openMINDS

integrated community-driven metadata models for neuroscience graph databases

by

Lyuba Zehl

Jülich Research Center | Institute of Neuroscience and Medicine - Structural & functional organisation of the brain (INM-1) | Big Data Analytics
Co-lead of the EBRAINS Curation Service | PO & Lead developer of openMINDS

Co-funded by the European Union

JÜLICH Forschungszentrum

EBRAINS

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

Research products are currently **datasets**, **computer models**, **software, (meta)data models** & **brain atlases.**

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

Research products are currently **datasets**, **computer models**, **software, (meta)data models** & **brain atlases.**

openMINDS core [1]

[1] https://github.com/HumanBrainProject/openMINDS_core
➔ general origin, resource location, and content of research products

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

Research products are currently **datasets**, **computer models**, **software, (meta)data models** & **brain atlases.**

[1] [2]

[1] `https://github.com/HumanBrainProject/openMINDS_core`
➔ general origin, resource location, and content of research products

[2] `https://github.com/HumanBrainProject/openMINDS_SANDS`
➔ anatomical location; identification of brain atlases & coordinate spaces

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

Research products are currently **datasets**, **computer models**, **software, (meta)data models** & **brain atlases.**

[1]

[2]

[3]

[1] https://github.com/HumanBrainProject/openMINDS_core
➔ general origin, resource location, and content of research products

[2] https://github.com/HumanBrainProject/openMINDS_SANDS
➔ anatomical location; identification of brain atlases & coordinate spaces

[3] https://github.com/HumanBrainProject/openMINDS_controlledTerms
➔ terminology that should be reused across research products

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

Research products are currently **datasets**, **computer models**, **software, (meta)data models** & **brain atlases.**

[1]

[2]

[3]

[4]

[1] `https://github.com/HumanBrainProject/openMINDS_core`
➔ general origin, resource location, and content of research products

[2] `https://github.com/HumanBrainProject/openMINDS_SANDS`
➔ anatomical location; identification of brain atlases & coordinate spaces

[3] `https://github.com/HumanBrainProject/openMINDS_controlledTerms`
➔ terminology that should be reused across research products

[4] `https://github.com/HumanBrainProject/openMINDS_computation`
➔ [in dev.] provenance of simulations, data analysis and visualizations

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

Research products are currently **datasets**, **computer models**, **software, (meta)data models** & **brain atlases.**

[1]

[2]

[3]

[4]

[5]

[1] `https://github.com/HumanBrainProject/openMINDS_core`
➔ general origin, resource location, and content of research products

[2] `https://github.com/HumanBrainProject/openMINDS_SANDS`
➔ anatomical location; identification of brain atlases & coordinate spaces

[3] `https://github.com/HumanBrainProject/openMINDS_controlledTerms`
➔ terminology that should be reused across research products

[4] `https://github.com/HumanBrainProject/openMINDS_computation`
➔ [in dev.] provenance of simulations, data analysis and visualizations

[5] `https://github.com/HumanBrainProject/openMINDS_ephys`
➔ [in dev.] provenance of electrophysiological experiments

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

Research products are currently **datasets**, **computer models**, **software, (meta)data models** & **brain atlases.**

[1] https://github.com/HumanBrainProject/openMINDS_core
➔ general origin, resource location, and content of research products

[2] https://github.com/HumanBrainProject/openMINDS_SANDS
➔ anatomical location; identification of brain atlases & coordinate spaces

[3] https://github.com/HumanBrainProject/openMINDS_controlledTerms
➔ terminology that should be reused across research products

[4] https://github.com/HumanBrainProject/openMINDS_computation
➔ [in dev.] provenance of simulations, data analysis and visualizations

[5] https://github.com/HumanBrainProject/openMINDS_ephys
➔ [in dev.] provenance of electrophysiological experiments

[6] https://github.com/HumanBrainProject/openMINDS_???
➔ potential new extensions (metadata models) to openMINDS

open **M**etadata **I**nitiative for **N**euroscience **D**ata **S**tructures

openMINDS is the overall umbrella of interlinked **metadata models** for **neuroscience graph databases**.

Each metadata model consists of **modular metadata schemas** that define descriptions of neuroscience research products.

Research products are currently **datasets**, **computer models**, **software, (meta)data models** & **brain atlases.**

`https://github.com/HumanBrainProject/openMINDS`
➔ central integration & access point for all metadata models
➔ central maintenance point for the openMINDS vocabulary
➔ provision of all schemas in formal, well-known formats

`https://github.com/HumanBrainProject/openMINDS_generator`
➔ integration pipeline building the main openMINDS repository

`[1] https://github.com/HumanBrainProject/openMINDS_core`
➔ general origin, resource location, and content of research products

`[2] https://github.com/HumanBrainProject/openMINDS_SANDS`
➔ anatomical location; identification of brain atlases & coordinate spaces

`[3] https://github.com/HumanBrainProject/openMINDS_controlledTerms`
➔ terminology that should be reused across research products

`[4] https://github.com/HumanBrainProject/openMINDS_computation`
➔ [in dev.] provenance of simulations, data analysis and visualizations

`[5] https://github.com/HumanBrainProject/openMINDS_ephys`
➔ [in dev.] provenance of electrophysiological experiments

`[6] https://github.com/HumanBrainProject/openMINDS_???`
➔ potential new extensions (metadata models) to openMINDS

openMINDS - technical implementation

openMINDS syntax vs. JSON-Schema

openMINDS syntax

```
{"_type": "https://openminds.ebrains.eu/core/Person",
 "required": [
   "givenName"]
 "properties": {
   "familyName": {
     "type": "string",
     "_instruction": "Enter the family name of this person."},
   "givenName": {
     "type": "string"
     "_instruction": "Enter the given name of this person."}}}
```

➔ common technical attributes & vocabulary definitions are outsourced

JSON-Schema

```
{"$schema": "http://json-schema.org/draft-07/schema#",
 "$id": "https://openminds.ebrains.eu/core/Person",
 "type": "object",
 "title": "Person",
 "description": "Structured information on a person.",
 "required": [
   "@id",
   "@type",
   "https://openminds.ebrains.eu/vocab/givenName"]
 "properties": {
   "@id": {
     "type": "string",
     "description": "Metadata node identifier."},
   "@type": {
     "type": "string",
     "const": "https://openminds.ebrains.eu/core/Person"},
   "https://openminds.ebrains.eu/vocab/familyName": {
     "type": "string",
     "title": "familyName",
     "description": "Name borne in common by members of a family.",
     "_instruction": "Enter the family name of this person."},
   "https://openminds.ebrains.eu/vocab/givenName": {
     "type": "string",
     "title": "givenName",
     "description": "Name given to a person (without family name).",
     "_instruction": "Enter the given name of this person."}}}
```

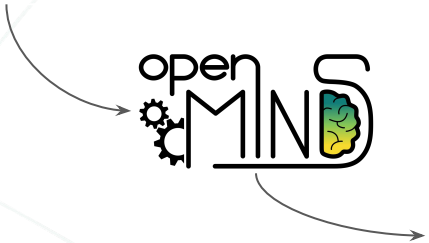
[**Example:** Definition of the Person schema (snippet) written in openMINDS syntax and its translation to JSON-Schema through the openMINDS integration pipeline.]

openMINDS syntax vs. JSON-Schema

openMINDS syntax

```
{"_type": "https://openminds.ebrains.eu/core/Person",
 "required": [
   "givenName"]
 "properties": {
   "familyName": {
     "type": "string",
     "_instruction": "Enter the family name of this person."},
   "givenName": {
     "type": "string"
     "_instruction": "Enter the given name of this person."}}}
```

➔ common technical attributes & vocabulary definitions are outsourced



JSON-Schema

```
{"$schema": "http://json-schema.org/draft-07/schema#",
 "$id": "https://openminds.ebrains.eu/core/Person",
 "type": "object",
 "title": "Person",
 "description": "Structured information on a person.",
 "required": [
   "@id",
   "@type",
   "https://openminds.ebrains.eu/vocab/givenName"]
 "properties": {
   "@id": {
     "type": "string",
     "description": "Metadata node identifier."},
   "@type": {
     "type": "string",
     "const": "https://openminds.ebrains.eu/core/Person"},
   "https://openminds.ebrains.eu/vocab/familyName": {
     "type": "string",
     "title": "familyName",
     "description": "Name borne in common by members of a family.",
     "_instruction": "Enter the family name of this person."},
   "https://openminds.ebrains.eu/vocab/givenName": {
     "type": "string",
     "title": "givenName",
     "description": "Name given to a person (without family name).",
     "_instruction": "Enter the given name of this person."}}}
```

[**Example:** Definition of the Person schema (snippet) written in openMINDS syntax and its translation to JSON-Schema through the openMINDS integration pipeline.]

openMINDS syntax vs. JSON-Schema

openMINDS syntax

```
{"_type": "https://openminds.ebrains.eu/core/Person",
 "required": [
   "givenName"]
 "properties": {
   "familyName": {
     "type": "string",
     "_instruction": "Enter the family name of this person."},
   "givenName": {
     "type": "string"
     "_instruction": "Enter the given name of this person."}}}
```

- ➔ common technical attributes & vocabulary definitions are outsourced
- ➔ introduction of additional attributes unknown to formal schema formats

JSON-Schema

```
{"$schema": "http://json-schema.org/draft-07/schema#",
 "$id": "https://openminds.ebrains.eu/core/Person",
 "type": "object",
 "title": "Person",
 "description": "Structured information on a person.",
 "required": [
   "@id",
   "@type",
   "https://openminds.ebrains.eu/vocab/givenName"]
 "properties": {
   "@id": {
     "type": "string",
     "description": "Metadata node identifier."},
   "@type": {
     "type": "string",
     "const": "https://openminds.ebrains.eu/core/Person"},
   "https://openminds.ebrains.eu/vocab/familyName": {
     "type": "string",
     "title": "familyName",
     "description": "Name borne in common by members of a family.",
     "_instruction": "Enter the family name of this person."},
   "https://openminds.ebrains.eu/vocab/givenName": {
     "type": "string",
     "title": "givenName",
     "description": "Name given to a person (without family name).",
     "_instruction": "Enter the given name of this person."}}}
```

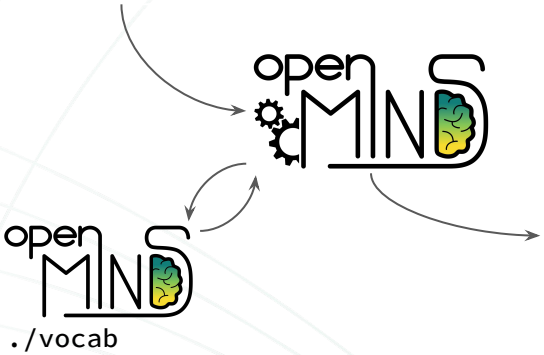
[**Example:** Definition of the Person schema (snippet) written in openMINDS syntax and its translation to JSON-Schema through the openMINDS integration pipeline.]

openMINDS syntax vs. JSON-Schema

openMINDS syntax

```
{"_type": "https://openminds.ebrains.eu/core/Person",
 "required": [
   "givenName"]
 "properties": {
   "familyName": {
     "type": "string",
     "_instruction": "Enter the family name of this person."},
   "givenName": {
     "type": "string"
     "_instruction": "Enter the given name of this person."}}}
```

- ➔ common technical attributes & vocabulary definitions are outsourced
- ➔ introduction of additional attributes unknown to formal schema formats
- ➔ allows to define & maintain vocabulary centrally

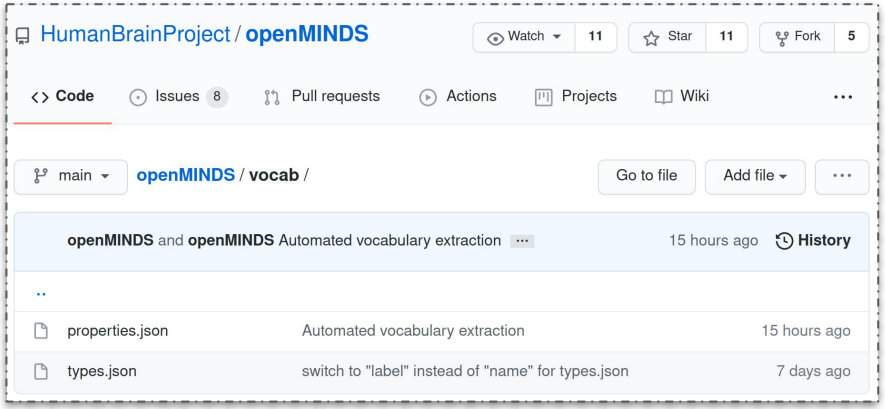


JSON-Schema

```
{"$schema": "http://json-schema.org/draft-07/schema#",
 "$id": "https://openminds.ebrains.eu/core/Person",
 "type": "object",
 "title": "Person",
 "description": "Structured information on a person.",
 "required": [
   "@id",
   "@type",
   "https://openminds.ebrains.eu/vocab/givenName"]
 "properties": {
   "@id": {
     "type": "string",
     "description": "Metadata node identifier."},
   "@type": {
     "type": "string",
     "const": "https://openminds.ebrains.eu/core/Person"},
   "https://openminds.ebrains.eu/vocab/familyName": {
     "type": "string",
     "title": "familyName",
     "description": "Name borne in common by members of a family.",
     "_instruction": "Enter the family name of this person."},
   "https://openminds.ebrains.eu/vocab/givenName": {
     "type": "string",
     "title": "givenName",
     "description": "Name given to a person (without family name).",
     "_instruction": "Enter the given name of this person."}}}
```

[**Example:** Definition of the Person schema (snippet) written in openMINDS syntax and its translation to JSON-Schema through the openMINDS integration pipeline.]

openMINDS vocabulary



➔ centrally defined & maintained across schemas, metadata models & versions

➔ builds automatically, but can be manually enriched over time

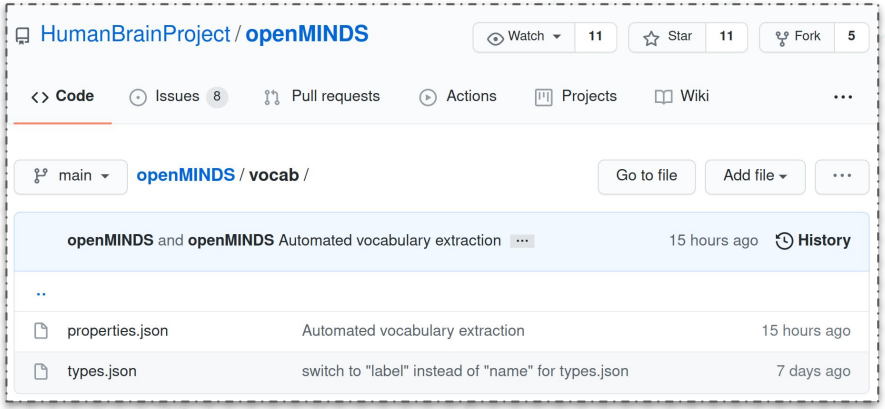
openMINDS: ./main/vocab/types.json

```
{...,
 "https://openminds.ebrains.eu/core/Person": {
   "description": "Structured information on a person.",
   "label": "Person",
   "schemas": [
     "core/v0/actors/person",
     "core/v3/actors/person"],
   "translatableTo": [
     "https://schema.org/Person"]},
...}
```

openMINDS: ./main/vocab/properties.json

```
{...,
 "https://openminds.ebrains.eu/vocab/contributor": {
   "description": "Legal person that gave or supplied something.",
   "label": "Contributor",
   "labelForReverseLink": "Is contributor of",
   "linkedTypes": [
     "https://openminds.ebrains.eu/core/Organization",
     "https://openminds.ebrains.eu/core/Person"],
   "name": "contributor",
   "sameAs": [
     "https://schema.org/contributor"],
   "schemas": [
     "core/v0/actors/contribution",
     "core/v3/actors/contribution"]},
...}
```

openMINDS vocabulary



- ➔ centrally defined & maintained across schemas, metadata models & versions
- ➔ builds automatically, but can be manually enriched over time
- ➔ **includes general descriptions & human-readable labels**

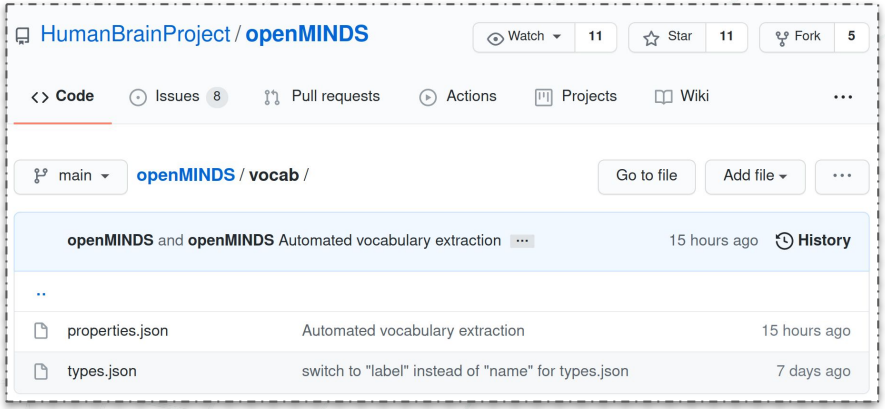
openMINDS: ./main/vocab/types.json

```
{...,
 "https://openminds.ebrains.eu/core/Person": {
   "description": "Structured information on a person.",
   "label": "Person",
   "schemas": [
     "core/v0/actors/person",
     "core/v3/actors/person"],
   "translatableTo": [
     "https://schema.org/Person"]},
...}
```

openMINDS: ./main/vocab/properties.json

```
{...,
 "https://openminds.ebrains.eu/vocab/contributor": {
   "description": "Legal person that gave or supplied something.",
   "label": "Contributor",
   "labelForReverseLink": "Is contributor of",
   "linkedTypes": [
     "https://openminds.ebrains.eu/core/Organization",
     "https://openminds.ebrains.eu/core/Person"],
   "name": "contributor",
   "sameAs": [
     "https://schema.org/contributor"],
   "schemas": [
     "core/v0/actors/contribution",
     "core/v3/actors/contribution"]},
...}
```

openMINDS vocabulary



- ➔ centrally defined & maintained across schemas, metadata models & versions
- ➔ builds automatically, but can be manually enriched over time
- ➔ includes general descriptions & human-readable labels
- ➔ **includes where/when the type or property is/was used**

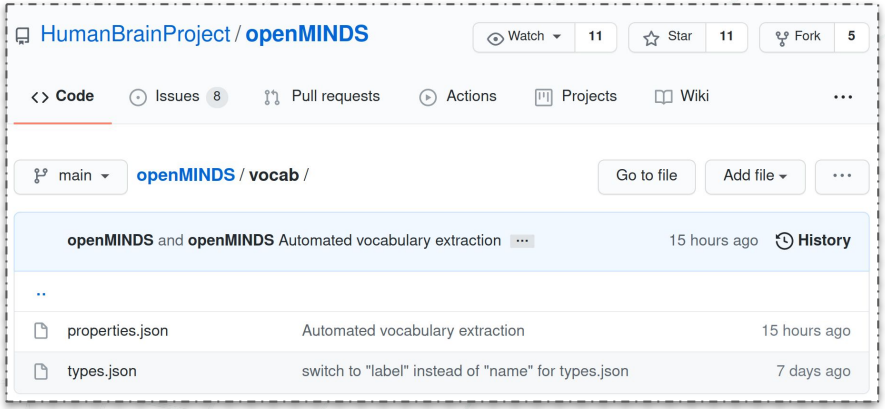
openMINDS: ./main/vocab/types.json

```
{...,
 "https://openminds.ebrains.eu/core/Person": {
   "description": "Structured information on a person.",
   "label": "Person",
   "schemas": [
     "core/v0/actors/person",
     "core/v3/actors/person"],
   "translatableTo": [
     "https://schema.org/Person"]},
...}
```

openMINDS: ./main/vocab/properties.json

```
{...,
 "https://openminds.ebrains.eu/vocab/contributor": {
   "description": "Legal person that gave or supplied something.",
   "label": "Contributor",
   "labelForReverseLink": "Is contributor of",
   "linkedTypes": [
     "https://openminds.ebrains.eu/core/Organization",
     "https://openminds.ebrains.eu/core/Person"],
   "name": "contributor",
   "sameAs": [
     "https://schema.org/contributor"],
   "schemas": [
     "core/v0/actors/contribution",
     "core/v3/actors/contribution"]},
...}
```

openMINDS vocabulary



- ➔ centrally defined & maintained across schemas, metadata models & versions
- ➔ builds automatically, but can be manually enriched over time
- ➔ includes general descriptions & human-readable labels
- ➔ includes where/when the type or property is/was used
- ➔ **enables references to matching schema types or properties of other metadata initiatives**

openMINDS: ./main/vocab/types.json

```
{...,
 "https://openminds.ebrains.eu/core/Person": {
   "description": "Structured information on a person.",
   "label": "Person",
   "schemas": [
     "core/v0/actors/person",
     "core/v3/actors/person"],
   "translatableTo": [
     "https://schema.org/Person"]},
...}
```

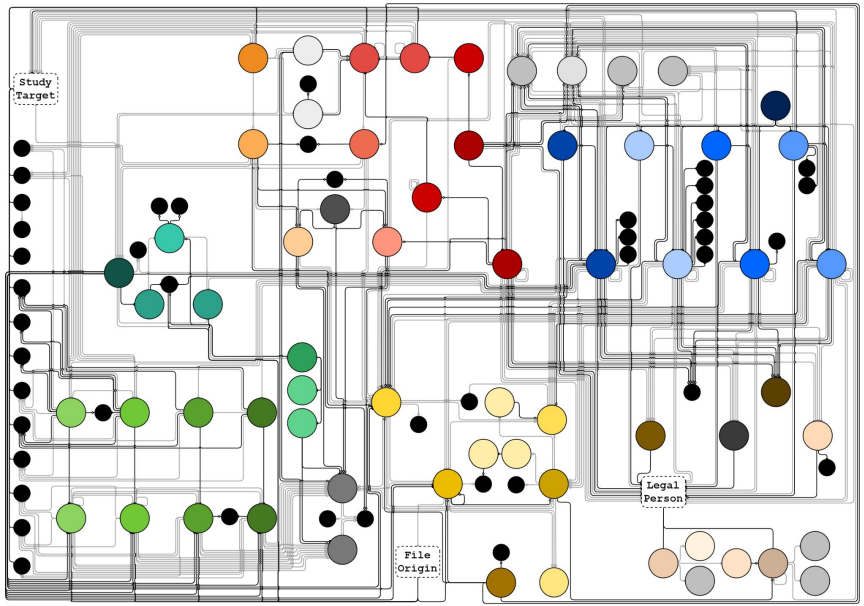
openMINDS: ./main/vocab/properties.json

```
{...,
 "https://openminds.ebrains.eu/vocab/contributor": {
   "description": "Legal person that gave or supplied something.",
   "label": "Contributor",
   "labelForReverseLink": "Is contributor of",
   "linkedTypes": [
     "https://openminds.ebrains.eu/core/Organization",
     "https://openminds.ebrains.eu/core/Person"],
   "name": "contributor",
   "sameAs": [
     "https://schema.org/contributor"],
   "schemas": [
     "core/v0/actors/contribution",
     "core/v3/actors/contribution"]},
...}
```

openMINDS - instances

openMINDS instances

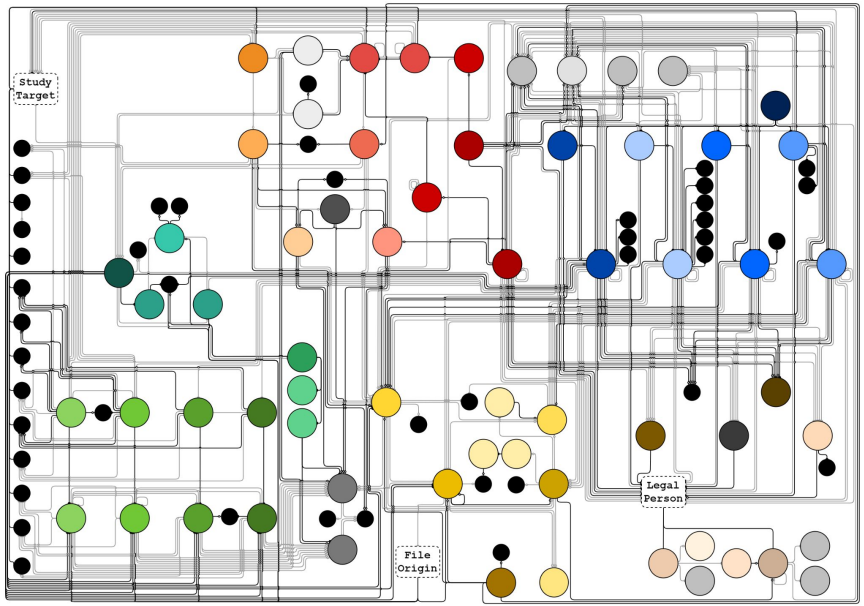
openMINDS schema model for core, controlledTerms and SANDS



by Ulrike Schlegel

openMINDS instances

openMINDS schema model for core, controlledTerms and SANDS



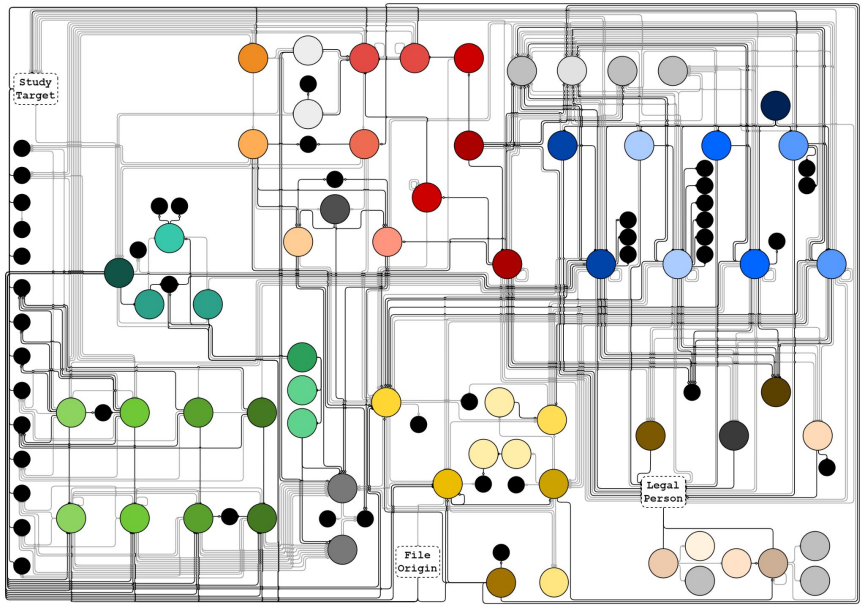
by Ulrike Schlegel

openMINDS linked metadata instances (JSONLDs)

```
{"@context": {
   "@vocab": PROPERTY-NAMESPACE},
 "@type": SCHEMA-TYPE,
 "@id": UNIQUE-IDENTIFIER,
 "PROPERTY-NAME": VALUE}
```

openMINDS instances

openMINDS schema model for core, controlledTerms and SANDS



by Ulrike Schlegel

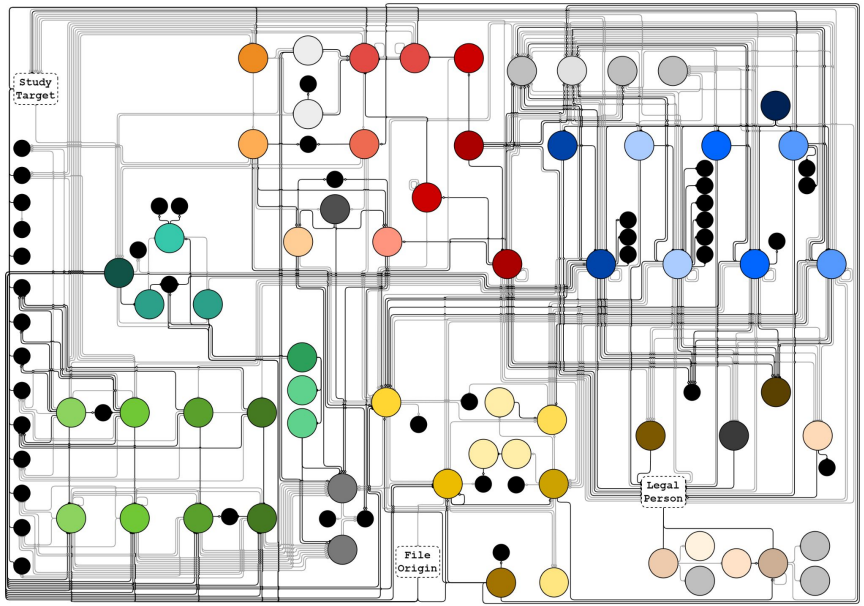
openMINDS linked metadata instances (JSONLDs)

```
{"@context": {
   "@vocab": "https://openminds.ebrains.eu/vocab/"},
 "@type": SCHEMA-TYPE,
 "@id": UNIQUE-IDENTIFIER,
 PROPERTY-NAME: VALUE}
```

```
{"@context": {
   "@vocab": "https://openminds.ebrains.eu/vocab/"},
 "@type": "https://openminds.ebrains.eu/core/ContactInformation",
 "@id": "d72ba653-ac9a-428d-ba65-84c137ce5ad6",
 "email": "l.zehl@fz-juelich.de"}
```

openMINDS instances

openMINDS schema model for core, controlledTerms and SANDS



by Ulrike Schlegel

openMINDS linked metadata instances (JSONLDs)

```
{"@context": {
   "@vocab": "https://openminds.ebrains.eu/vocab/"},
 "@type": SCHEMA-TYPE,
 "@id": UNIQUE-IDENTIFIER,
 PROPERTY-NAME: VALUE}
```

```
{"@context": {
   "@vocab": "https://openminds.ebrains.eu/vocab/"},
 "@type": "https://openminds.ebrains.eu/core/ContactInformation",
 "@id": "d72ba653-ac9a-428d-ba65-84c137ce5ad6",
 "email": "l.zehl@fz-juelich.de"}
```

```
{"@context": {
   "@vocab": "https://openminds.ebrains.eu/vocab/"},
 "@type": "https://openminds.ebrains.eu/core/Person",
 "@id": "5bc17d5c-f5a2-4350-be30-8515da2e4e37",
 “givenName”: “Lyuba”,
 “familyName”: “Zehl”,
 "contactInformation": {
   "@id": "d72ba653-ac9a-428d-ba65-84c137ce5ad6"}}
```

openMINDS - tooling & support

openMINDS services: Instance libraries for selected schemas

Example: `controlledTerms/species/`

- `homoSapiens.jsonld`
- `macacaFascicularis.jsonld`
- `musMusculus.jsonld`
- **`rattusNorvegicus.jsonld`**


```
{
  "@context": {
    "@vocab": "https://openminds.ebrains.eu/vocab/"
  },
  "@id": "https://openminds.ebrains.eu/instances/species/rattusNorvegicus",
  "@type": "https://openminds.ebrains.eu/controlledTerms/Species",
  "definition": "The species *Rattus norvegicus* (brown rat) belongs to the
                 family of *muridae* (murids).",
  "description": null,
  "interlexIdentifier": "http://uri.interlex.org/base/ilx_0109658",
  "knowledgeSpaceLink": "https://knowledge-space.org/wiki/NCBITaxon:10116#rat",
  "name": "Rattus norvegicus",
  "preferredOntologyIdentifier": "http://purl.obolibrary.org/obo/NCBITaxon_10116",
  "synonym": [
    "brown rat",
    "Norway rat",
    "rat"
  ]
}
```


Existing instance libraries:

- `controlledTerms/*` (except: `termSuggestion`)
- `data/contentType`
- `data/license`
- `atlas/brainAtlas`
- `atlas/brainAtlasVersion`
- `atlas/parcellationTerminology`
- `atlas/parcellationTerminologyVersion`
- `atlas/parcellationEntity`
- `atlas/parcellationEntityVersion`
- `atlas/atlasAnnotation`
- `atlas/commonCoordinateSpace`

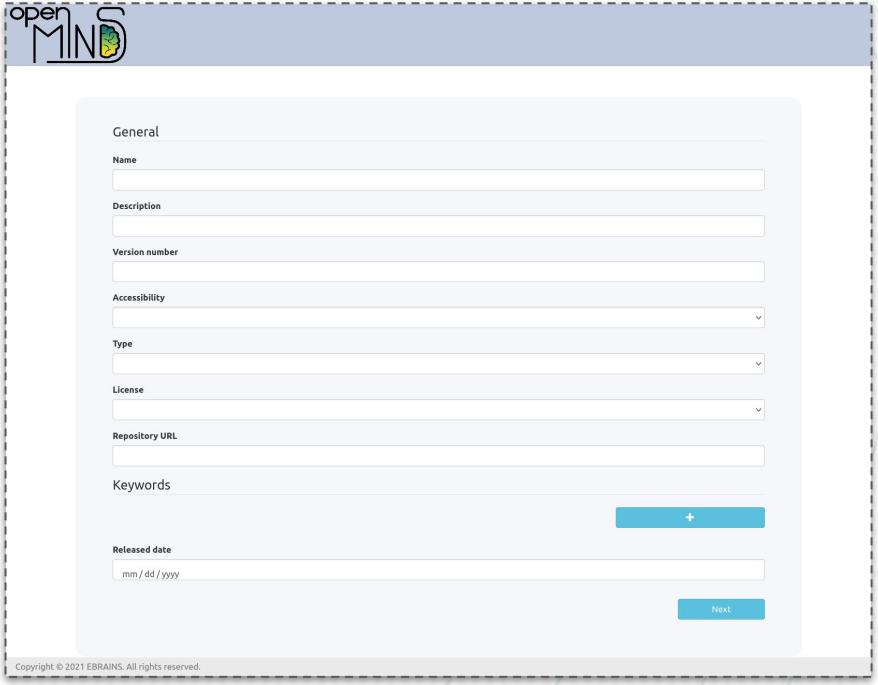
openMINDS Python library & Wizard

https://github.com/HumanBrainProject/openMINDS_generator alpha version
https://pypi.org/project/openMINDS

```
pip install openminds
```

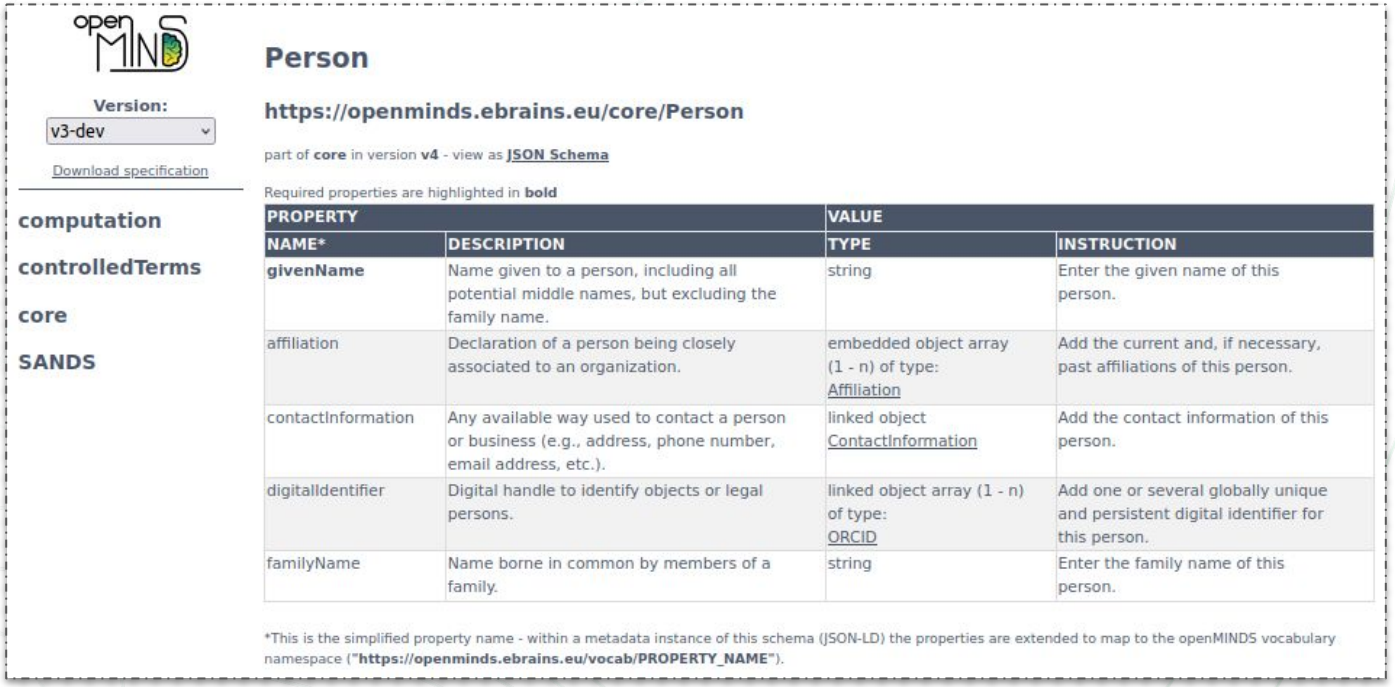
```python
import openMINDS
import openMINDS.version_manager

# Initialise the local copy of openMINDS
openMINDS.version_manager.init()

# Select which version of openMINDS to use
openMINDS.version_manager.version_selection('v2.0.0')

# initiate the helper class for the dynamic usage of a specific openMINDS version
helper = openMINDS.Helper()

# initiate the collection into which you will store all metadata instances
mycollection = helper.create_collection()

# create a metadata instance for (e.g.) the openMINDS Person schema
person_open = mycollection.add_core_person(givenName="open")

# add more metadata to a created instance
mycollection.get(person_open).familyName = "MINDS"

# add connections to other metadata instances
email_openminds = mycollection.add_core_contactInformation(email="openminds@ebrains.eu")
mycollection.get(person_open).contactInformation = email_openminds

# save your collection
mycollection.save("./myFirstOpenMINDSMetadataCollection/")
```

https://github.com/HumanBrainProject/openMINDS_wizard alpha version
https://wizard.kg-ppd.ebrains.eu (temporary URL; this might change)



openMINDS HTML views deployed as GitHub pages

https://humanbrainproject.github.io/openMINDS/



openMINDS

Version: v3-dev

Download specification

computation

controlledTerms

core

SANDS

Person

https://openminds.ebrains.eu/core/Person

part of **core** in version **v4** - view as **JSON Schema**

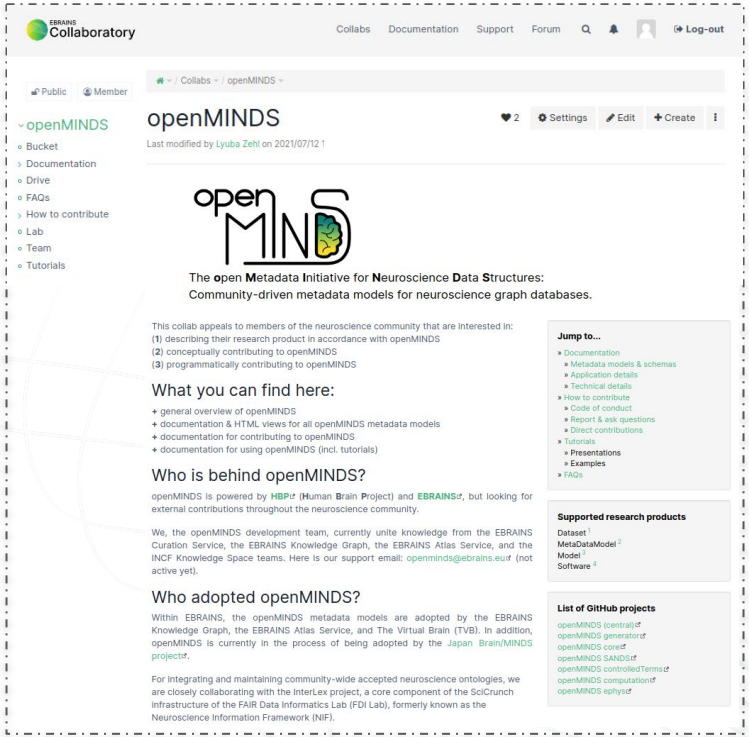
Required properties are highlighted in **bold**

PROPERTY		VALUE	
NAME*	**DESCRIPTION**	**TYPE**	**INSTRUCTION**
givenName	Name given to a person, including all potential middle names, but excluding the family name.	string	Enter the given name of this person.
affiliation	Declaration of a person being closely associated to an organization.	embedded object array (1 - n) of type: Affiliation	Add the current and, if necessary, past affiliations of this person.
contactInformation	Any available way used to contact a person or business (e.g., address, phone number, email address, etc.).	linked object ContactInformation	Add the contact information of this person.
digitalIdentifier	Digital handle to identify objects or legal persons.	linked object array (1 - n) of type: ORCID	Add one or several globally unique and persistent digital identifier for this person.
familyName	Name borne in common by members of a family.	string	Enter the family name of this person.

*This is the simplified property name - within a metadata instance of this schema (JSON-LD) the properties are extended to map to the openMINDS vocabulary namespace ("**https://openminds.ebrains.eu/vocab/PROPERTY_NAME**").

openMINDS on the EBRAINS Collaboratory

https://wiki.ebrains.eu/bin/view/Collabs/openminds/



What you can find here:

➔ **Documentation of …**
- metadata models & schemas (linked to HTML views)
- application details
- technical details

➔ **How to contribute …**
- code of conduct
- report & ask questions
- direct contributions

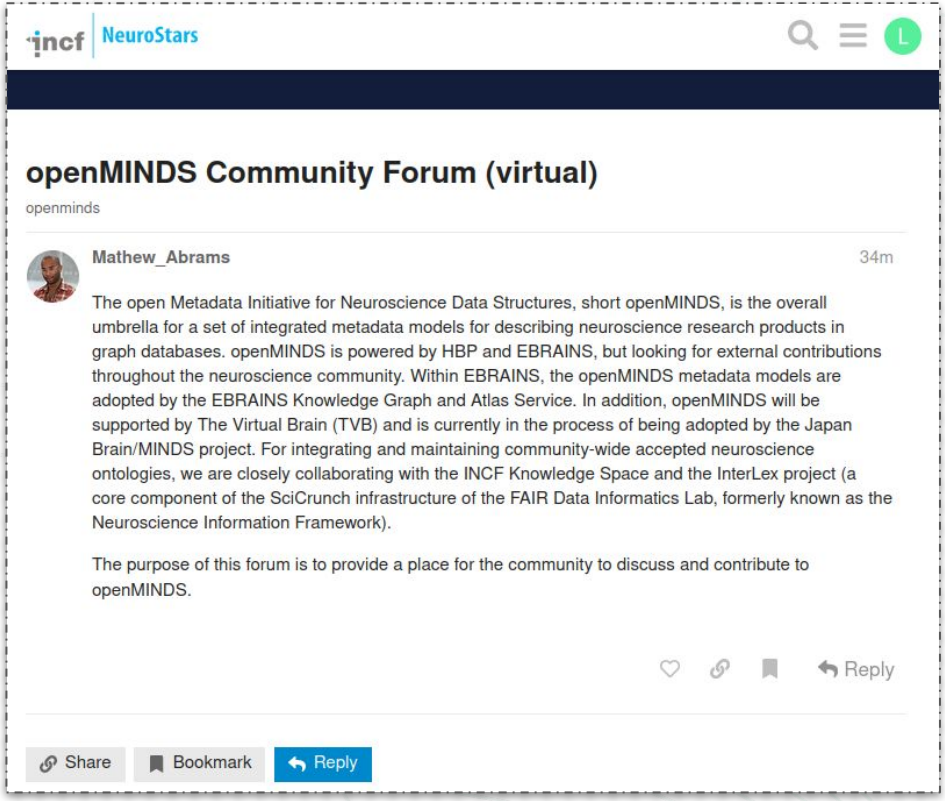
➔ **Tutorials …**
- presentations
- examples [in prep]

➔ **FAQs**

We are always happy to extend / improve the Collab based on your feedback! 😊

openMINDS Community Forum @ INCF NeuroStars

https://neurostars.org/t/openminds-community-forum-virtual



openminds@ebrains.eu

We are looking forward to your questions, discussions & contributions 😊

Who is behind openMINDS?

openMINDS is powered by **HBP** & **EBRAINS**, but we are looking for contributions from the whole neuroscience community!

If you want to learn more about openMINDS just get in touch, have a ☕ with us (in-person or via VC),

your openMINDS development team 😊

Who?	Role?	Team affiliation?	Institute affiliation?
Lyuba Zehl	openMINDS product owner	EBRAINS Curation & Atlas Service	Jülich Research Center (INM-1)
Oliver Schmid	KG product owner & openMINDS developer (tools)	EBRAINS Knowledge Graph	EBRAINS AISBL
Andrew Davison	openMINDS developer (models, in-depth, tools)	EBRAINS Curation Service	Université Paris-Saclay, CNRS (NeuroPSI)
Benjamin Weyers	openMINDS developer (software)	EBRAINS Curation Service	University of Trier (Human-Computer Interaction)
Ulrike Schlegel	openMINDS developer (datasets)	EBRAINS Curation Service	University of Oslo (Department of Anatomy, NeSys)
Stefan Köhnen	openMINDS developer (tools, SANDS)	EBRAINS Curation & Atlas Service	Jülich Research Center (INM-1)
Heidi Kleven	openMINDS developer (SANDS)	EBRAINS Curation Service	University of Oslo (Department of Anatomy, NeSys)
Peyman Najafi	openMINDS developer (models, in-depth)	EBRAINS Curation Service	Université Paris-Saclay, CNRS (NeuroPSI)
Jan Gründling	openMINDS developer (software)	EBRAINS Curation Service	University of Trier (Human-Computer Interaction)
Tom Gillespie	ontology developer & openMINDS developer (SANDS)	InterLex Project & Knowledge Space	INCF, University of California, Dep. of Neuroscience
Mathew Abrams	Knowledge Space developer	Knowledge Space	INCF, Karolinska Institutet
Visakh Muraleedharan	Knowledge Space developer	Knowledge Space	INCF, Karolinska Institutet

Some final information …

Who has adopted openMINDS?

Within EBRAINS, the openMINDS metadata models are adopted by the **Knowledge Graph**, the **Curation** and **Atlas Service**.

openMINDS is also supported by **The Virtual Brain (TVB)** and in the process of being adopted by the **Japan Brain/MINDS project**.

For integrating and maintaining community-wide accepted neuroscience ontologies, we are closely collaborating with the **InterLex**, a project of the SciCrunch infrastructure of the **FAIR Data Informatics Lab (FDI Lab)**, f.k.a. the Neuroscience Information Framework (NIF).

Acknowledgements:

The metadata model specification and corresponding open source code was developed in part or in whole in the Human Brain Project, funded from the European Union's Horizon 2020 Framework Programme for Research and Innovation under Specific Grant Agreements No. 720270, No. 785907, and No. 945539 (Human Brain Project SGA1, SGA2, and SGA3).

We would also like to thank the whole **EBRAINS Curation Service team**, the whole **EBRAINS Atlas Service team**, and all **EBRAINS data providers** that gave and are still giving us feedback to guide the development of openMINDS.