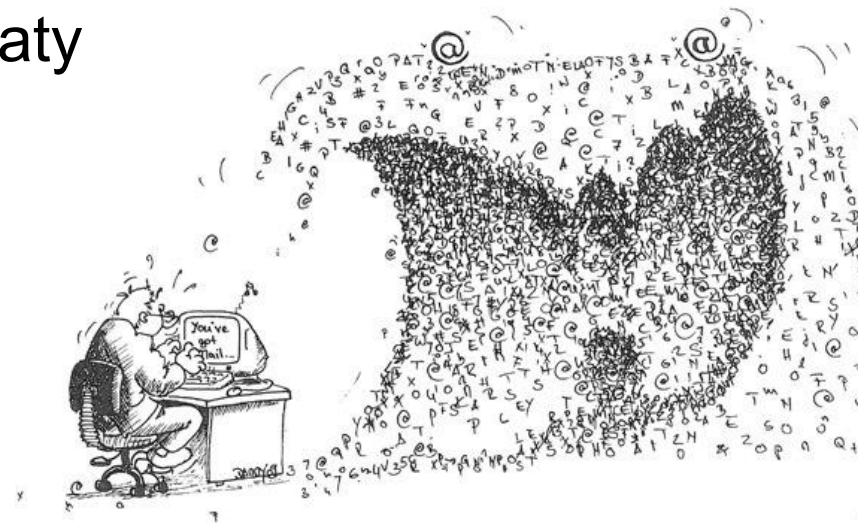




FAIR data / Open data pro uživatele CF MAFIL

Praktické představení nástrojů a postupů pro práci s daty

Tomáš Slavíček



Osnova

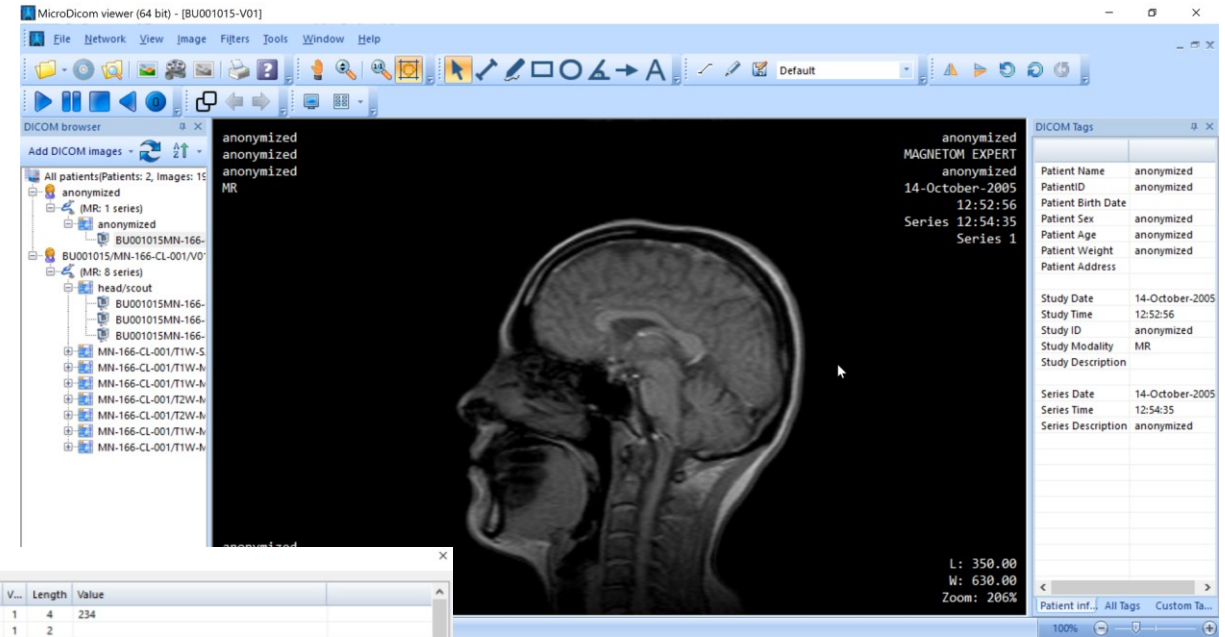
- Data workflow v CF MAFIL (MR)
- Datové formáty
- BIDS
- Příprava datasetu/‘curation’
- Anonymizace
- Nástroje pro práci s daty / ukázka na vzorovém datasetu

Data workflow (MR)



DICOM

- Standard pro obrazová data v medicíně
- Z MR konzole (Syngo) do PACS
- Metadata (tzv. TAGy)
 - Parametry akvizice (TR, TE, FOV, aj.)
 - Technické parametry (použité cívky, aj.)
 - Údaje o subjektu (citlivá)
- Nevhodné pro neurovědní aplikace
 - Objem dat – pomalé
 - Ukládání (řezy, mozaika)
 - Redundantní metadata



Group, El...	TAG Description	VR	V...	Length	Value
(0002,0000)	FileMetaInformationGroupLength	UL	1	4	234
(0002,0001)	FileMetaInformationVersion	OB	1	2	
(0002,0002)	MediaStorageSOPClassUID	UI	1	26	1.2.840.10008.5.1.4.1.1.4
(0002,0003)	MediaStorageSOPInstanceUID	UI	1	48	1.3.12.2.1107.5.8.1.12345.200510141312110223503
(0002,0010)	TransferSyntaxUID	UI	1	20	1.2.840.10008.1.2.1
(0002,0012)	ImplementationClassUID	UI	1	26	2.16.840.1.113669.2.931128
(0002,0013)	ImplementationVersionName	SH	1	26	dicomapi.dll version-lite
(0002,0016)	SourceApplicationEntityTitle	AE	1	26	dicom browser application
(0008,0005)	SpecificCharacterSet	CS	1	10	ISO_IR 100
(0008,0008)	ImageType	CS	3	22	ORIGINAL/PRIMARY/OTHER
(0008,0016)	SOPClassUID	UI	1	26	1.2.840.10008.5.1.4.1.1.4
(0008,0018)	SOPInstanceUID	UI	1	48	1.3.12.2.1107.5.8.1.12345.200510141312110223503
(0008,0020)	StudyDate	DA	1	8	20051014
(0008,0021)	SeriesDate	DA	1	8	20051014
(0008,0022)	AcquisitionDate	DA	1	8	20051014
(0008,0023)	ContentDate	DA	1	8	20051014
(0008,0030)	StudyTime	TM	1	14	125256.915000
(0008,0031)	SeriesTime	TM	1	14	125435.474000
(0008,0032)	AcquisitionTime	TM	1	14	125436.860000
(0008,0033)	ContentTime	TM	1	14	125449.475000
(0008,0050)	AccessionNumber	SH	1	10	anonymized
(0008,0060)	Modality	CS	1	2	MR
(0008,0070)	Manufacturer	LO	1	8	SIEMENS
(0008,0080)	InstitutionName	LO	1	10	anonymized
(0008,0090)	ReferringPhysicianName	PN	1	10	anonymized
(0008,1010)	StationName	SH	1	10	anonymized
(0008,103E)	SeriesDescription	LO	1	10	anonymized
(0008,1090)	ManufacturerModelName	LO	1	16	MAGNETOM EXPERT
(0010,0010)	PatientName	PN	1	10	anonymized
(0010,0020)	PatientID	LO	1	10	anonymized

NIfTI-1 (*.nii or *.nii.gz)

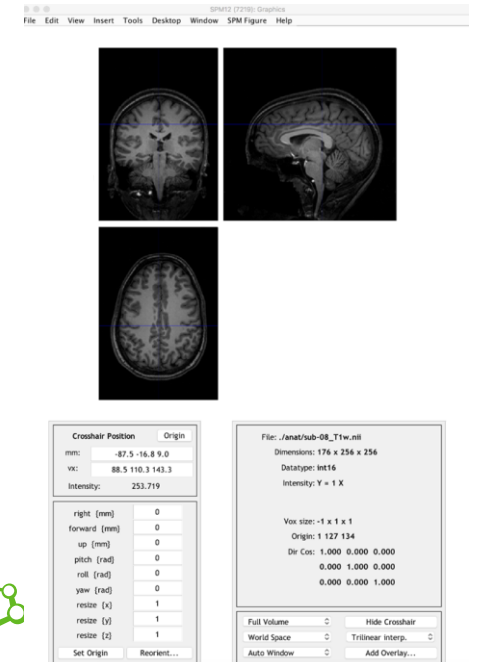
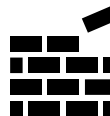
- Neuroimaging Informatics Technology Initiative (2003), <https://nifti.nimh.nih.gov/>
 - Nástupce ANALYZE 7.5 formátu (*.img + *.hdr)
- Pro většinu aplikací ≈ sekvencí (anat, func, diff, atd.), pro MRS – v přípravě
- Široká podpora nástrojů – SPM, FSL, FreeSurfer, AFNI, BrainVoyager, etc.
- Hlavička (348 bytes)

- Intent type (statistika nebo obrazová data)
- Prostorové transformace (VX to „real world“)
- Datový typ (bits per voxel) – typicky UINT16
- Velikosti voxelů, škálování (slope+intercept), aj.



Datová matice

- 3D pro anatomické snímky
- 4D pro funkční/difuzní/jiné



Konverze DICOM do NIfTI-1



- Redukce metadat → 'sidecar' soubor (malá velikost hlavičky NIfTI)
- Parametry difuzních sekvencí → *.bvec + *.bval soubory
- Nestandardní DICOM implementace – Siemens CSA header
 - Pokročilé parametry akvizice (typ „prescan normalize“, MB acceleration factor, atd.)
- Příklady kovertorů
 - <https://github.com/rordenlab/dcm2nix> (Linux and Windows)
 - <https://github.com/xiangruili/dicm2nii> (MATLAB)

Organizace dat



BIDS standard

SCIENTIFIC DATA 

OPEN

SUBJECT CATEGORIES

» Data publication and
archiving
» Research data

The brain imaging data structure,
a format for organizing and
describing outputs of neuroimaging
experiments

Krzysztof J. Gorgolewski¹, Tibor Auer², Vince D. Calhoun^{3,4}, R. Cameron Craddock^{5,6}, Samir Das⁷,
Eugene P. Duff⁸, Guillaume Flandin⁹, Satrajit S. Ghosh^{10,11}, Tristan Glatard^{7,12}, Yaroslav O. Halchenko¹³,
Daniel A. Handwerker¹⁴, Michael Hanke^{15,16}, David Keator¹⁷, Xiangrui Li¹⁸, Zachary Michael¹⁹,
Camille Maumet²⁰, B. Nolan Nichols^{21,22}, Thomas E. Nichols^{20,23}, John Pellman⁶, Jean-Baptiste Poline²⁴,
Ariel Rokem²⁵, Gunnar Schaefer^{1,26}, Vanessa Sochat²⁷, William Triplett¹, Jessica A. Turner^{3,28},
Gaël Varoquaux²⁹ & Russell A. Poldrack¹

Received: 18 December 2015

Accepted: 19 May 2016

Published: 21 June 2016

- Brain Imaging Data Structure

- <https://bids.neuroimaging.io>
- K.Gorgolewski, 2015
- Pokrývá většinu neurozobrazovacích modalit (MRI, PET, EEG, MEG, ...)
- Vychází z „best practice“, která se a posteriori stala „standardem“

- Je to **datová skladba**; nikoliv nový formát dat (NIfTI, TSV, JSON)

- Je o tom jak:

- Utřídíme data do složek
- Pojmenujeme soubory
- Dokumentujeme metadata

BIDS standard



- Snadno čitelný pro člověka a srozumitelný pro počítač
 - Usnadňuje sdílení + archivaci (noví členové týmu, spolupráce, repozitáře)
 - Snižuje výskyt chyb (polo/automatizace zpracování dat)
 - Snadné zpracování – podpora pipeline (MRIQC, fMRIPrep, HCP Pipelines, aj.)
- Založený na **klíčových slovech a slovnících**
 - Dataset, subject, session, data type, task, event, run, <index>, <label>, suffix, etc.
 - Povinná, doporučená a doplňková data a metadata
- Princip dědičnosti (metadata)
 - Shora-dolů
 - Maximálně jeden na dané úrovni
 - Výjimky

```
dset/  
├── dataset_description.json  
├── participants.tsv  
└── sub-01  
    ├── anat  
    │   ├── sub-01_T1w.json  
    │   └── sub-01_T1w.nii.gz  
    ├── dwi  
    │   ├── sub-01_dwi.bval  
    │   ├── sub-01_dwi.bvec  
    │   ├── sub-01_dwi.json  
    │   └── sub-01_dwi.nii.gz  
    └── fmap  
        ├── sub-01_acq-dwi_dir-AP_epi.json  
        ├── sub-01_acq-dwi_dir-AP_epi.nii.gz  
        ├── sub-01_acq-dwi_dir-PA_epi.json  
        ├── sub-01_acq-dwi_dir-PA_epi.nii.gz  
        ├── sub-01_acq-func_dir-AP_epi.json  
        └── sub-01_acq-func_dir-AP_epi.nii.gz
```



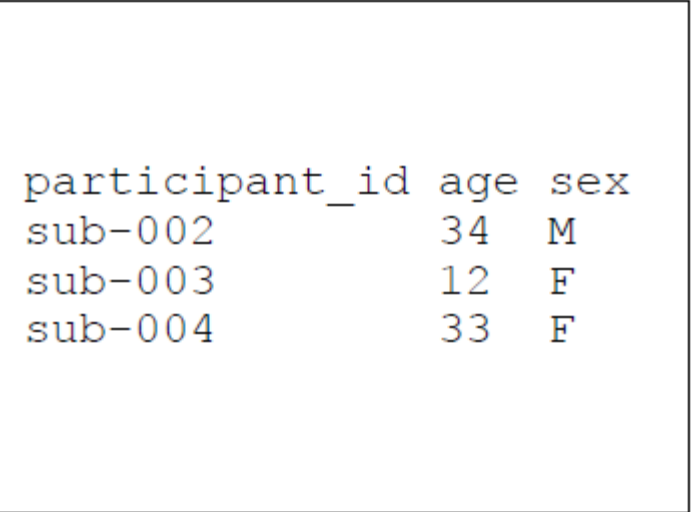
Metadata jako textové soubory (*.tsv, *.json)

```
dset/
├── dataset_description.json
├── participants.tsv
├── sub-01
│   ├── anat
│   │   ├── sub-01_T1w.json
│   │   └── sub-01_T1w.nii.gz
│   ├── dwi
│   │   ├── sub-01_dwi.bval
│   │   ├── sub-01_dwi.bvec
│   │   ├── sub-01_dwi.json
│   │   └── sub-01_dwi.nii.gz
│   ├── fmap
│   │   ├── sub-01_acq-dwi_dir-AP_epi.json
│   │   ├── sub-01_acq-dwi_dir-AP_epi.nii.gz
│   │   ├── sub-01_acq-dwi_dir-PA_epi.json
│   │   ├── sub-01_acq-dwi_dir-PA_epi.nii.gz
│   │   ├── sub-01_acq-func_dir-AP_epi.json
│   │   ├── sub-01_acq-func_dir-AP_epi.nii.gz
│   │   ├── sub-01_acq-func_dir-PA_epi.json
│   │   └── sub-01_acq-func_dir-PA_epi.nii.gz
│   └── func
│       ├── sub-01_task-nback_run-01_bold.json
│       ├── sub-01_task-nback_run-01_bold.nii.gz
│       ├── sub-01_task-nback_run-01_events.tsv
│       ├── sub-01_task-nback_run-01_sbref.json
│       └── sub-01_task-nback_run-01_sbref.nii.gz
```

```
{
  "Name": "",
  "BIDSVersion": "",
  "License": "",
  "Authors": "",
  "Acknowledgements": "",
  "HowToAcknowledge": " ",
  "Funding": "",
  "ReferencesAndLinks": "",
  "SourceDatasetsURLs": ""
}
```

Metadata jako textové soubory (*.tsv, *.json)

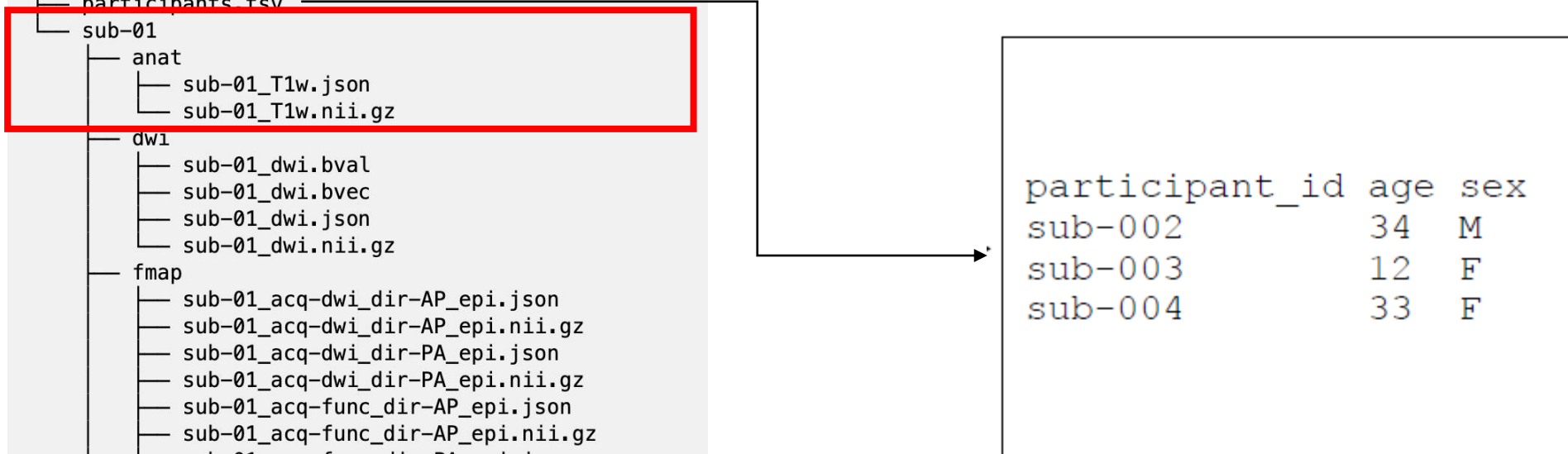
```
dset/  
├── dataset_description.json  
├── participants.tsv  
├── sub-01  
│   ├── anat  
│   │   ├── sub-01_T1w.json  
│   │   └── sub-01_T1w.nii.gz  
│   ├── dwi  
│   │   ├── sub-01_dwi.bval  
│   │   ├── sub-01_dwi.bvec  
│   │   ├── sub-01_dwi.json  
│   │   └── sub-01_dwi.nii.gz  
│   ├── fmap  
│   │   ├── sub-01_acq-dwi_dir-AP_epi.json  
│   │   ├── sub-01_acq-dwi_dir-AP_epi.nii.gz  
│   │   ├── sub-01_acq-dwi_dir-PA_epi.json  
│   │   ├── sub-01_acq-dwi_dir-PA_epi.nii.gz  
│   │   ├── sub-01_acq-func_dir-AP_epi.json  
│   │   ├── sub-01_acq-func_dir-AP_epi.nii.gz  
│   │   ├── sub-01_acq-func_dir-PA_epi.json  
│   │   └── sub-01_acq-func_dir-PA_epi.nii.gz  
│   └── func  
│       ├── sub-01_task-nback_run-01_bold.json  
│       ├── sub-01_task-nback_run-01_bold.nii.gz  
│       ├── sub-01_task-nback_run-01_events.tsv  
│       ├── sub-01_task-nback_run-01_sbref.json  
│       └── sub-01_task-nback_run-01_sbref.nii.gz
```



```
participant_id age sex  
sub-002        34  M  
sub-003        12  F  
sub-004        33  F
```

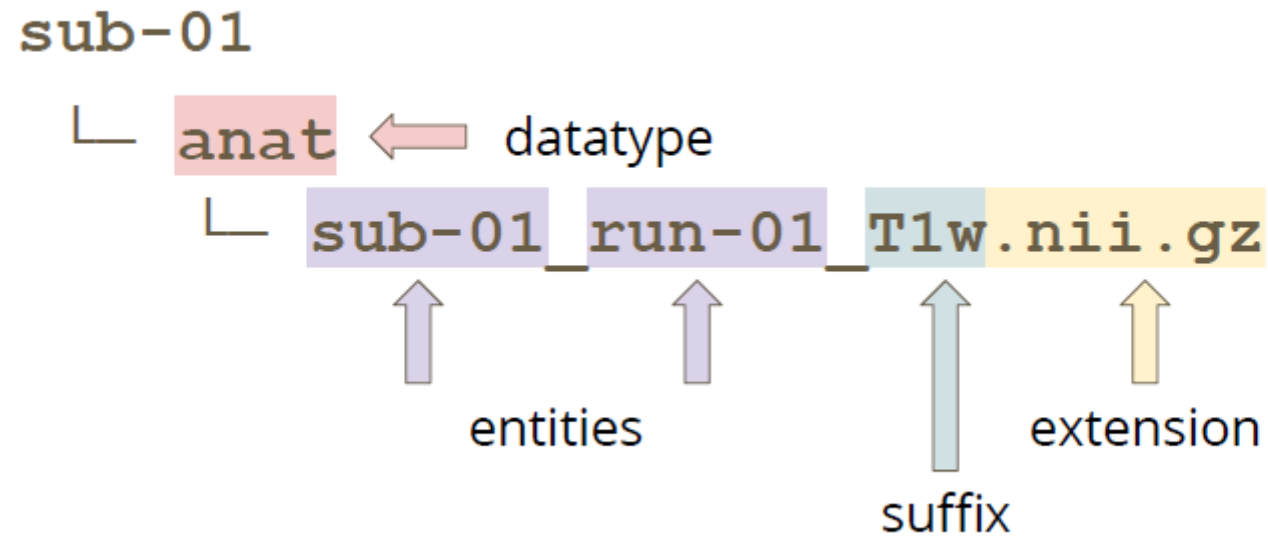
Metadata jako textové soubory (*.tsv, *.json)

```
dset/  
├── dataset_description.json  
├── participants.tsv  
└── sub-01  
    ├── anat  
    │   ├── sub-01_T1w.json  
    │   └── sub-01_T1w.nii.gz  
    ├── dwi  
    │   ├── sub-01_dwi.bval  
    │   ├── sub-01_dwi.bvec  
    │   ├── sub-01_dwi.json  
    │   └── sub-01_dwi.nii.gz  
    ├── fmap  
    │   ├── sub-01_acq-dwi_dir-AP_epi.json  
    │   ├── sub-01_acq-dwi_dir-AP_epi.nii.gz  
    │   ├── sub-01_acq-dwi_dir-PA_epi.json  
    │   ├── sub-01_acq-dwi_dir-PA_epi.nii.gz  
    │   ├── sub-01_acq-func_dir-AP_epi.json  
    │   ├── sub-01_acq-func_dir-AP_epi.nii.gz  
    │   ├── sub-01_acq-func_dir-PA_epi.json  
    │   └── sub-01_acq-func_dir-PA_epi.nii.gz  
    └── func  
        ├── sub-01_task-nback_run-01_bold.json  
        ├── sub-01_task-nback_run-01_bold.nii.gz  
        ├── sub-01_task-nback_run-01_events.tsv  
        ├── sub-01_task-nback_run-01_sbref.json  
        └── sub-01_task-nback_run-01_sbref.nii.gz
```



```
participant_id age sex  
sub-002 34 M  
sub-003 12 F  
sub-004 33 F
```

Princip pojmenování souborů



Anatomické snímky

sub-01

└ anat

└ sub-01_T1w.nii.gz

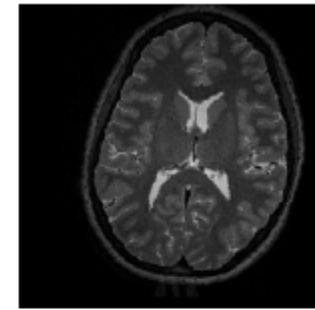
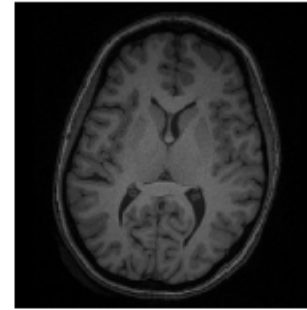
└ sub-01_T1w.json

└ sub-01_mod-T1w_defacemask.nii.gz

└ sub-01_T2w.nii.gz

└ sub-01_T2w.json

└ sub-01_mod-T2w_defacemask.nii.gz



Anatomické snímky



sub-01

└ anat

├ sub-01_T1w.nii.gz

├ sub-01_T1w.json

├ sub-01_mod-T1w_defacemask

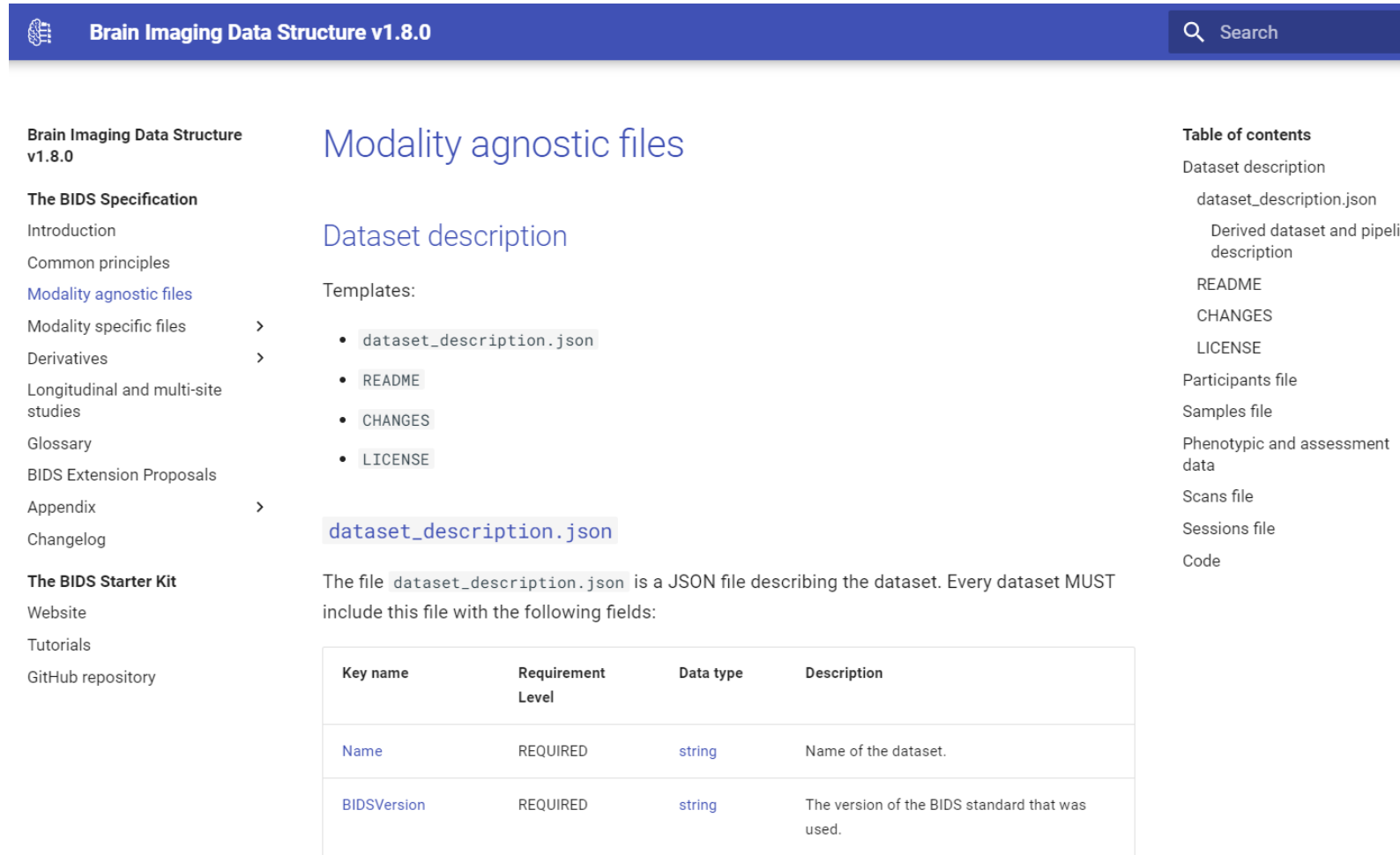
├ sub-01_T2w.nii.gz

├ sub-01_T2w.json

└ sub-01_mod-T2w_defacemask.nii.gz

```
{
  "EchoTime": 0.06052,
  "EffectiveEchoSpacing": 0.000245314,
  "FlipAngle": 77,
  "MagneticFieldStrength": 3,
  "Manufacturer": "Siemens",
  "ManufacturersModelName": "Prisma",
  "MultibandAccelerationFactor": 3,
  "ParallelReductionFactorInPlane": 2,
  "PhaseEncodingDirection": "j-",
  "RepetitionTime": 1.5,
  "SliceThickness": 2.5,
  "SpacingBetweenSlices": 2.5,
  "TaskName": "strangerthings",
  "TotalReadoutTime": 0.0208517
}
```

<https://bids-specification.readthedocs.io/en/stable/>



The screenshot shows the BIDS specification website. The header is dark blue with the text 'Brain Imaging Data Structure v1.8.0' and a search bar. The left sidebar contains a navigation menu with categories like 'The BIDS Specification' and 'The BIDS Starter Kit'. The main content area is titled 'Modality agnostic files' and 'Dataset description'. It lists templates: dataset_description.json, README, CHANGES, and LICENSE. The 'dataset_description.json' file is highlighted, and a table below lists its required fields: Name and BIDSVersion.

Brain Imaging Data Structure v1.8.0 Search

Brain Imaging Data Structure v1.8.0

The BIDS Specification

- Introduction
- Common principles
- [Modality agnostic files](#)
- Modality specific files >
- Derivatives >
- Longitudinal and multi-site studies
- Glossary
- BIDS Extension Proposals
- Appendix >
- Changelog

The BIDS Starter Kit

- Website
- Tutorials
- GitHub repository

Modality agnostic files

Dataset description

Templates:

- dataset_description.json
- README
- CHANGES
- LICENSE

[dataset_description.json](#)

The file `dataset_description.json` is a JSON file describing the dataset. Every dataset MUST include this file with the following fields:

Key name	Requirement Level	Data type	Description
Name	REQUIRED	string	Name of the dataset.
BIDSVersion	REQUIRED	string	The version of the BIDS standard that was used.

Table of contents

- Dataset description
 - dataset_description.json
 - Derived dataset and pipeline description
- README
- CHANGES
- LICENSE
- Participants file
- Samples file
- Phenotypic and assessment data
- Scans file
- Sessions file
- Code

Příprava datasetu ('curation')

- Předání dat MAFIL → výzkumník
 - Stažení + konverze + **pseudonymizace** → **preBIDS**
 - Pseudonymizace použitím VisitID (nutná znalost pro „dešifrování“)
 - Párování s jinými modalitami v rámci MAFIL – stimulační logy, EEG, ExG, aj.
 - Upload na MAFIL servery do složky projektu nebo zaslání přes Filesender
- Kompletace + čištění
 - Doplnění dalších vstupů (zdraví vs nemocní, krevní rozbory, psychologické testy, aj.)
 - Konverze formátů (BIDS kompatibilní)
 - Kontrola kvality – pohybové parametry, SNR
 - BIDS validátor (online i offline verze)
- Příprava na publikování v repozitáři
 - Detailněji viz praktická ukázka

Anonymizace

- Cíl – zachování soukromí účastníků

- Nařízení GDPR + informovaný souhlas

- ... zda je osoba identifikovatelná s vynaložením přiměřeného úsilí

- Pseudonymizace

- Smazání/náhrada osobních údajů kódy,
 - Existuje **převodní tabulka**, lze doplnit data později

- Anonymizace

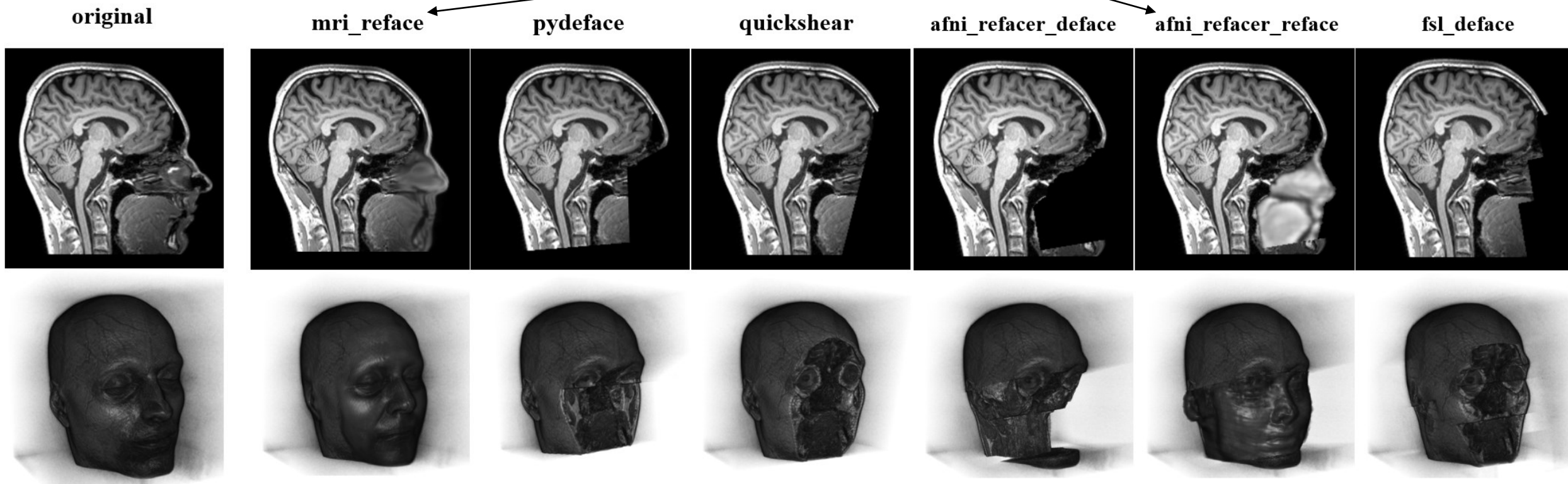
- Nevratný jednosměrný proces, převodní tabulka neexistuje, nelze doplnit data
 - Absolutní anonymizace není (!) – rovnováha mezi zachováním soukromí a využitelností dat

DATA DEIDENTIFICATION



Deface

- Anatomické snímky s vysokým rozlíšením – $1 \times 1 \times 1\text{mm}$ (T1, T2, FLAIR)
- Poškození dat → nevhodné pro morfometrii, problematická normalizace
- Odstranění nebo nahrazení „průměrnou“ tváří (tzv. reface)
- Nástroje:





Ukázka na vzorovém datasetu (screenshoty)

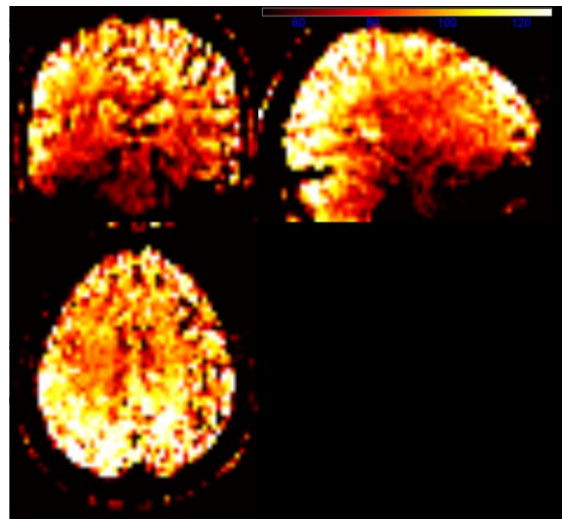
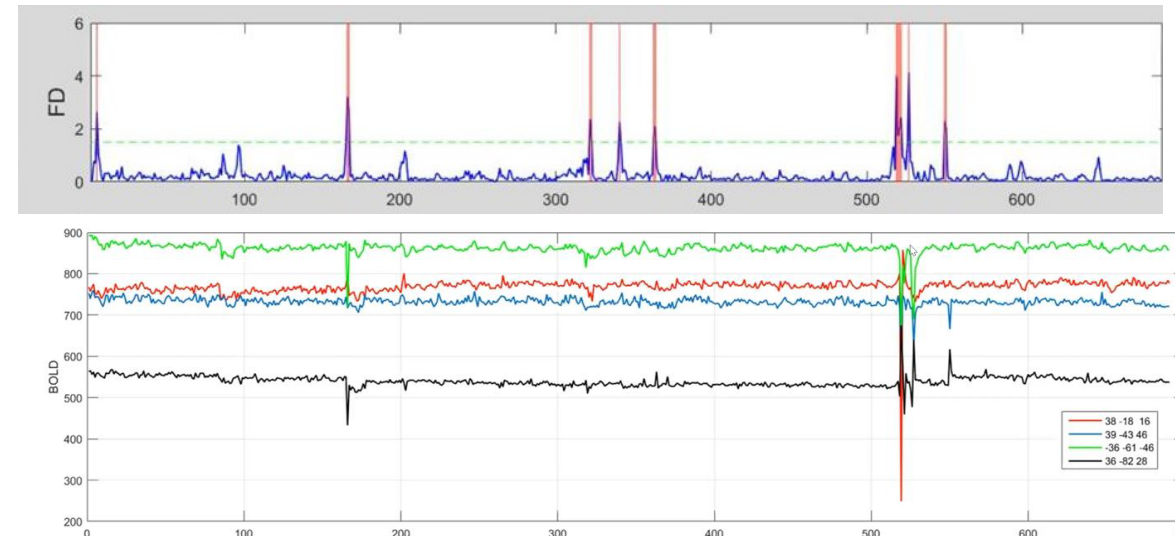
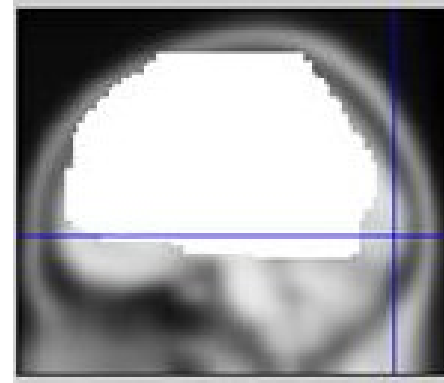
- Kompletace, čištění
- Kontrola kvality
- Deface
- Anonymizace
- Doplnění informací o datasetu
- Validace
- Přidělení DOI
- Upload do repozitáře
- Ověření záznamu DOI

Kompletace, čištění

- BOSAPS3 – vliv MB faktoru a velikosti FA na kvalitu dat
- 50 subjektů, 1 session
- MR data
 - Anat – T1
 - Fmap
 - Func – 7× bold (multiecho + multiband)
- Vizuální stimulace (blokový design)
- Čištění
 - opakovaná měření (run-02)
 - sjednocení protokolu (2017 + 2021), nová část navíc part-phase u bold

Kontrola kvality

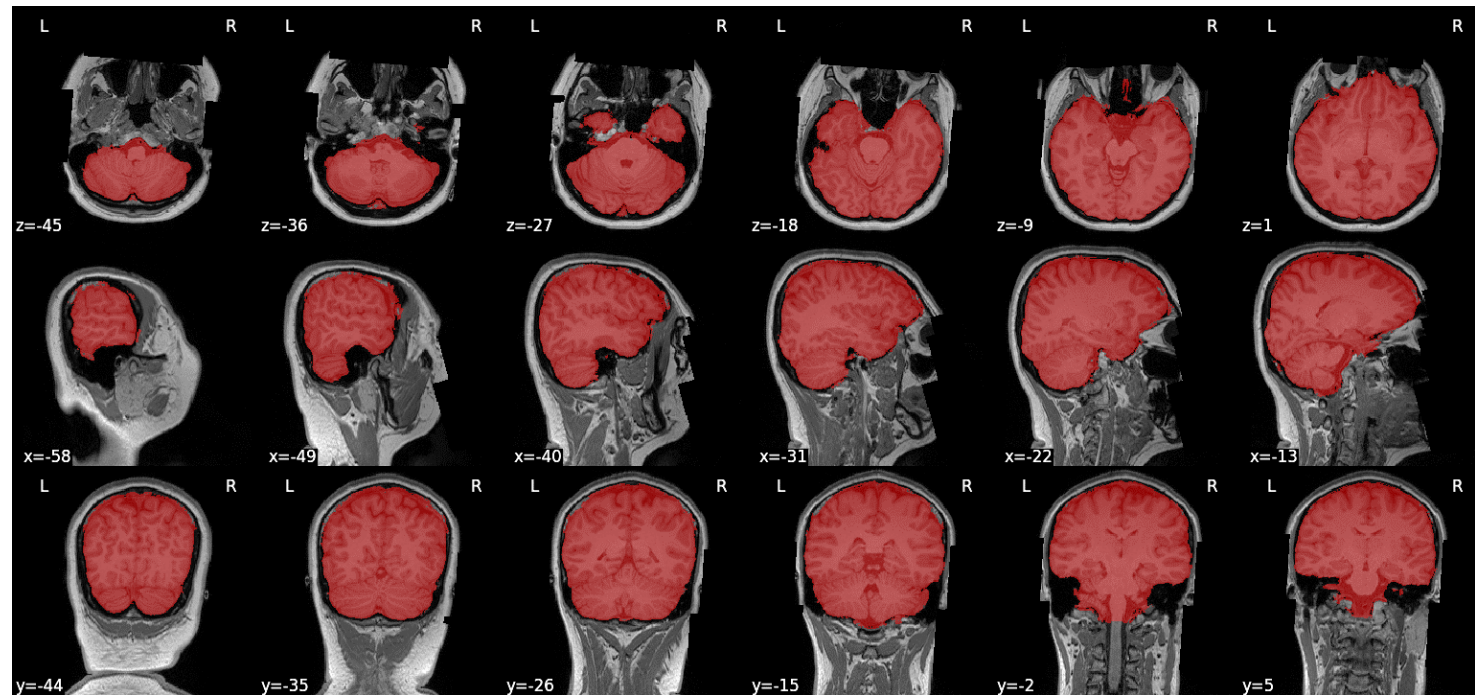
- Pokrytí dat
 - Překryv validních dat napříč celým souborem
- Pohybové artefakty
 - FWD, DVARs, ...
- Kvalita dat
 - SNR, tSNR, ...



Deface

- FSL_deface
 - BIAS corrected
- Ověření integrity
 - Pomocí 'inbrain' masky
 - Metriky podobnosti
 - Manuální kontrola

sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0,00011	0,01881	1,99998	0,99999
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	1,6E-05	0,00319	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1
sub-	B	fsl_deface	bias_corrected	0	0	2	1



Anonymizace (vlastní MATLAB skript)

- Převodní tabulka pro VisitID

- Náhodné přiřazení čísel (1234A → 08)
- Na konci procesu bude smazána

- Odstranění/nahrazení citlivých údajů

- Instituce, akviziční protokol (CEITEC, adresa, head^ceitec)
- Projekt = ReferringPhysician (BOSAPS3)
- VisitID = AccessionNumber (1234A)
- Osobní údaje (jméno, příjmení, datum narození, rodné číslo) – zde již pseudonymizováno
- Pozor na jednoznačné identifikátory (StudyUID, SeriesUID, časová značka)

```
1: {
2:   "Modality": "MR",
3:   "MagneticFieldStrength": 3,
4:   "ImagingFrequency": 123.219,
5:   "Manufacturer": "Siemens",
6:   "ManufacturersModelName": "Prisma",
7:   "ImagingStationName": "CEITEC",
8:   "ReferringPhysicianName": "BOSAPS3",
9:   "AccessionNumber": "1234A",
10:  "PatientSex": "F",
11:  "BodyPartExamined": "HEAD",
12:  "PatientPosition": "HFS",
13:  "ProcedureStepDescription": "Head CEITEC",
14:  "SoftwareVersions": "syngo MR E11",
15:  "MRAcquisitionType": "3D",
16:  "SeriesDescription": "t1_mprage_sag_p2_liso",
17:  "ProtocolName": "t1_mprage_sag_p2_liso",
18:  "ScanningSequence": "GR\\IR",
19:  "SequenceVariant": "SR\\SP\\MP",
20:  "ScanOptions": "IR",
21:  "SequenceName": "t1f13d1_16ns",
22:  "ImageType": [
23:    "ORIGINAL",
24:    "PRIMARY",
25:    "M",
26:    "ND",
27:    "NORM"
28:  ],
29:  "SeriesNumber": 2,
30:  "AcquisitionNumber": 1,
31:  "SliceThickness": 1,
32:  "SAR": 0.0424845,
33:  "EchoTime": 0.00233
}

1: {
2:   "Modality": "MR",
3:   "MagneticFieldStrength": 3,
4:   "ImagingFrequency": 123.219,
5:   "Manufacturer": "Siemens",
6:   "ManufacturersModelName": "Prisma",
7:   "AccessionNumber": "08",
8:   "PatientSex": "F",
9:   "BodyPartExamined": "HEAD",
10:  "PatientPosition": "HFS",
11:  "SoftwareVersions": "syngo MR E11",
12:  "MRAcquisitionType": "3D",
13:  "SeriesDescription": "t1_mprage_sag_p2_liso",
14:  "ProtocolName": "t1_mprage_sag_p2_liso",
15:  "ScanningSequence": "GR\\IR",
16:  "SequenceVariant": "SR\\SP\\MP",
17:  "ScanOptions": "IR",
18:  "SequenceName": "t1f13d1_16ns",
19:  "ImageType": [
20:    "ORIGINAL",
21:    "PRIMARY",
22:    "M",
23:    "ND",
24:    "NORM"
25:  ],
26:  "SeriesNumber": 2,
27:  "AcquisitionNumber": 1,
28:  "SliceThickness": 1,
29:  "SAR": 0.0424845,
30:  "EchoTime": 0.00233
}
```

- Aktualizace metadat (participants.tsv, sub-*.json, *.nii hlavička)

- Přejmenování názvu souborů a složek

Doplnění informací o datasetu

- Dataset_description.json
- README (volný text)
- Participants.json, task-*_bold.json, aj.

```
dataset_description.json
1 {
2   "Name": "Multi-echo simultaneous multislice fMRI dataset: Effect of acquisition parameters on fMRI data",
3   "BIDSVersion": "1.8.0",
4   "DatasetType": "raw",
5   "Authors": [
6     "Mikl Michal",
7     "Kovarova Anezka",
8     "Gajdos Martin",
9     "Marecek Radek",
10    "Novakova Marie",
11    "Slavicek Tomas"
12  ],
13  "License": "CC0",
14  "Acknowledgements": "The work was supported from the European Regional Development Fund project National infrastr
15  "HowToAcknowledge": "We acknowledge the core facility MAFIL supported by the Czech BioImaging large RI project (I
16  "Funding": [
17    "LM2018129 and LM2023050 funded by MEYS-CR"
18  ],
19  "ReferencesAndLinks": [
20    "https://mafil.ceitec.cz"
21  ],
22  "DatasetDOI": "10.58071/njhx-b011",
23  "GeneratedBy": [
24    {
25      "Name": "mafil_dicom2preBIDS",
26      "Version": "v1.07"
27    }
28  ]
29 }
```

- Brain Imaging Data Structure v1.8.0
- The BIDS Specification
 - Introduction
 - Common principles
 - Modality agnostic files
 - Modality specific files >
 - Derivatives >
 - Longitudinal and multi-site studies
 - Glossary
 - BIDS Extension Proposals
 - Appendix >
 - Changelog
- The BIDS Starter Kit
 - Website
 - Tutorials
 - GitHub repository

Modality agnostic files

Dataset description

Templates:

- dataset_description.json
- README
- CHANGES
- LICENSE

dataset_description.json

The file `dataset_description.json` is a JSON file describing the dataset. Every dataset MUST include this file with the following fields:

Key name	Requirement Level	Data type	Description
Name	REQUIRED	string	Name of the dataset.
BIDSVersion	REQUIRED	string	The version of the BIDS standard that was used.
HEDVersion	RECOMMENDED	string or array of strings	If HED tags are used: The version of the HED schema used to validate HED tags for study. May include a single schema or a base schema and one or more library schema.
DatasetLinks	REQUIRED if BIDS URIs are used	object of strings	Used to map a given <code><dataset-name></code> from a BIDS URI of the form <code>bids:<dataset-name>:path/within/dataset</code> to a local or

Table of contents

- Dataset description
 - dataset_description.json
 - Derived dataset and pipeline description
- README
- CHANGES
- LICENSE
- Participants file
- Samples file
- Phenotypic and assessment data
- Scans file
- Sessions file
- Code

Validace

- Online verze – snadné použití
 - <https://bids-standard.github.io/bids-validator/>
- Kontroluje metadata i data (hlavičku NII)
- Platné názvosloví pro daná data
 - Tzv. ‘Entity Table’
 - Např. nelze multiecho pro T1w
- Uniformní struktura napříč subjekty
 - Např. sekvence navíc → warning
- Včetně parametrů akvizice
 - Např. různé TR u stejné bold sekvence
- Výjimky – soubor .bidsignore

BIDS Validator v1.10.0

Select a **BIDS dataset** to validate

Soubor nevybrán

Options: Ignore Warnings Ignore NIfTI Headers Skip Subject Filename Consistency Check

Note: Selecting a dataset only performs validation. Files are never uploaded.

_BIDS_50sub_vzorovy_dataset

Summary

- 2518 Files, 152.23GB
- 50 - Subjects
- 1 - Session

Available Tasks

- FCNI1
- FCNI2
- FCNI3
- FCNI4
- FCNI5
- FCNI6
- FCNI7

Available Modalities

- MRI

This is a valid BIDS dataset!

Click to view details on [BIDS specification](#)

If you have any questions please post on [Neurostars](#)

The source code for the validator can be found [here](#)

Přidělení DOI (spravuje MAFIL)



About Support GCNC.CCLSVN ▾

Multimodal and Functional Imaging Laboratory / DOIs

10.58071/njhx-b011

📄 Update DOI (Form)

📁 Update DOI (File Upload)

Findable

Metadata Export

DataCite XML

DataCite JSON

Schema.org JSON-LD

BibTeX

DOI created

February 17, 2023 at 12:36:30 UTC

DOI registered

February 17, 2023 at 12:42:06 UTC

DOI last updated

February 17, 2023 at 13:16:06 UTC

Metadata version ⓘ

3

Schema ⓘ

DataCite Metadata Schema 4

URL

<https://openneuro.org/datasets/ds004499>

Metadata

Summary View ▾

Multi-echo simultaneous multislice fMRI dataset: Effect of acquisition parameters on fMRI data

Dataset

Michal Mikl, Anezka Kovarova, Martin Gajdoš, Radek Mareček, Marie Nováková, Tomáš Slaviček,

Dataset published 2023 via MAFIL-CEITEC-MU

🔗 <https://doi.org/10.58071/njhx-b011>

Citation

APA ▾

Mikl, M., Kovarova, A., Gajdoš, M., Mareček, R., Nováková, M., & Slaviček, T. (2023). *Multi-echo simultaneous multislice fMRI dataset: Effect of acquisition parameters on fMRI data* [Data set]. MAFIL-CEITEC-MU. <https://doi.org/10.58071/NJHX-B011>

Upload do repozitáře

- <https://openneuro.org/>
- Po nahrání aktualizace DOI (URL)

Upload Dataset

Step 1: Select Files | Step 2: Validation | **Step 3: Metadata** | Step 4: Accept Terms

To protect the privacy of the individuals who have been scanned, we require that all scan data be defaced before publishing a dataset.

Select a [BIDS dataset](#) to upload

Select folder

close

Upload Dataset

Step 1: Select Files | Step 2: Validation | **Step 3: Metadata** | Step 4: Accept Terms

Incomplete fields in this form will make it more difficult for users to search for your dataset.

We recommend completing the applicable fields to improve your search results.

DOI of papers from the source data lab

10.1002/hbm.25698

Species

Human

Study Type

Longitudinal

Domain Studied

Brain

Number of Trials (if applicable)

1

Study Design

Block visual-motor tasks with repetitions over various acquisition parameters

Papers published from this dataset

DX status(es)

Healthy / Control

Grant Funder Name

Ministry of Education, Youth, and Sports of the Czech Republic

Grant Identifier

LM2018129

Ověření záznamu DOI

The screenshot displays the OpenNeuro dataset page for "Multi-echo simultaneous multislice fMRI dataset: Effect of acquisition parameters on fMRI data". The page features a dark teal header with the OpenNeuro logo, navigation links (SEARCH, SUPPORT, FAQ, UPLOAD), and a "My Account" button. A yellow banner at the top states: "This dataset has not been published! Before it can be published, please [create a version](#)".

The main content area includes a "BIDS Validation" section with a green checkmark and "Valid" status, and a "Clone" button. Below this is a navigation bar with icons for Files, Publish, Share, Versioning, Download, Metadata, and Delete.

The "README" section contains the following text:
The dataset was created for the purpose of evaluation of multi-echo fMRI at various levels of acceleration (SMS or MB factors) and flip angles. It is suitable for testing and optimization of data processing pipelines and comparing characteristics of single-echo and/or multi-echo data for various acquisition settings. Each subject's data consists of structural scan (T1 MRAGE), field map (GRE), and seven functional runs with identical visual-motor tasks but different acquisition parameters. The block task consisted of alternating active and baseline blocks in the following manner: BABABABABABAB, i.e. seven active blocks (duration 21.4 seconds) and eight baseline blocks (duration of 30 seconds except the first one with duration only 10 seconds). There was flickering checkerboard with frequency of 2 Hz covering whole field of view and the numbers 1 to 4 place in the center of screen. The numbers changed each second repeating the sequence from 1 to 4. Participants were asked to press one of four buttons by fingers of the right (dominant) hand based on the numbers (1 for index finger, 2 for middle finger, etc). The data were acquired at 3T Siemens Magnetom Prisma scanner placed at the Multimodal and Functional Imaging Laboratory (MAFIL, <http://mafil.ceitec.cz>), Central European Institute of Technology (CEITEC), Masaryk University. We acquired the seven BOLD runs (FCNI1 to FCNI7) with different acquisition parameters. fMRI protocols were based on the MB-EPI BOLD sequence obtained from the Centre for Magnetic Resonance Research (CMRR), University of Minnesota. The acquisition time of each run was 6 min, but different numbers of images were obtained in each run due to different TR values. Both field of view (FOV) (192 x 192 mm) and TE (17.00, 24.64, 32.28, 39.92, 47.56, 55.20, 62.84 ms) were constant for all BOLD runs. The TR, MB factor, number
[READ MORE](#)

The "OpenNeuro Accession Number" is ds004499. The "Authors" are Mikl Michal, Kovarova Anezka, Gajdos Martin, Marecek Radek, Novakova Marie, Slavicek Tomas. The "Available Modalities" section shows "MRI". The "Version" section indicates a "Draft" version updated on 2023-02-17, with a "Create Version" button. The "Tasks" section lists FCNI1, FCNI2, FCNI3, FCNI4, FCNI5, FCNI6, FCNI7. The "Uploaded by" section shows Michal Mikl on 2023-02-16 - about 24 hours ago. The "Sessions" section shows 1 session. The "Participants" section shows 50 participants.

The "Files" section at the bottom shows a file list with columns for name, size, and actions. The files listed are "README" and "dataset_description.json".



Díky za pozornost!

Otázky?

