



## ➤ **Representation in RDF of Scientific Variables**

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# Variable

**Une variable est une caractéristique commune à un ensemble d'entités impliquées dans une expérimentation. La valeur de cette caractéristique varie entre les entités. Cette valeur est issue d'une observation ou d'une mesure ou d'une simulation ou d'un calcul effectué sur une entité identifiée individuellement (site, objet scientifique, parcelle...) sous certaines conditions (méthode de mesure, niveau d'agrégation...).**

**Par exemple, la variable "circonférence des arbres" s'effectue sur le tronc (une partie de l'objet scientifique) d'un arbre identifié à l'aide d'un compas forestier à une hauteur de 1,30 m. Autre exemple, la variable "vitesse du vent" s'effectue sur l'entité vent par une station météo sur un site identifié et à l'aide d'un anémomètre.**



# Discrete and Continuous Data

**Discrete** data can only take on certain individual values.

**Continuous** data can take on any value in a certain range.

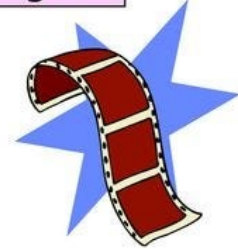
## Example 1

Number of pages in a book is a **discrete variable**.



## Example 2

Length of a film is a **continuous variable**.



## Example 3

Shoe size is a **Discrete variable**. E.g. 5,  $5\frac{1}{2}$ , 6,  $6\frac{1}{2}$  etc. Not in between.



## Example 4

Temperature is a **continuous variable**.

## Example 5

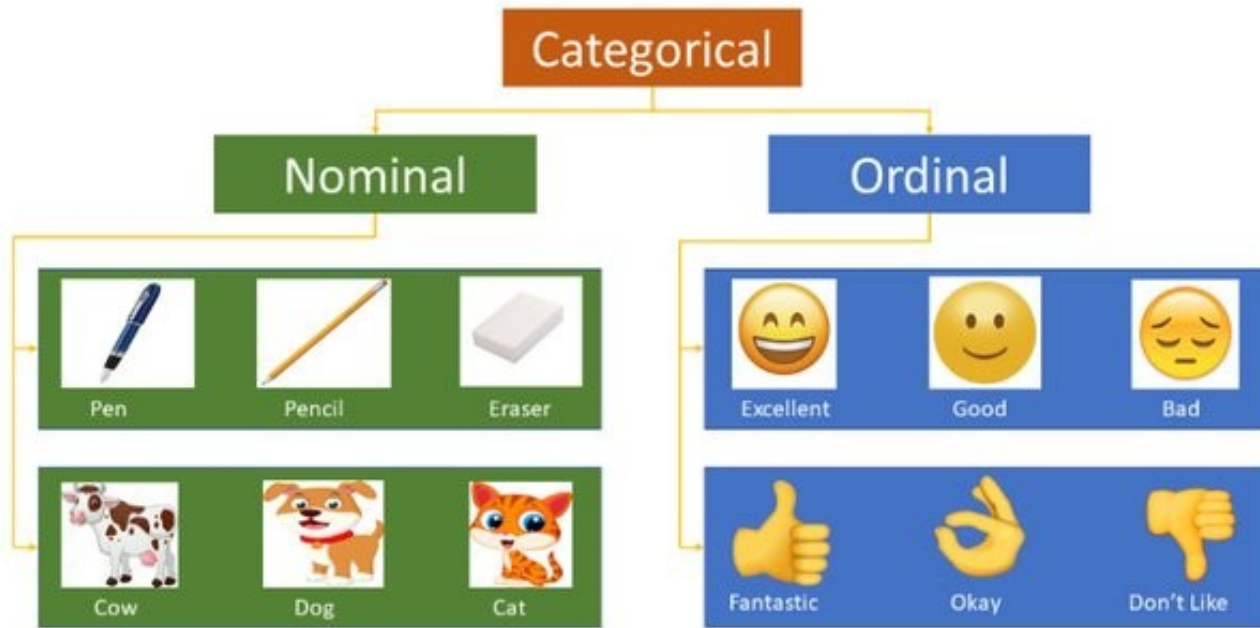
Number of people in a race is a **discrete variable**.

## Example 6

Time taken to run a race is a **continuous variable**.

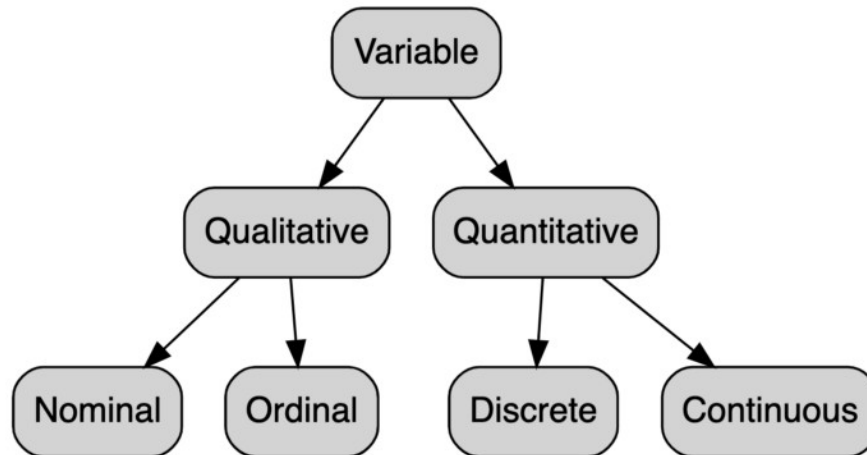


# Qualitative Variable

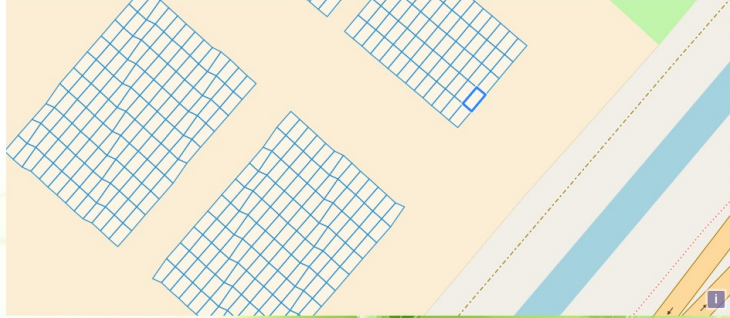


# Variable

Variable is the key element of data structuring and analytics



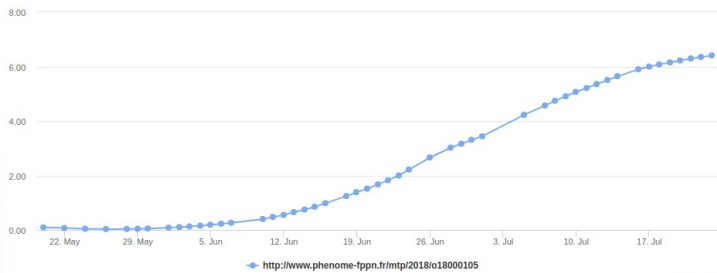
# Phenomics Variable Example



Use Alt+Shift+Drag to rotate the map. Use Ctrl+Click+Drag to select multiple elements.

## Dataset(s) Visualization (On selected plot(s))

Leaf-Area-Index\_LAI-Computation\_m2.m2



### Quantitative Variable

Leaf-Area-Index\_LAI-Computation\_m2.m2

### Date Start

Enter date start

### Date End

Enter date end

Search

## Images Visualization (On selected plot(s))

Type

Use Alt+Shift+Drag to rotate the map. Use Ctrl+Click+Drag to select multiple elements.

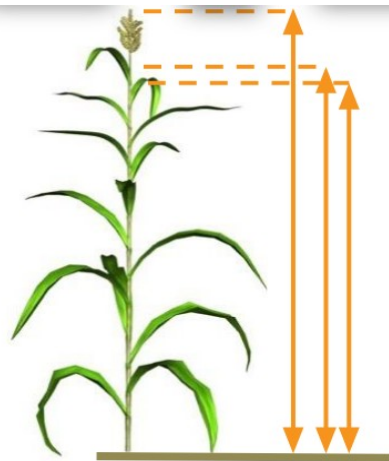
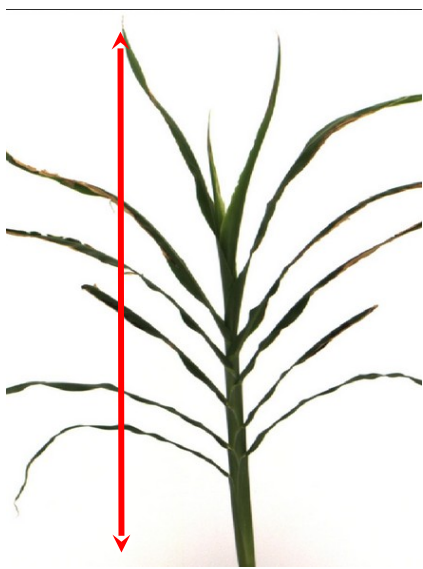
# What Can I do?

1	<u>CodeDpt</u>	sexe	jour	Effect1	Effec2	r
2	1	0	2020-03-18	16	0	
3	1	1	2020-03-18	14	0	
4	2	1	2020-03-18	10	0	
5	3	0	2020-03-18	34	0	
6	3	1	2020-03-18	38	0	
7	4	0	2020-03-18	0	33	
8	4	1	2020-03-18	0	27	

	A	B	C	D	E	F	G
1	<u>dep</u>	sexe	jour	<u>hosp</u>	<u>rea</u>	rad	<u>dc</u>
2	1	0	2020-03-18	2	0	1	0
3	1	1	2020-03-18	1	0	1	0
4	1	2	2020-03-18	1	0	0	0
5	2	0	2020-03-18	41	10	18	11
6	2	1	2020-03-18	19	4	11	6
7	2	2	2020-03-18	22	6	7	5
8	3	0	2020-03-18	4	0	1	0
9	3	1	2020-03-18	1	0	0	0
10	3	2	2020-03-18	3	0	1	0
11	4	0	2020-03-18	3	1	2	0
12	4	1	2020-03-18	3	1	0	0
13	4	2	2020-03-18	0	0	2	0
14	5	0	2020-03-18	8	1	9	0



- **No variable ID**
- Same name for different variables
- Different names for same variable
- No (or not machine readable) variable description
- Unstable variable





## Formalized variable with ID

- Aims FAIR data with a focus on interoperability
- Share an approach: simple, precise, unambiguous
- Share/Reuse variable: descriptions, structuring
- Make easier aggregate and analyse of harmonized data
- Be able to compare, merge, combine, etc.

Tair	size	Bioma	wt	pr
18.5	5.0	4.2	4.2	3.7
19.6	3.8	4.2	4.2	5.2
19.0	3.3	6.0	6.0	3.8
19.5	3.8	3.4	4.9	5.2
19.7	3.4	3.1	5.1	4.3
19.0	4.8	4.0	4.2	3.5
20.7	4.7	5.0	7.3	5.2

length	temp	biomass
3.79	18.55	2.93
3.62	19.16	3.32
3.83	19.79	3.41
4.19	19.87	5.38
5.14	19.12	5.33
3.66	19.16	2.35
3.84	19.03	4.74
5.74	20.27	4.55
2.90	18.66	3.75
4.65	19.52	2.53
3.50	18.66	2.27
4.06	17.56	2.98

same-as?

similar?

bias?

transform?

Compatible individuals?

# Variable Model

## Requires to formalize variables

- that anyone could easily understand
- that can be manipulate with machine

## A Common representation in biology

**Trait** characteristic of an organism

**Method** is the way we have to measure variable. Giving description of protocols and type of instruments used.

**Scale/Unit** allow to specify unit or scale use for ordinal variable

# Variable Model

We need to create an infinite number of variables!

**Entity** is the entity of interest of the variable, what we are measuring on.

**Characteristic** is the observed property such as physical quantity or biological quality.

**Observation level entity** : entity of the level of individual measurements or aggregations

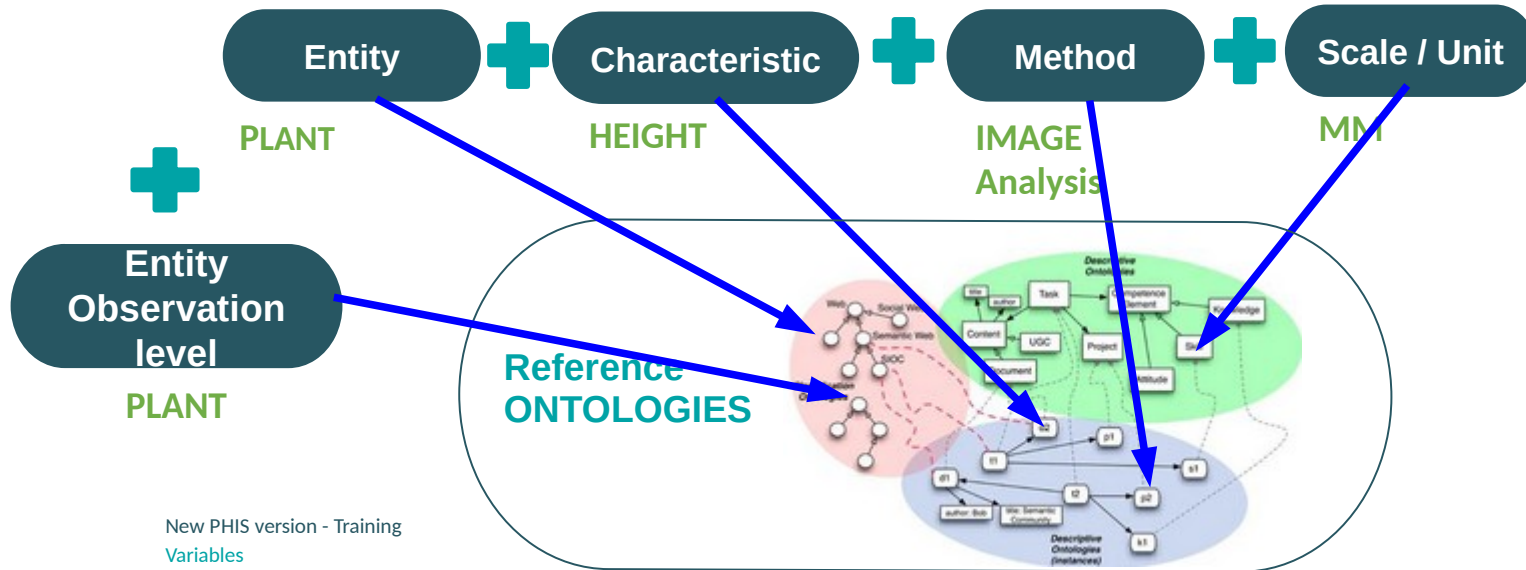
**Method** is the way we have to measure **or aggregate variable**. Giving description of protocols and type of instruments used.

**Scale/Unit** allow to specify unit or scale use for ordinal variable

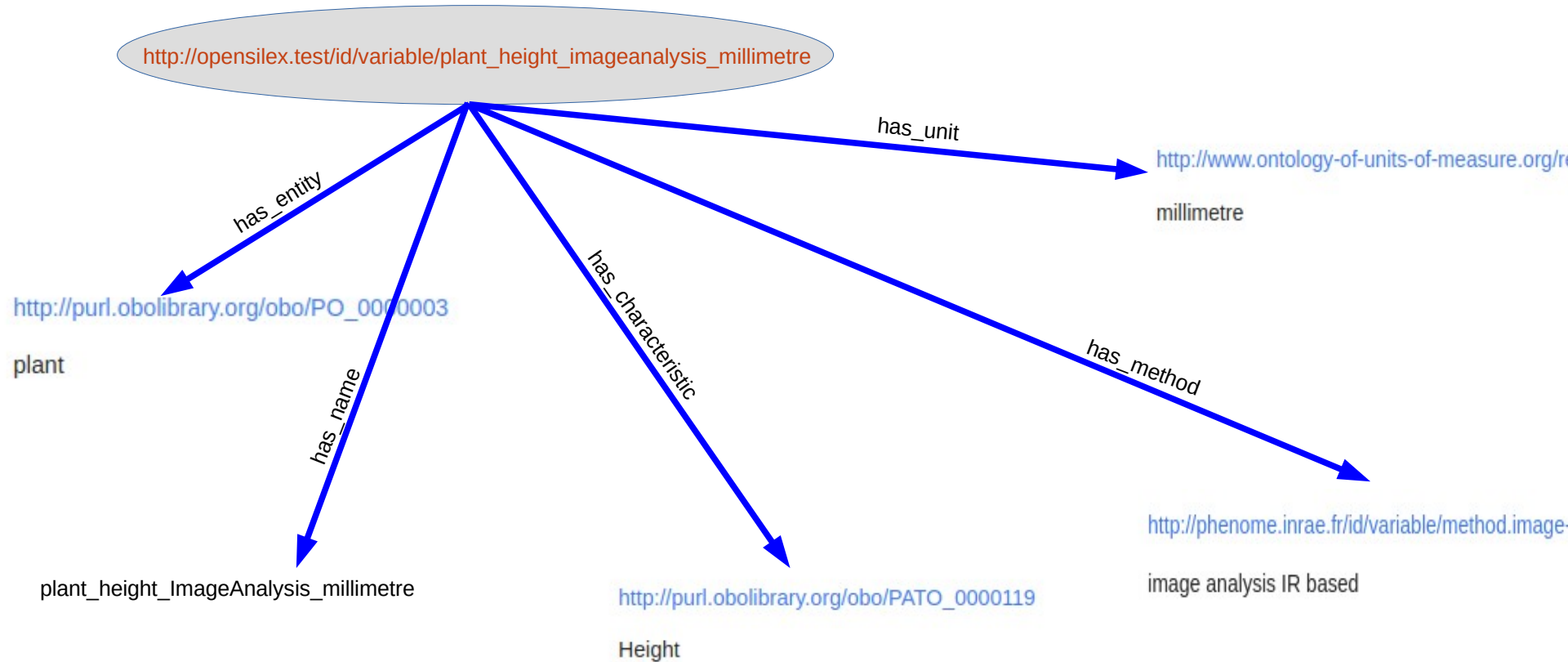


# Variable Model

- Enabling semantically precise descriptions
- Decomposing description into standardized elements
- Link to existing vocabularies/ontologies
- Make description machine readable



# Variable Class



## Needs of flexibility

- Variable declaration
- Interoperability

## Ontologies References

In order to fill ontological references (URI) you can

- [AGROPORAL](#)
- [AGROVOC](#)
- [PLANT ONTOLOGY](#)
- [PLANTEOME](#)
- [CROP ONTOLOGY](#)
- [UNIT ONTOLOGY](#)

Related References

**Variables**

**🔖 Add variable**

[? Form Tutorial](#) ✕

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**URI**

autogenerated URI

**Entity** ? \*

Search and select an entity
▼
+

**Observation level** ?

Search and select an observation level
▼
+

**Characteristic** ? \*

Search and select a characteristic
▼
+

**Species**

Select species
▼

📌 Trait already existing in an ontology

**Method** ? \*

Search and select a method
▼
+

**Unit/Scale** ? \*

Search and select an unit
▼
+

---

**Name** \*

**Alternative name**

**Data type** ? \*

Select a datatype
▼

**Time interval** ?

Select an interval
▼

**Sample interval** ?


Select an interval
▼

**Description**











































# Share and Reuse variables

- Scientific Organization >
- Shared resources >
- Variables**
- Germplasm
- Tools >
- Users management >

 Selected Variables 0 Actions

Showing 0 to 20 of 174 entries

<input type="checkbox"/>	Name	Entity	Entity of interest	Characteristic	Method	Unit/Scale	Actions
<input type="checkbox"/>	air_humidity	Air		Humidity	Measurement	percentage	   
<input type="checkbox"/>	air_humidity_averageDailyComputation_percent	Air		Humidity	Average Daily Computation	percent	   
<input type="checkbox"/>	air_humidity_durationBetween80pcAnd90pcHourlyComputatio...	Air		Humidity	Duration_between_80pc_and_90pc Hourly Computation	hour	   
<input type="checkbox"/>	air_humidity_durationOver80pcDailyComputation_decimalHour	Air		Humidity	Duration_over_80pc Daily Computation	hour	   
<input type="checkbox"/>	air_humidity_durationOver90pcDailyComputation_decimalHour	Air		Humidity	Duration_over_90pc Daily Computation	hour	   
<input type="checkbox"/>	air_humidity_durationOver90pcHourlyComputation_decimalHour	Air		Humidity	Duration_over_90pc Hourly Computation	hour	   
<input type="checkbox"/>	air_humidity_durationUnder40pcDailyComputation_decimalHour	Air		Humidity	Duration_under_40pc Daily Computation	hour	   
<input type="checkbox"/>	air_humidity_instantHourlyMeasurement_percent	Air		Humidity	Instant Hourly Measurement	percent	   
<input type="checkbox"/>	air_humidity_maximumDailyMeasurement_percent	Air		Humidity	Maximum Daily Measurement	percent	   
<input type="checkbox"/>	air_humidity_maximumMomentDailyMeasurement_decimalHour	Air		Humidity	MaximumMoment Daily Measurement	hour	   

# Share and Reuse variables

## Variables

Gérer et configurer les variables, entités, caractéristiques, méthodes et unités

Tableau de bord / Variables

Variables Entité Entité d'intérêt Caractéristique Méthode Unité/Echelle Groupe de variables ? + Ajouter une variable

### Sources

PHENOME x

### Nom

Entrer un nom de variable x

### Entité

Sélectionner une entité



Local

### Groupe de variables

Sélectionner un groupe de variables

### Recherche Avancée

x Réinitialiser

Rechercher

### Variables Sélectionnées

Affiche 0 à 20 des 174 éléments

<input type="checkbox"/>	Nom	Entité	Entité d'intérêt	Caractéristique	Méthode	Unité/Echelle	Actions
<input type="checkbox"/>	air_humidity	Air		Humidity	Measurement	percentage	
<input type="checkbox"/>	air_humidity_averageDailyComputation_percent	Air		Humidity	Average Daily Computation	percent	
<input type="checkbox"/>	air_humidity_durationBetween80pcAnd90pcHourlyComputatio...	Air		Humidity	Duration_between_80pc_and_90pc Hourly Computation	hour	
<input type="checkbox"/>	air_humidity_durationOver80pcDailyComputation_decimalHour	Air		Humidity	Duration_over_80pc Daily Computation	hour	
<input type="checkbox"/>	air_humidity_durationOver90pcDailyComputation_decimalHour	Air		Humidity	Duration_over_90pc Daily Computation	hour	

# Share and Reuse variables

- Organisation scientifique
- Informations scientifiques
- Données
- Vocabulaire
- Administration
- Outils
- API web

## Variables

Gérer et configurer les variables, entités, caractéristiques, méthodes et unités

Tableau de bord / Variables

Variables Entité Entité d'intérêt Caractéristique Méthode Unité/Echelle Groupe de variables ? + Ajouter une variable

Sources: Source locale

Nom: Entrez un nom de variable

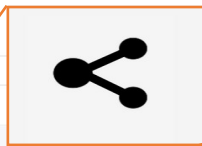
Entité: Sélectionner une entité

Caractéristique: Sélectionner une caractéristique

Groupe de variables: Sélectionner un groupe de variables

Recherche Avancée

Reinitialiser Rechercher

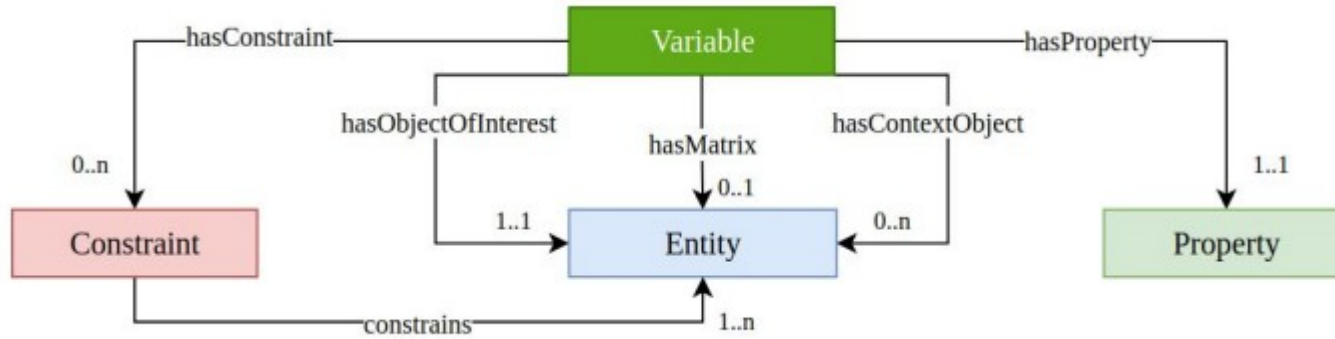


Shared

### Variables Sélectionnées 0 Actions +

Affiche 0 à 5 des 5 éléments

<input type="checkbox"/>	Nom	Entité	Entité d'intérêt	Caractéristique	Méthode	Unité/Echelle	Actions			
<input type="checkbox"/>	air_humidity	Air		Humidity	Measurement	percentage				
<input type="checkbox"/>	air_humidity_averageDailyComputation_percent UM_DAILY	Air		Humidity	Average Daily Computation	percent				
<input type="checkbox"/>	Berry_Alcohol_Alcohol_NIRS_analyser_%v/v Berry_Alcohol	Berry		Alcohol	Alcohol_NIRS_analyser	%v/v				
<input type="checkbox"/>	test	Berry		Alcohol	Calibration	g/l eq H2SO4				



- Object of interest = Entity
- Property = Characteristic
- Matrix = **Level of observation entity?**
- Context object = **Level of observation entity?**
- Constraint =

*The measurement of the molar conductivity of potassium iodide in a solution of glycerol and water (at different temperatures and concentrations of glycerol)*

**Variable:** molar conductivity (property) **OF** potassium iodide (ObjectOfInterest) **IN** glycerol water mixture

**Matrix:** glycerol + water (different compositions) + Property: molar conductivity

**Constraints:** pressure of the system, system temperature, glycerol concentration, potassium iodide conc. (by calculation the concentration of water)

**Entities:** mixtures of the potassium iodide, glycerol and water at specific concentrations

**ContextObject:** glycerol/water mixture which can be tested to get the 'background' molar conductivity

constrains: Entity (mixture at a specific set of concentrations) constrains Variable (molar conductivity of KI in glycerol/water)

**hasConstraint:** Variable (molar conductivity of KI in glycerol/water) hasConstraint Entity (mixture at a specific set of concentrations)

**hasContextObject:** Variable (molar conductivity of KI in glycerol/water) hasContextObject ContextObject (background molar conductivity measurement of a mixture of glycerol/water with specific composition)

**hasMatrix:** Variable (molar conductivity of KI in glycerol/water) hasMatrix Matrix (mixture of glycerol/water with specific composition that the potassium iodide is dissolved in)

**hasObjectOfInterest:** Variable (molar conductivity of KI in glycerol/water) hasObjectOfInterest Entity (potassium iodide)

**hasProperty:** Variable (molar conductivity of KI in glycerol/water) has Property Property (molar conductivity)