

Appendix I — BEAMRAD Tool: Bias Evaluation And Monitoring for Transparent And Reliable Medical Datasets

Overview of the dataset documentation evaluation tool.

Category	Key Items
Title	<ol style="list-style-type: none"> 1. Is there a title/acronym available for the dataset? If yes, please provide the title of the dataset. 2. Is there information on how to cite the resource? If yes, provide the citation.
General description	<ol style="list-style-type: none"> 3. Please describe the target entities, i.e., the anatomical region of subjects from whom the data was acquired (e.g., brain shown in MRI). 4. What data type is included in this dataset? Image data such as MRI or Color Fundus Photography (CFP), or signal data (ECGs)? 5. Is the principal motivation and objective for the dataset described? If so, please provide a summary of the principal motivations behind the development of the dataset. 6. Are there different versions of this dataset? If so, is the principal motivation and objective for updating this dataset described? Please, provide the current version and a description of the principal motivations. 7. Provide keywords for the dataset (e.g., datatype, modality, body part, relevant medical terms). 8. Is there information about coordinators or organizers involved in the dataset creation? Is there a list of contributors available? If so, please provide the list of contributors, including their affiliations. 9. When was the dataset published (first version)? Please provide the date of publication (year, month). 10. Is the dataset associated with a challenge? If so, please provide the challenge name.
Dataset usage	<ol style="list-style-type: none"> 11. Is there an official website or other place where the dataset is hosted? If so, please provide the location (e.g., a URL). 12. What is the accessibility of the dataset (choose from provided categories) [5]? Are there any specific barriers or formal agreements? If yes, provide details on them.

	<p>a. Open access – no requirements for access or only sign-in</p> <p>b. Open access with barriers – datasets fulfilling the theoretical criteria for open access, but are inaccessible because of unpredictable reasons (e.g., no response to requests or broken hyperlinks)</p> <p>c. Regulated access – required the fulfilment of formal agreements or approvals.</p> <p>13. Is there information about the ethics approval? If so, please provide the reference to the ethics approval or waiver.</p> <p>14. Is there a data usage agreement? Is there an explicit listing of the license applied? If so, please describe the license.</p> <p>15. Is there information regarding sponsoring/funding provided? If so, please provide the sponsorship information.</p> <p>16. Are there any publication restrictions? If so, please provide the restriction information</p>
Data sources	<p>17. Is there a description of when the data included in the dataset was acquired (e.g., between 2005-2020)? If so, please provide the information.</p> <p>18. Is there information about the origin of data (e.g., country and hospital)? If so, please provide this information.</p> <p>19. Is it a single-center or multi-center study?</p> <p>20. Are the criteria for data inclusion described? (e.g., consecutive participants, inclusion and exclusion criteria). If yes, please provide the description.</p> <p>21. Are there relevant characteristics (e.g., level of expertise) of the subjects (e.g., surgeon)/objects (e.g., robot) involved in the data acquisition process? If so, please provide this information.</p> <p>22. Is there any information on the data anonymization protocol? If so, please describe the anonymization protocol.</p>
Metadata	<p>23. Is there information about the participant (e.g., age, medical history)? If relevant, what are the features, variable types, and the number of categories provided for the variable? Please provide a description.</p> <p>24. Is any information provided along with the data? If yes, what kind of information?</p> <p>25. Is there information about the hardware used for the data acquisition? If so, provide the information about the hardware—i.e. the vendor and the specific model.</p>

	<p>26. Is there general information about the data acquisition protocol, such as view or modality? If so, what kind of information is provided?</p>
Sample size	<p>27. What is the number of participants and the number of data samples? Please, provide the number of samples.</p> <p>28. If there is more than one inclusion for a participant, what is the number of data samples per participant? Please, provide the number of samples per participant</p>
Missing data	<p>29. Is the information about missing values provided? If so, please describe the details.</p>
Training and test set distribution	<p>30. Is data divided into training/test sets? If the dataset consists of training/test sets, how is the data distributed? Please provide a description.</p> <p>31. Are both the training and test datasets available?</p> <p>32. Is there an explanation for the potential differences between distributions of the data subjects in in training and test sets and the real-world distribution?</p>
Data Annotation	<p>33. What types of annotations are included in this dataset? If so, please describe the different types of annotations.</p> <p>34. Are the data annotation methods explained? If so, please describe the methods.</p> <p>35. Are there human annotators involved?</p> <p>36. If human annotators were involved, is the annotation instruction protocol available? If so, please describe the protocol.</p> <p>37. If human annotators were involved, is the number of annotators indicated? If yes, how many individual annotators are involved in the annotations process? Please provide this information.</p> <p>38. If human annotators were involved, is there information on how they were selected? If so, please provide this information on the selection process.</p> <p>39. If human annotators were involved, is the disciplinary background of the annotators indicated, including their years of expertise? If so, please provide this information.</p> <p>40. If there are multiple annotations, is the approach to reaching a consensus on the final labels described by the dataset's creators? If so, provide this information.</p>

Data preprocessing	41. Is the data preprocessed? If yes, how was the data preprocessed? Please describe the methods (e.g., cropping, resampling, and contrast enhancement).
Sources of error	42. Are the most relevant possible sources of error (e.g., error through annotation variability) described in the documentation of the dataset? If so, please provide this information. 43. Are the most relevant error sources quantified? (For instance, by giving specific information for training, validation and test cases?). If so, please provide a list of the quantifications. 44. Is there information regarding the limitations of the dataset? If so, please provide the information.

Appendix II – Tables of included datasets [MRI, CFP, ECG]

Magnetic Resonance Imaging				
Title	Challenge	Dataset	Documentation	Challenge Status [Open / Closed] + Data Access Date
BONBID-HIE 2023 - BOston Neonatal Brain Injury Dataset for Hypoxic Ischemic Encephalopathy	https://bonbid-hie2023.grand-challenge.org/	https://zenodo.org/record/8104103	https://www.biorxiv.org/content/10.1101/2023.06.30.546841v1.full.pdf	Closed; Data was accessed August 24, 2023

BrainPTM 2021 - Brain Pre-surgical white matter Tractography Mapping Challenge	https://brainptm-2021.grand-challenge.org/	https://zenodo.org/records/6359760	https://zenodo.org/records/6359760	Closed; Data was accessed September 6, 2024
Carotid Artery Vessel Wall Segmentation Challenge 2021	https://vessel-wall-segmentation.grand-challenge.org/	https://vessel-wall-segmentation.grand-challenge.org/	https://zenodo.org/record/4575301	Closed; Data was accessed 14 August 2024
Chaos 2019 - Combined (CT-MR) Healthy Abdominal Organ Segmentation	https://chaos.grand-challenge.org/	https://zenodo.org/record/3431873	https://arxiv.org/pdf/2001.06535.pdf	Closed; Data was accessed August 21, 2023
COSMOS 2022 - CarOtId vessel wall Segmentation and atherosclerOsis diagnosiS challenge	https://vessel-wall-segmentation-2022.grand-challenge.org/	https://zenodo.org/record/6481870	https://vessel-wall-segmentation-2022.grand-challenge.org/data/	Closed; Data was accessed August 23, 2023
CROSSMODA 2022 - Cross-Modality Domain Adaptation for Medical Image Segmentation	https://crossmoda2022.grand-challenge.org/	https://zenodo.org/record/4662239	https://arxiv.org/abs/2201.02831	Closed; Data was accessed August 21, 2023
FETA 2022 - Fetal Tissue Annotation and Segmentation Challenge (FeTA), MICCAI 2022	https://feta.grand-challenge.org/	https://feta.grand-challenge.org/	https://zenodo.org/record/6683366	Closed; Data was accessed August 14, 2023
HaN-Seg 2022 - The head and Neck organ-at-risk CT & MR segmentation challenge	https://han-seg2023.grand-challenge.org/	https://zenodo.org/record/7442914#.ZBtfBHbMJJaQ	https://aapm.onlinelibrary.wiley.com/doi/full/10.1002/mp.16197?af=R	Closed; Data was accessed August 22, 2023
ISLES 2022 - Ischemic Stroke Lesion Segmentation Challenge	https://isles22.grand-challenge.org/	https://zenodo.org/record/7960856#.ZK5orxBzmE	https://www.nature.com/articles/s41597-022-01875-5	Closed; Data was accessed August 24, 2023
PI-CAI 2022 – Artificial intelligence and radiologist at	https://pi-cai.grand-challenge.org/	https://zenodo.org/record/6624726	https://zenodo.org/record/6522364	Closed; Data was accessed August 22, 2023

prostate cancer Detection in MRI				
QUBIC 2021 - Quantification of Uncertainties in Biomedical Image Quantification Challenge	https://qubiq21.grand-challenge.org/	https://syncandshare.lrz.de/getlink/fi7wpcsxhK9AjyjBU7vj5y8m/training_data_v3_QC.zip	https://syncandshare.lrz.de/getlink/fi7wpcsxhK9AjyjBU7vj5y8m/training_data_v3_QC.zip	Closed; Data was accessed August 21, 2023
Shifts 2022 - Shifts Multiple Sclerosis Lesion Segmentation Dataset	https://shifts.grand-challenge.org/	https://zenodo.org/record/7051658 & https://zenodo.org/record/7051692	https://arxiv.org/abs/2206.15407	Closed; Data was accessed August 22, 2023
SynthRAD 2023 - synthesizing computed tomography for radiotherapy	https://synthrad2023.grand-challenge.org/	https://zenodo.org/record/7260705	https://doi.org/10.1002/mp.16529	Open; Data was accessed August 14, 2024
SPIDER 2023 - Spine Segmentation: Discs, Vertebrae and Spinal Canal	https://spider.grand-challenge.org/	https://zenodo.org/record/8009680	https://arxiv.org/pdf/2306.12217.pdf	Open; Data was accessed August 14, 2023
VALDO 2021 - Where is VALDO - Vascular Lesions Detection Challenge	https://valdo.grand-challenge.org/	https://zenodo.org/record/4687995	https://zenodo.org/record/4687995	Open; Data was accessed August 24, 2023

Color Fundus Photography				
Title	Challenge	Dataset	Documentation	Challenge Status [Open / Closed, Date Accessed]
AIROGS 2022 - Artificial Intelligence for RObust Glaucoma Screening Challenge	https://airogs.grand-challenge.org/	https://zenodo.org/record/5793241	https://arxiv.org/pdf/2302.01738.pdf	Closed; Data was accessed September 6, 2023
ODIR 2019 - Peking University International Competition on Ocular Disease Intelligent Recognition	https://odir2019.grand-challenge.org/	https://www.kaggle.com/datasets/andrewmvd/ocular-disease-recognition-odir5k	https://www.kaggle.com/datasets/andrewmvd/ocular-disease-recognition-odir5k	Open; Data was accessed September 11, 2023

PALM 2019 - Pathologic Myopia Challenge	https://palm.grand-challenge.org/	https://palm.grand-challenge.org/	https://arxiv.org/pdf/2305.07816.pdf	Closed; Data was accessed September 14, 2023
REFUGE 2020 - Retinal Fundus Glaucoma Challenge Edition 2	https://refuge.grand-challenge.org/	https://zenodo.org/record/3714947	https://zenodo.org/record/3714947	Closed; Data was accessed September 12, 2023
RFMiD 2021 - Retinal Image Analysis for multi-Disease Detection Challenge	https://riadd.grand-challenge.org/	https://zenodo.org/record/7505822	https://www.mdpi.com/2306-5729/6/2/14	Closed; Data was accessed September 12, 2023

Electrocardiogram			
Title	PhysioNet	Documentation	Data Access Date
A large scale 12-lead electrocardiogram database for arrhythmia study	https://physionet.org/content/ecg-arrhythmia/1.0.0/	https://www.nature.com/articles/s41597-020-0386-x	August 14, 2023
Autonomic Aging	https://physionet.org/content/autonomic-aging-cardiovascular/1.0.0/	https://www.nature.com/articles/s41597-022-01202-y	August 14, 2023
Brno University of Technology ECG Quality Database (BUT QDB)	https://physionet.org/content/butqdb/1.0.0/	https://physionet.org/content/butqdb/1.0.0/	August 18, 2023
Brno University of Technology Smartphone PPG Database (BUT PPG)	https://physionet.org/content/butppg/1.0.0/	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8440059/	August 18, 2023
Electrocardiogram, skin conductance and respiration from spider-	https://physionet.org/content/ecg-spider-clip/1.0.0/	https://physionet.org/content/ecg-spider-clip/1.0.0/	August 21, 2023

fearful individuals watching spider video clips			
EPHNOGRAM: A Simultaneous Electrocardiogram and Phonocardiogram Database	https://physionet.org/content/ephnogram/1.0.0/	https://www.biorxiv.org/content/10.1101/2021.05.17.444563v2.full.pdf	August 21, 2023
Haaglanden Medisch Centrum sleep staging database	https://physionet.org/content/hmc-sleep-staging/1.1/	https://physionet.org/content/hmc-sleep-staging/1.1/	August 21, 2023
I-CARE: International Cardiac Arrest REsearch consortium Database	https://physionet.org/content/i-care/2.0/	https://www.researchgate.net/publication/373478395_The_International_Cardiac_Arrest_Research_I-CARE_Consortium_Electroencephalography_Database	August 22, 2023
Icentia11k Single Lead Continuous Raw Electrocardiogram Dataset	https://physionet.org/content/icentia11k-continuous-ecg/1.0/	https://www.cinc.org/2021/Program/accepted/229_Preprint.pdf	August 22, 2023
Influence of the MHD effect on 12-lead and 3-lead ECGs recorded in 1T to 7T MRI scanners	https://physionet.org/content/mhd-effect-ecg-mri/1.0.0/	https://www.cinc.org/archives/2017/pdf/132-090.pdf	August 22, 2023
Lobachevsky University Electrocardiography Database	https://physionet.org/content/ludb/1.0.1/	https://physionet.org/content/ludb/1.0.1/	August 22, 2023
Norwegian Endurance Athlete ECG Database	https://physionet.org/content/norwegian-athlete-ecg/1.0.0/	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9829117/	August 24, 2023
PTB-XL - a large publicly available electrocardiography dataset	https://physionet.org/content/ptb-xl/1.0.3/	https://www.nature.com/articles/s41597-020-0495-6	August 24, 2023
Simultaneous physiological measurements with five devices at different cognitive and physical loads	https://physionet.org/content/simultaneous-measurements/1.0.2/	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0274994	August 24, 2023
VitalDB - a high-fidelity multi-parameter vital signs database in surgical patients	https://physionet.org/content/wctecgdb/1.0.1/	https://www.mdpi.com/2075-1702/4/4/18	August 24, 2023

Wilson Central Terminal ECG Database	https://physionet.org/content/wearable-exercise-frailty/1.0.0/	https://ieeexplore.ieee.org/document/9795954	August 24, 2023
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