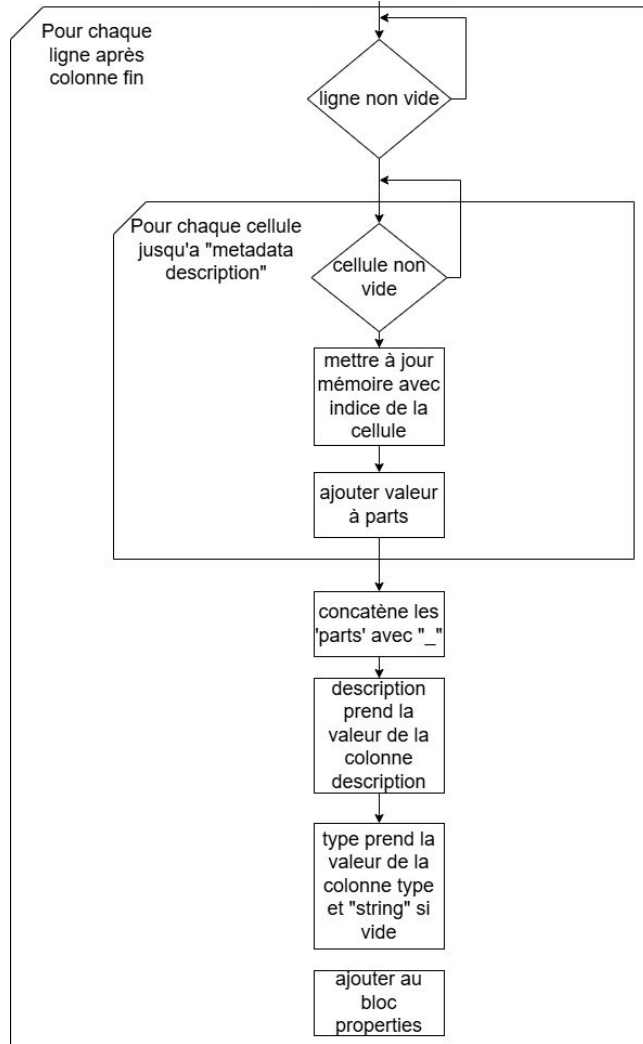
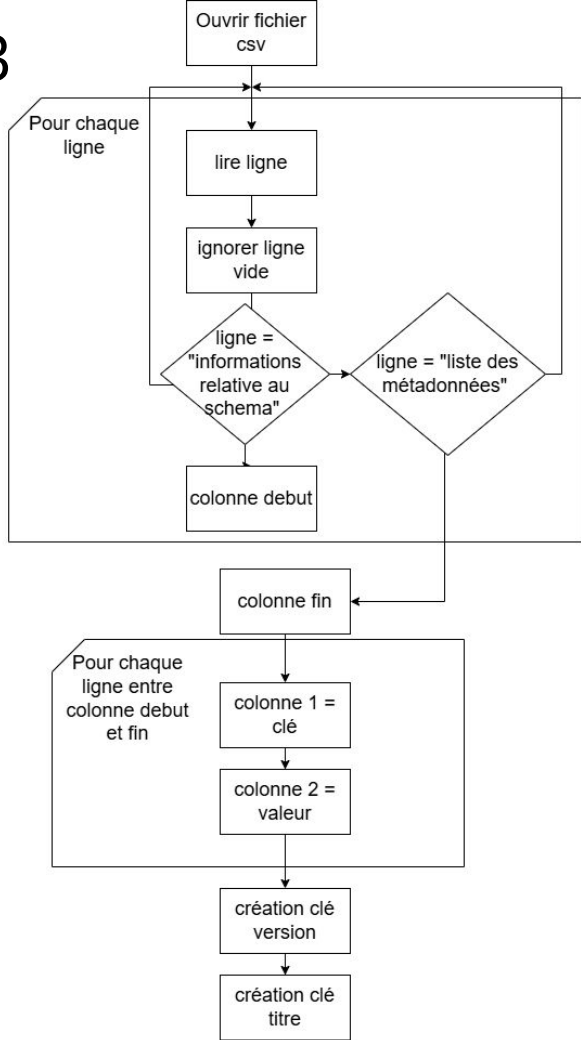
Python

json

Script 3

Le csv ne peut pas être utilisé pour vérifier la structure des données

# Script 3





Informations relative au schéma de métadonnées		Mandatory	Metadata description	
domain	Digital Cultural heritage		domaine pour lequel le schéma est créer	
Activity type	Photogrammetry acquisition	required	le type d'activité qui est couvert pas ce schéma	
institution	NDP_Digital_Data_WG	required	l'institution qui créé le schéma	
year	2025	required	l'année de création du schéma	
version	0		la version du schéma	
description	metadata schema for data acquisition based on W7	required	description du schéma pour indiquer son utilisation	
author	Anthony Pamart, Florent		le ou les auteurs du schéma	
contributor	Simon Paolorsi, Livio De Luca		le ou les contributeurs	
format	Json		le format (normalement toujours json schema)	
schema_reference	PAW			
date	04/30/2025		la date au format AAA/MM/JJ	
URI			l'URI du schema json	
ARK identifier			iden	
Liste des métadonnées				
metadata label			Metadata description	metadata type
w7_appellation			It describes the appellation or the title of the activity.	
w7_type			It describes the type of activity. in this case it is an activity of photogrammetry acquisition.	
w7_unique_identifier			It describes the unique identifier that identifies this recorded activity.	
w7_schema			It describes the W7 schema used to document this recorded activity.	
w7_comment			This field allows to add complementary information regarding the activity.	
What			It describes information on the objects associated with the activity, either material objects or digital objects. It answers the question What, in the sense of what object, what thing, what digital result or digital resources.	
	ME		It describes the material object, artefact, structure, object (ME, i.e. material entity) that the activity is focussing about.	
		appellation	It describes the name or appellation used to identify the artefact, structure, object (ME, ie. material entity) that the activity is focussing about.	
		identifier	It describes the identifier that allows the identification of the object, artefact, structure (ME, ie. material entity) that this activity is focussing about.	

```

{
  "$schema": "http://json-schema.org/draft-07/schema#",
  "title": "PAWS_photogrammetry_acquisition_gt_numérique_2025_v1",
  "type": "activité couverte par ce schéma": "photogrammetry acquisition",
  "institution": "gt numérique",
  "année": "2025",
  "version": "v1",
  "description": "description du schema",
  "auteur": "anaïs guillem, florent comte, anthony pamart",
  "contributors": "simon paolorsi, livio de luca",
  "format": "json",
  "date (format aaaa/mm/jj)": "04/30/2025",
  "type": "object",
  "properties": {
    "w7_appellation": {
      "description": "It describes the appellation or the title of the act",
      "type": "string"
    },
    "w7_type": {
      "description": "It describes the type of activity. in this case it i",
      "type": "string"
    },
    "w7_unique_identifi": {
      "description": "It describes the unique identifier that identifies t",
      "type": "string"
    },
    "w7_schema": {
      "description": "It describes the metadata schema used for the docume",
      "type": "string"
    },
    "w7_schema_type": {
      "description": "It describes the metadata schema used for the docume",
      "type": "string"
    },
    "w7_comment": {
      "description": "This field allows to add complementary information r",
      "type": "string"
    }
  },
}

```

# Prise en compte de la granularité

```
    type: "string"
  },
  "w7_what": {
    "description": "It describes information on the objects associated with the activity, either material objects or digital",
    "type": "string"
  },
  "w7_what_me": {
    "description": "It describes the artefact, structure, object (ME, ie. material entity) that the activity is focussing ab",
    "type": "string"
  },
  "w7_what_me_appellation": {
    "description": "It describes the name or appellation used to identify the artefact, structure, object (ME, ie. material",
    "type": "string"
  },
  "w7_what_me_identifier": {
    "description": "It describes the identifier that allows the identification of the object, artefact, structure (ME, ie. m",
    "type": "string"
  },
  "w7_what_me_unique_identifier": {
    "description": "It describes the unique identifier that identifies this material entity (ME).",
    "type": "string"
  },
  "w7_what_me_type": {
    "description": "It describes the type of object, artifact, structure (ME, ie. material entity) that this activity is foc",
    "type": "string"
  },
  "w7_what_me_material": {
    "description": "It describes the material of object, artifact, structure (ME, ie. material entity) that this activity is",
    "type": "string"
  },
},
```

# Alignement des données

metadata field	bool	float	int	list	str	alignement PAW	format de donnée	choice field
Activity_HOW_BreakTime	0	804	0	0	0		float	
Activity_HOW_Modality_NbCam	0	0	949	0	0			
Activity_HOW_Modality_Protocol_AcquisitionType	0	0	0	0	141	w7_which_photo_number	int	
Activity_HOW_Modality_Protocol_Automation	141	0	0	0	0	w7_which_acquisition_type	str	Circular
Activity_HOW_Modality_Protocol_ColorCalib	141	0	0	0	0	w7_which_acquisition_protocol	bool	
Activity_HOW_Modality_Protocol_NbFaces	0	0	141	0	0	w7_which_color_calibration	bool	
Activity_HOW_Modality_Protocol_NbImgPerFaces	0	0	0	141	0	w7_wich_chunk_number	int	
Activity_HOW_Modality_SubTechnique	0	0	0	0	949	w7_which_photo_number_per_chunk	list	
Activity_HOW_Modality_Technique	0	0	0	0	949	w7_how_subtechnique	str	Manual acquisition, Mult
Activity_HOW_Protocol_AcquisitionType	0	0	0	0	808	w7_how_technique	str	Photogrammetry, Photo
Activity_HOW_Protocol_Automation	808	0	0	0	0		bool	Circular
Activity_HOW_Protocol_BreakTime	0	807	0	0	0		float	
Activity_HOW_Protocol_ColorCalib	808	0	0	0	0		bool	
Activity_HOW_Protocol_NbFaces	0	0	808	0	0		int	
Activity_HOW_Protocol_NbImgPerFaces	0	0	799	9	0		list	
Activity_WHAT_Appellation	0	0	760	0	189	w7_appellation	str	
Activity_WHAT_Comment	0	0	0	0	145	w7_comment	str	
Activity_WHEN_Date	0	0	0	0	949		Date	
Activity_WHEN_EndTime	0	0	0	0	949	w7_when_time_end	Date	
Activity_WHEN_StartTime	0	0	0	0	949	w7_when_time_start	Date	
Activity_WHERE_Location	0	0	0	0	949	w7_where_location_city	str	
Activity_WHICH_Camera_Aperture	0	144	655	0	9	w7_which_camera_settings_aperture	str	
Activity_WHICH_Camera_Iso	0	0	808	0	0		int	
Activity_WHICH_Camera_Lens	0	0	806	0	132	w7_which_instrument_lens	str	
Activity_WHICH_Camera_Model	0	0	0	0	949	w7_which_instrument_model	str	
Activity_WHICH_Camera_Settings_Aperture	0	132	55	0	758	w7_which_camera_settings_aperture		
Activity_WHICH_Camera_Settings_ColorProfile	142	0	0	0	807	w7_which_camera_settings_color_profile	str	
Activity_WHICH_Camera_Settings_Focal	0	3	946	0	0	w7_which_camera_settings_focal	float	
Activity_WHICH_Camera_Settings_Iso	0	0	949	0	0	w7_which_camera_settings_iso	int	
Activity_WHICH_Camera_Settings_JPEG	807	0	0	0	0	w7_which_camera_settings_format_jpg	bool	
Activity_WHICH_Camera_Settings_JPG	142	0	0	0	0	w7_which camera settings format jpg	bool	

# Conclusion

- Tests avec d'autres jeux de données pour vérifier la méthode:
  - GT Pierre (données claveaux),
  - GT Décor (photos),
  - GT Métal (analyses demétallographie et travail de thèse de M. Bernard)
- Test d'ingestion de données dans Archeogrid
- Tests d'ingestion des données du GT Numérique sont en cours sur l'outil d'archivage Data.gouv

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