Supplementary Table 1: Search Strategy (list of queries used to search databases)

Database	Query	Study Num
Scopus	(TITLE-ABS-KEY ("deep learning" OR "machine learning" OR "neural network*" OR "artificial intelligence" OR "AI" OR "LLM*" OR "large language model*" OR "foundation model*" OR "vision language model*" OR "vision-language model*") AND TITLE-ABS-KEY ("epilep*" OR "seizure*") AND TITLE-ABS-KEY ("surgery" OR "surgical" OR "presurgical" OR "preoperative" OR "intraoperative" OR "postoperative")) AND PUBYEAR > 2017 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (LANGUAGE , "English"))	639
Web of Science	((TS=("deep learning" OR "machine learning" OR "neural network*" OR "artificial intelligence" OR "AI" OR "LLM*" OR "large language model*" OR "foundation model*" OR "vision language model*" OR "vision-language model*")) AND TS=("epilep*" OR "seizure*")) AND TS=("surgery" OR "surgical" OR "presurgical" OR "preoperative" OR "intraoperative" OR "postoperative")	528
Embase	("deep learning" OR "machine learning" OR "neural network*" OR "artificial intelligence" OR "AI" OR "LLM*" OR "large language model*" OR "foundation model*" OR "vision language model*" OR "vision-language model*") AND ("epilep*" OR "seizure*") AND ("surgery" OR "surgical" OR "presurgical" OR "preoperative" OR "intraoperative" OR "postoperative")	582
PubMed	(("deep learning"[Title/Abstract] OR "machine learning"[Title/Abstract] OR "neural network*"[Title/Abstract] OR "artificial intelligence"[Title/Abstract] OR "AI"[Title/Abstract] OR "LLM*"[Title/Abstract] OR "large language model*"[Title/Abstract] OR "foundation model*"[Title/Abstract] OR "vision language model*"[Title/Abstract] OR "vision-language model*"[Title/Abstract]) AND ("epilep*"[Title/Abstract] OR "seizure*"[Title/Abstract])) AND ("surgery"[Title/Abstract] OR "surgical"[Title/Abstract] OR "presurgical"[Title/Abstract] OR "preoperative"[Title/Abstract] OR "intraoperative"[Title/Abstract] OR "postoperative"[Title/Abstract])	467
IEEE	("All Metadata":"deep learning" OR "All Metadata":"machine learning" OR "All Metadata":"neural network*" OR "All Metadata":"artificial intelligence" OR "All Metadata":"AI" OR "All Metadata":"LLM*" OR "All Metadata":"large language model*" OR "All Metadata":"foundation model*" OR "All Metadata":"vision language model*" OR "All Metadata":"vision-language model*") AND ("All Metadata":"epilep*" OR "All Metadata":"seizure*") AND ("All Metadata":"surgery" OR "All Metadata":"surgical" OR "All Metadata":"presurgical" OR "All Metadata":"preoperative" OR "All Metadata":"intraoperative" OR "All Metadata":"postoperative")	142
ACM	[[All: "deep learning"] OR [All: "machine learning"] OR [All: "neural network*"] OR [All: "artificial intelligence"] OR [All: "ai"] OR [All: "llm*"] OR [All: "large	133

	language model*"] OR [All: "foundation model*"] OR [All: "vision language model*"] OR [All: "vision-language model*"]] AND [[All: "epilep*"] OR [All: "seizure*"]] AND [[All: "surgery"] OR [All: "surgical"] OR [All: "presurgical"] OR [All: "preoperative"] OR [All: "intraoperative"] OR [All: "postoperative"]] AND [E-Publication Date: (01/01/2018 TO 05/31/2025)]	
CINAHL	("deep learning" OR "machine learning" OR "neural network*" OR "artificial intelligence" OR "AI" OR "LLM*" OR "large language model*" OR "foundation model*" OR "vision language model*" OR "vision-language model*") AND ("epilep*" OR "seizure*") AND ("surgery" OR "surgical" OR "presurgical" OR "preoperative" OR "intraoperative" OR "postoperative")	43
Total Studies		**2,534**

Supplementary Table 2: Data Extraction Form

Concept	Definition
Basic Information	
ID	Unique ID assigned to each study.
Title	The title of the included paper.
Publication Type	Journal (J), Conference (C).
Published Year	The year in which the study was published.
Author Region	The geographic region (e.g., Asia, Europe, North America, Oceania, Africa) corresponding to the first author's primary institutional affiliation.
Epilepsy Surgery Stage & Clinical Task	
Epilepsy Surgery Stage	The specific stage of the epilepsy surgery pathway (pre-operative, intra-operative, post-operative) in which the deep learning model is applied.
Clinical Task	The specific clinical task addressed by the deep learning model within the identified epilepsy surgery stage (e.g., lesion detection, SOZ localization, SEEG trajectory planning, postoperative outcome prediction).
Data Characteristics	
Data Source Region	The geographic region(s) from which the study's dataset was collected or evaluated (e.g., Asia, North America, Europe, multi-region).
Data Modality	The data modalities used in the study, including structural and functional imaging (MRI, PET, CT), electrophysiological signals (EEG, iEEG, ECoG), audio, or clinical text.
Data Size	The size of the dataset used for model development and evaluation, reported in terms of the number of patients, scans, recordings, or other relevant units based on the modality.
Dataset Access (Public / Private / Mixed)	Whether the dataset used in the study was publicly available, private, or a combination of both.
Modeling Details	
Deep Model Architecture / Name	The specific deep learning architecture used in the study (e.g., CNN, 3D CNN, U-Net, ResNet, Transformer, multimodal fusion model).
Training Strategy	The training paradigm applied in the study, such as supervised learning, transfer learning, self-supervised learning, weak supervision, federated learning, or other specified strategies.
Evaluation	
External Validation	Whether the study includes external evaluation beyond the training dataset, categorized as: None, Single-center external, Multicenter.
Evaluation Type	Whether evaluation was performed automatically, manually by experts, or through a mixed process combining quantitative metrics and human review.

Evaluation Metrics	The quantitative metrics used to assess model performance (e.g., Dice, IoU, AUC, accuracy, sensitivity, specificity, correlation, MAE).
Performance Summary	A concise summary of the key performance outcomes reported in the paper.
Clinical Translation	
Clinical Workflow Integration Level	The extent to which the deep learning system is integrated into real clinical workflows, categorized as offline research (models evaluated retrospectively without clinical use), standalone decision support tools (outputs available for clinician review but not embedded), or semi-integrated clinical systems (outputs partially incorporated into clinical workflows).

Supplementary Table 3: Basic Information

ID	Title	Type	Year	Author Region
1	A hierarchical multimodal system for motion analysis in patients with epilepsy	J	2018	Oceania (Australia)
2	A stacked sparse autoencoder-based detector for automatic identification of neuromagnetic high frequency oscillations in epilepsy	J	2018	North America (USA)
3	Automatic detection of eloquent axonal pathways in diffusion tractography using intracanial electrical stimulation mapping and convolutional neural networks	C	2018	North America (USA)
4	Deep facial analysis: A new phase I epilepsy evaluation using computer vision	J	2018	Oceania (Australia)
5	Deep learning applied to whole-brain connectome to determine seizure control after epilepsy surgery	J	2018	North America (USA)
6	DeepIED: An epileptic discharge detector for EEG-fMRI based on deep learning	J	2018	North America (Canada)
7	A long short-term memory neural network for the detection of epileptiform spikes and high frequency oscillations	J	2019	North America (USA)
8	Applying deep learning for epilepsy seizure detection and brain mapping visualization	C	2019	Asia (Saudi Arabia)
9	Automatic detection and localization of focal cortical dysplasia lesions in MRI using fully convolutional neural network	J	2019	Asia (India)
10	Automatic detection of high frequency oscillations (80-500Hz) based on convolutional neural network in human intracerebral electroencephalogram	C	2019	Asia (China)
11	Localization of epileptic foci by using convolutional neural network based on iEEG	C	2019	Asia (Japan)
12	Motion signatures for the analysis of seizure evolution in epilepsy	C	2019	Europe (Germany)
13	Objective detection of eloquent axonal pathways to minimize postoperative deficits in pediatric epilepsy surgery using diffusion tractography and convolutional neural networks	J	2019	North America (USA)
14	Robust approach based on convolutional neural networks for identification of focal EEG signals	J	2019	Asia (India)
15	Semi-supervised learning for epileptic focus localization using deep convolutional autoencoder	C	2019	North America (USA)
16	Time-frequency domain deep convolutional neural network for the classification of focal and non-focal EEG signals	J	2019	Asia (India)
17	A Convolutional Gated Recurrent Neural Network for Seizure Onset Localization	C	2020	North America (USA)
18	A Novel MEGNet for Classification of High-Frequency Oscillations in Magnetoencephalography of Epileptic Patients	J	2020	Asia (China)
19	Automated detection of focal cortical dysplasia using a deep convolutional neural network	J	2020	North America (Canada)
20	Automatic and accurate epilepsy ripple and fast ripple detection via virtual sample generation and attention neural networks	J	2020	North America (USA)

21	Automatic localization and segmentation of focal cortical dysplasia in FLAIR-negative patients using a convolutional neural network	J	2020	Asia (China)
22	Classification of epileptic IEEG signals by CNN and data augmentation	C	2020	Asia (Japan)
23	Classification of focal and non-focal epileptic patients using single channel EEG and long short-term memory learning system	J	2020	Asia (United Arab Emirates)
24	Classifying cross-frequency coupling pattern in epileptogenic tissues by convolutional neural network	C	2020	Asia (China)
25	Deep convolutional neural network based interictal-preictal electroencephalography prediction: application to focal cortical dysplasia type-II	J	2020	Asia (South Korea)
26	Deep learning approach for epileptic focus localization	J	2020	North America (USA)
27	Deep learning provides exceptional accuracy to ECoG-based functional language mapping for epilepsy surgery	J	2020	North America (USA)
28	Deep relational reasoning for the prediction of language impairment and postoperative seizure outcome using preoperative DWI connectome data of children with focal epilepsy	J	2020	North America (USA)
29	EEG based multi-class seizure type classification using convolutional neural network and transfer learning	J	2020	Europe (Netherlands)
30	Epileptic focus localization based on iEEG plot images by using convolutional neural network	C	2020	Asia (Japan)
31	Identifying epilepsy based on deep learning using DKI images	J	2020	Asia (China)
32	Integrated automatic detection, classification and imaging of high frequency oscillations with stereoelectroencephalography	J	2020	Asia (China)
33	Lesion localization in paediatric epilepsy using patch-based convolutional neural network	C	2020	North America (Canada)
34	Multimodal data analysis of epileptic EEG and rs-fMRI via deep learning and edge computing	J	2020	North America (USA)
35	Neural network based epileptic eeg detection and classification	J	2020	Asia (India)
36	Novel deep learning network analysis of electrical stimulation mapping-driven diffusion MRI tractography to improve preoperative evaluation of pediatric epilepsy	J	2020	North America (USA)
37	Regularized siamese neural network for unsupervised outlier detection on brain multiparametric magnetic resonance imaging: application to epilepsy lesion screening	J	2020	Europe (France)
38	Simulation of brain resection for cavity segmentation using self-supervised and semi-supervised learning	C	2020	Europe (UK)
39	Stacked sparse autoencoder based automatic detection of ripples and fast ripples in epilepsy	C	2020	Asia (China)
40	Towards uncertainty quantification for electrode bending prediction in stereotactic neurosurgery	C	2020	Europe (UK)
41	A self-supervised learning strategy for postoperative brain cavity segmentation simulating resections	J	2021	Europe (UK)

42	Automatic localization of seizure onset zone from high-frequency SEEG signals: A preliminary study	J	2021	Asia (China)
43	Computer-aided intracranial EEG signal identification method based on a multi-branch deep learning fusion model and clinical validation	J	2021	Asia (China)
44	Convolution neural network recognition of epileptic foci based on composite signal processing of electroencephalograph data	J	2021	Asia (Japan)
45	Data-driven electrophysiological feature based on deep learning to detect epileptic seizures	J	2021	Asia (Japan)
46	Deep learning of simultaneous intracranial and scalp EEG for prediction, detection, and lateralization of mesial temporal lobe seizures	J	2021	North America (USA)
47	Deep learning-based diagnosis of temporal lobe epilepsy associated with hippocampal sclerosis: An MRI study	J	2021	Asia (Japan)
48	Efficient detection of high-frequency biomarker signals of epilepsy by a transfer-learning-based Convolutional Neural Network	J	2021	Asia (Japan)
49	Expert-level intracranial electroencephalogram ictal pattern detection by a deep learning neural network	J	2021	North America (USA)
50	Focal epileptic area recognition employing cross EEG rhythm spectrum images and convolutional neural network	J	2021	Asia (India)
51	Generative adversarial network based semi-supervised learning for epileptic focus localization	C	2021	North America (USA)
52	Hybrid convolutional neural network for localization of epileptic focus based on iEEG	J	2021	Asia (Japan)
53	Identification of epileptogenic and non-epileptogenic high-frequency oscillations using a multi-feature convolutional neural network model	J	2021	Asia (China)
54	IEEG-TCN: A concise and robust temporal convolutional network for intracranial electroencephalogram signal identification	C	2021	Asia (China)
55	Multi-feature fusion for epileptic focus localization based on tensor representation	C	2021	Asia (Japan)
56	Multicenter validation of a deep learning detection algorithm for focal cortical dysplasia	J	2021	North America (Canada)
57	Segmentation of focal cortical dysplasia lesions from magnetic resonance images using 3D convolutional neural networks	J	2021	Asia (India)
58	2D and 3D-UNet for segmentation of SEEG electrode contacts on post-operative CT scans	C	2022	Europe (France)
59	A cross-patient seeg epileptic signal detection method based on adaptive feature fusion of brain network features and single-channel features	C	2022	Asia (China)
60	A multi-head self-attention deep learning approach for detection and recommendation of neuromagnetic high frequency oscillations in epilepsy	J	2022	Asia (China)
61	A multi-rater comparative study of automatic target localization methods for epilepsy deep brain stimulation procedures	C	2022	North America (USA)
62	An efficient cadnet for classification of high-frequency oscillations in magnetoencephalography	C	2022	Asia (China)

63	Application of deep learning and WT-SST in localization of epileptogenic zone using epileptic EEG signals	J	2022	Asia (China)
64	Automated detection and surgical planning for focal cortical dysplasia with multicenter validation	J	2022	Asia (China)
65	Automatic localization of seizure onset zone based on multi-epileptogenic biomarkers analysis of single-contact from interictal SEEG	J	2022	Asia (China)
66	Brainnet: Epileptic wave detection from seeg with hierarchical graph diffusion learning	C	2022	Asia (China)
67	Characterizing physiological high-frequency oscillations using deep learning	J	2022	North America (USA)
68	Clustering of high frequency oscillations HFO in epilepsy using pretrained neural networks	C	2022	Africa (Tunisia)
69	Convolutional neural network-aided tuber segmentation in tuberous sclerosis complex patients correlates with electroencephalogram	J	2022	North America (USA)
70	CRM: An automatic label generation method based on semi-supervised learning for high frequency oscillatory	C	2022	Asia (China)
71	Deep learning resting state functional magnetic resonance imaging lateralization of temporal lobe epilepsy	J	2022	North America (USA)
72	Deep learning-based automated segmentation of resection cavities on postsurgical epilepsy MRI	J	2022	North America (USA)
73	Deep neural networks constrained by neural mass models improve electrophysiological source imaging of spatiotemporal brain dynamics	J	2022	North America (USA)
74	DeepEZ: a graph convolutional network for automated epileptogenic zone localization from resting-state fMRI connectivity	J	2022	North America (USA)
75	Detection of focal and non-focal epileptic seizure using continuous wavelet transform-based scalogram images and pre-trained deep neural networks	J	2022	Asia (Turkey)
76	E2SGAN: EEG-to-SEEG translation with generative adversarial networks	J	2022	Asia (China)
77	Generation of synthetic training data for SEEG electrodes segmentation	J	2022	Europe (France)
78	Lesion Segmentation in Paediatric Epilepsy Utilizing Deep Learning Approaches	J	2022	North America (Canada)
79	Localization of seizure onset zone with epilepsy propagation networks based on graph convolutional network	J	2022	Asia (China)
80	Localizing seizure onset zones in surgical epilepsy with neurostimulation deep learning	J	2022	North America (USA)
81	Machine learning-derived multimodal neuroimaging of presurgical target area to predict individual's seizure outcomes after epilepsy surgery	J	2022	Asia (China)
82	Multi-scale deep learning of clinically acquired multi-modal MRI improves the localization of seizure onset zone in children with drug-resistant epilepsy	J	2022	North America (USA)
83	Noninvasive detection of hippocampal epileptiform activity on scalp electroencephalogram	J	2022	North America (USA)
84	Refining epileptogenic high-frequency oscillations using deep learning: a reverse engineering approach	J	2022	North America (USA)
85	SEEG-Net: An explainable and deep learning-based cross-subject pathological activity detection method for drug-resistant epilepsy	J	2022	Asia (China)

86	Seizure onset zone classification based on imbalanced iEEG with data augmentation	J	2022	Asia (Japan)
87	Transformer-based high-frequency oscillation signal detection on magnetoencephalography from epileptic patients	J	2022	Asia (China)
88	Using a recurrent neural network with S2 characteristics, efficient identification of localised cortical dysplasia	J	2022	Asia (India)
89	A deep learning-based histopathology classifier for Focal Cortical Dysplasia	J	2023	Europe (France)
90	A novel fusion mechanism for multimodal neuroimaging of focal cortical dysplasias	C	2023	Asia (China)
91	An artificial intelligence–based pipeline for automated detection and localisation of epileptic sources from magnetoencephalography	J	2023	Asia (China)
92	Automated detection of hippocampal sclerosis using real-world clinical MRI images	J	2023	Asia (China)
93	Automatic, deep-learning-based segmentation of the amygdalohippocampectomy resection cavity in MR images	C	2023	North America (USA)
94	Classifying epileptic phase-amplitude coupling in SEEG using complex-valued convolutional neural network	J	2023	Asia (China)
95	Convolutional neural network algorithm to determine lateralization of seizure onset in patients with epilepsy: A proof-of-principle study	J	2023	North America (USA)
96	Deep learning and radiomics based automatic diagnosis of hippocampal sclerosis	J	2023	Asia (China)
97	Deep learning based source imaging provides strong sublobar localization of epileptogenic zone from MEG interictal spikes	J	2023	North America (USA)
98	Deep neural networks and gradient-weighted class activation mapping to classify and analyze EEG	J	2023	North America (USA)
99	Deep-learning predicted PET can be subtracted from the true clinical fluorodeoxyglucose PET co-registered to MRI to identify the epileptogenic zone in focal epilepsy	J	2023	Europe (France)
100	Enhanced Classification of Epileptogenic and Nonepileptogenic EEG Signals using ANN-FDM	C	2023	Asia (India)
101	Epileptic focus localization using transfer learning on multi-modal EEG	J	2023	Asia (China)
102	Focal EEG recognition combining LMD and deep reinforcement learning	C	2023	Asia (China)
103	Identification of epileptic networks with graph convolutional network incorporating oscillatory activities and evoked synaptic responses	J	2023	Asia (China)
104	Identification of TLE Focus from EEG Signals by Using Deep Learning Approach	J	2023	Asia (Turkey)
105	Localization of epileptic surgical area using automated hybrid approach based on higher-order statistics with sensitivity analysis and residual wavelet transform	J	2023	Asia (India)
106	Localization of Focal Intractable Epileptic Focus Based on Long-Term Recurrent Convolutional Network	C	2023	Asia (China)
107	Optimizing detection and deep learning-based classification of pathological high-frequency oscillations in epilepsy	J	2023	North America (USA)
108	Robust and generalisable segmentation of subtle epilepsy-causing lesions: a graph convolutional approach	C	2023	Europe (Germany)

109	A Deep Learning Framework To Characterize Noisy Labels In Epileptogenic Zone Localization Using Functional Connectivity	C	2024	North America (USA)
110	Adding the third dimension: 3D convolutional neural network diagnosis of temporal lobe epilepsy	J	2024	North America (USA)
111	Automated segmentation of epilepsy surgical resection cavities: Comparison of four methods to manual segmentation	J	2024	Oceania (Australia)
112	Customized GPT model largely increases surgery decision accuracy for pharmaco-resistant epilepsy	J	2024	Asia (China)
113	Deep learning approaches for imaging-based automated segmentation of Tuberous Sclerosis Complex	J	2024	Asia (China)
114	Deep learning-based automated lesion segmentation on pediatric focal cortical dysplasia II preoperative MRI: a reliable approach	J	2024	Asia (China)
115	Deep Learning-Based Tract Classification of Preoperative DWI Tractography Advances the Prediction of Short-Term Postoperative Language Improvement in Children With Drug-Resistant Epilepsy	J	2024	North America (USA)
116	Development and prospective clinical validation of a convolutional neural network for automated detection and segmentation of focal cortical dysplasias	J	2024	Europe (Germany)
117	Electrophysiological brain imaging based on simulation-driven deep learning in the context of epilepsy	J	2024	Asia (China)
118	Epilepsy Detection by Different Modalities with the Use of AI-Assisted Models	J	2024	Asia (India)
119	Expert knowledge driven human-ai collaboration for medical imaging: a study on epileptic seizure onset zone identification	J	2024	North America (USA)
120	Focal cortical dysplasia lesion segmentation using multiscale transformer	J	2024	Asia (China)
121	High-performance prediction of epilepsy surgical outcomes based on the genetic neural networks and hybrid iEEG marker	J	2024	Asia (China)
122	Image synthesis of interictal SPECT from MRI and PET using machine learning	J	2024	Oceania (Australia)
123	Lateralizing Value of Artificial Intelligence-Based Segmentation Software in MRI-Negative Focal Epilepsy	J	2024	Asia (South Korea)
124	Localising the Seizure Onset Zone from Single-Pulse Electrical Stimulation Responses with a CNN Transformer	C	2024	Europe (UK)
125	Localization of Epileptogenicity Using Incomplete MRI Sequence Data in Children with Seizure Onset Zone Involving Temporal Lobe	C	2024	North America (USA)
126	MATPR-UNet: a multi attention two-path residual UNet for focal cortical dysplasia lesions segmentation	C	2024	Asia (China)
127	Multi-modal Multitask Learning Model for Simultaneous Classification of Two Epilepsy Biomarkers	C	2024	Asia (Japan)
128	Seizure Onset Zone Detection Based on Convolutional Neural Networks and EEG Signals	J	2024	Asia (China)
129	Seizure Onset Zone Localization Method based on GNN Explanation	C	2024	Asia (China)

130	Seizure Sources Can Be Imaged from Scalp EEG by Means of Biophysically Constrained Deep Neural Networks	J	2024	North America (USA)
131	The expert's knowledge combined with AI outperforms AI alone in seizure onset zone localization using resting state fMRI	J	2024	North America (USA)
132	Brain-region specific epileptic seizure detection through EEG dynamics: integrating spectral features, SMOTE and long short-term memory networks	J	2025	Asia (India)
133	Clinical Value of ChatGPT for Epilepsy Presurgical Decision-Making: Systematic Evaluation of Seizure Semiology Interpretation	J	2025	North America (USA)
134	Deep learning based tractography with TractSeg in patients with hemispherotomy: Evaluation and refinement	J	2025	Europe (Germany)
135	Deep learning on brief interictal intracranial recordings can accurately characterize seizure onset zones	J	2025	North America (USA)
136	Detecting fast-ripples on both micro- and macro-electrodes in epilepsy: A wavelet-based CNN detector	J	2025	Europe (France)
137	Detection of epileptogenic focal cortical dysplasia using graph neural networks: a MELD study	J	2025	Europe (UK)
138	DirichNet Model for Detection of TMS-Induced Speech Errors in Patients Undergoing Epilepsy Surgery	C	2025	North America (USA)
139	GAN-based synthetic FDG PET images from T1 brain MRI can serve to improve performance of deep unsupervised anomaly detection models	J	2025	Europe (France)
140	Integrating standard epilepsy protocol, ASL-perfusion, MP2RAGE/EDGE and the MELD-FCD classifier in the detection of subtle epileptogenic lesions: a 3 Tesla MRI pilot study	J	2025	Europe (Italy)
141	Leveraging interictal multimodal features and graph neural networks for automated planning of epilepsy surgery	J	2025	Europe (Czech Republic)
142	Localization of epileptic foci from intracranial EEG using the GRU-GC algorithm	J	2025	Asia (China)
143	Multi-classification of High-Frequency Oscillations Using iEEG Signals and Deep Learning Models	J	2025	Africa (Tunisia)
144	Non-Invasive Localization of Epileptogenic Zone in Drug-Resistant Epilepsy Based on Time–Frequency Analysis and VGG Convolutional Neural Network	J	2025	Asia (China)
145	Unsupervised detection of high-frequency oscillations in intracranial electroencephalogram: promoting a valuable automated diagnostic tool for epilepsy	J	2025	Asia (China)

Supplementary Table 4: Full Data Extraction

ID	Surgery Context		Data Characteristics				Modeling		Evaluation				Clinical Workflow Integration
	Stage	Task	Region	Modality	Size	Access	Architecture	Training	Ext Val	Eval Type	Metrics	Summary	
1	Pre	Presurgical Functional Mapping	Oceania	Video	34 Patients	Private	Hybrid CNN–RNN Models	Transfer Learning	Single	Auto	ACC, SEN, SPEC, PREC, AUC, IoU	AUC: 0.965, ACC: 90%, SEN: 85%, SPEC: 95%, PREC: 94.37%	Offline research
2	Pre	SOZ / EZ Localization	North America	Electrophysiology	20 Patients	Private	Autoencoder-based Models	Pretraining + Fine-tuning	No	Auto	ACC, SEN, SPEC	ACC: 89.9%, SEN: 88.2%, SPEC: 91.6%	Offline research
3	Pre	Presurgical Functional Mapping	North America	Diffusion MRI	70 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	F1	F1: 0.5358	Offline research
4	Pre	Presurgical Functional Mapping	Oceania	Video	16 Patients	Private	Hybrid CNN–RNN Models	Transfer learning	No	Auto	ACC, AUC-ROC	ACC: 95.19%, AUC: 0.98	Offline research
5	Post	Post-operative Assessment & Outcome Prediction	North America	Diffusion MRI	50 Patients	Private	DNN / MLP-based Models	Supervised Learning	No	Auto	PPV, NPV	PPV: 88±7%, NPV: 79±8%	Offline research
6	Pre	SOZ / EZ Localization	North America	Electrophysiology	82 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	SEN, FPR, ROC	SEN: 84.2%	Offline research
7	Pre	SOZ / EZ Localization	North America	Electrophysiology	12 Patients	Public, Private	RNN-based Models	Supervised Learning	Single	Auto	ACC, SEN, SPEC	ACC: >90%, SPEC: >90%	Offline research
8	Pre	SOZ / EZ Localization, Presurgical Functional Mapping	North America	Electrophysiology	23 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC	ACC: 98.05%, SEN: 90%, SPEC: 91.65%	Offline research
9	Pre	Lesion Detection / Classification	Asia	Structural MRI	43 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	DSC, PREC, REC	Patient-wise REC: 82.5%, Pixel-wise REC: 40.1%, PREC: 80.69%, DSC: 52.47%	Offline research

10	Pre	SOZ / EZ Localization	Asia	Electrophysiology	3 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	PREC, REC, F1	PREC: 94.19%, REC: 89.37%, F1: 91.71%	Offline research
11	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC	ACC: 91.8%	Offline research
12	Pre	Presurgical Functional Mapping	Oceania	Video	7 Patients	Private	Detection Frameworks	Non-learning	No	Mixed	Periodicity score via autocorrelation, Power spectrum values, Frequency analysis	NA	Offline research
13	Pre	Presurgical Functional Mapping	North America	Diffusion MRI	140 Patients	Private	CNN-based Models	Supervised learning	No	Auto	F1, ACC, SEN, SPEC, AUC	F1: 0.9525, AUC: 0.90–0.97	Offline research
14	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Transfer Learning	No	Auto	ACC, Confusion Matrix	ACC: 99.8%	Offline research
15	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	public	Autoencoder-based Models	Semi-supervised Learning	No	Auto	ACC, SEN, SPEC	ACC: 93.2%, SEN: 90.5%, SPEC: 95.9%	Offline research
16	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	public	CNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC	ACC: >99%	Offline research
17	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	public	Hybrid CNN–RNN Models	Supervised Learning	No	Auto	SEN, SPEC, ACC	ACC: 95.1 %, SEN: 94.8 %, SPEC: 95.3 %	Offline research
18	Pre	SOZ / EZ Localization	Asia, North America	Electrophysiology	20 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, PREC, REC, F1	ACC: 94%, PREC: 95%, REC: 94%, F1: 94%	Offline research
19	Pre	Lesion Detection / Classification	Europe, North America	Structural MRI	30 Patients	Public, Private	CNN-based Models	Supervised Learning	No	Auto	ACC, AUC, Dice	Patch-level ACC: 94.1%, AUC: 0.985, System-level SEN: 0.90, SPEC: 0.85, DSC: 0.78	Offline research

20	Pre	SOZ / EZ Localization	Asia, North America	Electrophysiology	20 Patients	Private	Attention-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC, AUC	ACC: 89.3%, AUC: 0.88	Offline research
21	Pre	Lesion Detection / Classification	Asia	Structural MRI	19 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	REC, SPEC, ACC, PREC, DSC	REC: 83.3%, DSC: 52.68%	Offline research
22	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	public	CNN-based Models	Supervised Learning	No	Auto	ACC	ACC: 89.28 ± 0.91 %	Offline research
23	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	public	RNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC, PREC, F1, Kappa, MCC, JI, AUC	Kappa: 99.20%, ACC: 99.60%, SEN: 99.55%, SPEC: 99.65%	Offline research
24	Pre	SOZ / EZ Localization	Asia	Electrophysiology	6 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ROC, AUC, SEN, SPEC	AUC: 0.88, SEN: 0.81, SPEC: 0.79	Offline research
25	Pre	SOZ / EZ Localization	Asia	Electrophysiology	9 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, F1, PREC, REC	ACC: 99.7%, F1: 99.6%, PREC: 99.6%, REC: 99.7%	Offline research
26	Pre	SOZ / EZ Localization	Europe	Electrophysiology	15 Patients	Public	Autoencoder-based Models	Semi-supervised Learning, Unsupervised Learning	No	Auto	ACC, SEN, SPEC, PPV, NPV, F1	Bern/Bonn: ACC: 93.2%/96.0%	Offline research
27	Pre & Post	Presurgical Functional Mapping	North America	Electrophysiology	11 Patients	Private	Hybrid CNN–RNN Models	Supervised Learning	No	Auto	ACC, SEN, SPEC	ACC: 83.05%, SEN: 85.8%, SPEC: 80.3%	Offline research
28	Pre	Presurgical Functional Mapping, Post-operative Assessment & Outcome Prediction	North America	Diffusion MRI	51 Patients	Private	GNN-based Models	Supervised Learning	No	Auto	MAE, SDAE, PREC, REC, F1	Improving language score prediction MAE by 90.2–97.3% and postoperative seizure outcome F1 by 2.2–4% compared with SOTAs	Offline research

29	Pre	SOZ / EZ Localization	North America	Electrophysiology	352 Patients	Public	CNN-based Models	Transfer Learning	No	Auto	ACC	ACC: 82.85% / 88.30%	Offline research
30	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC	ACC: 88.77%	Offline research
31	Pre	Lesion Detection / Classification	Asia	Diffusion MRI	129 Patients	Private	CNN-based Models	Transfer Learning	No	Auto	ACC, PREC, SEN, SPEC, AUC	ACC: 90.75%, SEN: 87.67%, SPEC: 93.50%, AUC: 0.97	Offline research
32	Pre	Lesion Detection / Classification	Asia	Electrophysiology	32 Patients	Public, Private	CNN-based Models	Transfer Learning	Single	Auto	ACC, SEN, PREC, F1, ROC, AUC	ACC: 95%, AUC: 0.99	Offline research
33	Pre	Lesion Detection / Classification	North America	Structural MRI	104 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	Subject-wise SEN, Subject-wise SPEC, DSC	Subject-wise SEN: 96%, Subject-wise SPEC: 100 %, DSC: 0.57	Offline research
34	Pre	Lesion Detection / Classification	North America	Electrophysiology, Functional MRI	18 Patients	Private	Hybrid CNN–RNN Models	Supervised Learning	No	Auto	ACC, PREC, SEN, SPEC, FPR, FNR	ACC: 98%, SEN: 96%, SPEC: 97%	Offline research
35	Pre	Lesion Detection / Classification	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	SEN, SPEC	SEN: 81%, SPEC: 81.4%	Offline research
36	Pre	Presurgical Functional Mapping	North America	Diffusion MRI	128 Patients	Private	CNN-based Models	Supervised Learning	Single	Auto	ACC, F1	ACC: 97–99% for presurgical localization of eloquent areas, 92% accuracy for predicting postoperative preservation of function	Offline research
37	Pre	Lesion Detection / Classification	Europe	Structural MRI	96 Patients	Private	Autoencoder-based Models	Unsupervised Learning	No	Auto	SEN, FP/patient	SEN: 62%	Offline research
38	Post	Post-operative Assessment & Outcome Prediction	Europe, North America	Structural MRI	2244 Patients	Public, Private	U-Net / FCN Segmentation Models	Self-supervised Learning, Semi-	No	Auto	DSC	DSC: 81.7	Offline research

								supervised Learning					
39	Pre	SOZ / EZ Localization	Asia	Electrophysiology	10 Patients	Private	Autoencoder-based Models	Pretraining + Fine-tuning	No	Auto	SEN, SPEC	Rs/FRs: SEN: 88.9±2.4%/83.2 ±2.5%, SPEC: 92.3±2.8%/86.1 ±2.8%	Offline research
40	Pre	Surgical Planning & Navigation	Europe	Structural MRI, Diffusion MRI, CT	23 Patients	Private	DNN / MLP-based Models	Supervised Learning	No	Auto	Model-level RMSE, Trajectory-level RMSE	Model-level RMSE: 4.21 ± 0.11, Trajectory-level RMSE: 0.58 ± 0.72	Offline research
41	Post	Post-operative Assessment & Outcome Prediction	Europe, North America	Structural MRI	502 Patients	Public, Private	U-Net / FCN Segmentation Models	Pretraining + Fine-tuning	Multiple	Auto	DSC	DSC: 89.2 (13.3) (Milan), 84.1 (19.8) (Strasbourg), 80.2 (20.1) (Paris), and 85.2 (10.8) (EPISURG)	Offline research
42	Pre	SOZ / EZ Localization	Asian	Electrophysiology	3 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC	NA	Offline research
43	Pre	SOZ / EZ Localization	Asian, Europe	Electrophysiology	20 Patients	Public, Private	Hybrid CNN–RNN Models	Supervised Learning	Single	Auto	SEN, ACC, and SPEC.	Intra/Cross-Subject ACC: 92.53%/88.03%	Offline research
44	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC	ACC: 91.3%	Offline research
45	Pre	SOZ / EZ Localization	Asian	Electrophysiology	21 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	AUC, SEN, SPEC	AUC: 0.944 ± 0.067	Offline research
46	Pre	SOZ / EZ Localization	North America	Electrophysiology	19 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC, FPR	ACC: 98.99%	Offline research
47	Pre	Lesion Detection / Classification	Asia	Structural MRI	141 Patients	Private	CNN-based Models	Transfer Learning	No	Auto	ACC, SEN, SPEC, AUC, FPR/FNR	SEN: 91.1%, SPEC: 83.5%, ACC: 87.8%, AUC: 0.94	Offline research
48	Pre	SOZ / EZ Localization	Asia	Electrophysiology	2 Patients	Private	CNN-based Models	Transfer Learning	No	Auto	ACC, FDR, PREC, REC, F-measure	ACC: 93.0 ± 0.997%, FDR: 78.0%	Offline research

49	Post	Post-operative Assessment & Outcome Prediction	North America	Electrophysiology	22 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	AUPRC, MAE	AUPRC: 0.84 ± 0.19 (95% CI: 0.72–0.93) for chronic recording scenario, 0.80 ± 0.19 (95% CI: 0.68–0.91) for new implantation scenario	Offline research
50	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC, PREC, SPEC, F1, Kappa value, AROC	ACC: 99.66, PREC: 96.59, SPEC: 96.87, F1: 99.4, Kappa: 0.941, AROC: 0.956	Offline research
51	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	GAN-based Models	Semi-supervised Learning	No	Auto	ACC, SEN, SPEC	ACC: 95.5%, SEN: 95.2%, SPEC: 95.8%	Offline research
52	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC, PREC, REC, MCC	ACC: 94.3 %, PREC: 94.3 %, REC: 94.3 %, κ/MCC = 0.887	Offline research
53	Pre	SOZ / EZ Localization	Asian	Electrophysiology	19 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC	Ripple/Fast Ripple: ACC: 80.89 %, 77.85 %	Offline research
54	Pre	SOZ / EZ Localization	Europe, North America	Electrophysiology	44 Patients	Public	CNN-based Models	Supervised Learning	Single	Auto	ACC, SEN, SPE, F1, AUC, AUROC, AUPRC, Kappa	ACC: 93.76%, SEN: 94.7%, SPEC: 92.76%	Offline research
55	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC, PREC, REC, SPEC, F1	ACC: 93.44 ±0.03942, PREC: 94.28 ±0.1110, REC: 92.50 ±0.1260, SPEC: 94.38 ±0.1371, F1: 93.38 ±0.03876	Offline research

56	Pre	Lesion Detection / Classification	Asia, Europe, North America, South America	Structural MRI	302 Patients	Private	CNN-based Models	Supervised Learning	Multiple	Auto	SEN, SPEC, FPR, AUC, DSC	SEN: 83%, SPEC: 89%	Offline research
57	Pre	Lesion Detection / Classification	Asia	Structural MRI	26 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	DSC, PREC, REC	DSC: 64.32%, PREC: 69.58%, REC: 61.86%	Offline research
58	Post	Electrode Localization / Navigation Support	Europe	CT	18 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	ACC, Jaccard Index (IoU), DSC	2D/3D U-Net: ACC: 0.999/0.999, IoU 0.704/0.701, DSC: 0.807/0.806	Offline research
59	Pre	SOZ / EZ Localization	Asia	Electrophysiology	7 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPE, F1, AUC	ACC: 92.14%, SEN:93.96%, SPE: 87.45%, F1: 0.85, AUC: 0.8968	Offline research
60	Pre	SOZ / EZ Localization	Asia	Electrophysiology	20 Patients	Private	Attention-based Models	Supervised Learning	No	Auto	ACC, REC, PREC, F1, Top-N Precision (P@1, P@3, P@5)	ACC: 0.886, REC: 0.840, F1: 0.859, P@1: 0.967	Offline research
61	Pre	Surgical Planning & Navigation	North America	Structural MRI	309 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	MRE, SDR, Inference Time	MRE: 2.34±1.12, SDR: 42/92/100, Inference Time: 0.005s	Offline research
62	Pre	SOZ / EZ Localization	Asia	Electrophysiology	20 Patients	Private	Transformer-based Models	Supervised Learning	No	Auto	ACC, PREC, REC, F1	ACC: 0.97, PREC: 0.98, REC: 0.97, F1: 0.97	Offline research
63	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Supervised Learning	No	Auto	ACC, SEM, SPEC, PREC, F1	ACC: 99.7, SEN: 99.5, SPEC: 99.7, PREC: 99.7, F1: 99.6	Offline research

64	Pre	Lesion Detection / Classification, Surgical Planning & Navigation	Asia	Structural MRI, PET	202 Patients	Private	CNN-based Models	Supervised Learning	Multiple	Mixed	FOM (JAFROC), SEN, SPEC, ACC	FOM: 0.827, SEN: 83.1%, SPEC: 82.4%	Decision tools
65	Pre	SOZ / EZ Localization	Asia	Electrophysiology	10 Patients	Private	Attention-based Models	Supervised Learning	No	Auto	SEN, SPEC, ACC, PPV, NPV	SEN: 89.27%, SPE: 90.37%, ACC: 90.87%, PPV: 81.38%, NPV: 96.58%	Offline research
66	Pre	SOZ / EZ Localization	Asia	Electrophysiology	10 Patients	Private	GNN-based Models	Pretraining + Fine-tuning	No	Auto	PREC, REC, F1, F2, AUC	PREC: 79.61, REC: 79.08, F1: 76.69, F2: 76.87, AUC: 94.92	Integrated system
67	Pre	SOZ / EZ Localization, Presurgical Functional Mapping	North America	Electrophysiology	19 Patients	Private	CNN-based Models	Semi-supervised Learning	No	Auto	AUC, BAAC, F1, PREC, REC	AUC: 0.93, REC: 98.0%, PREC: 96.1%, F1: 96.8%	Offline research
68	Pre	SOZ / EZ Localization	NA	Electrophysiology	120 Patients (Simulated data)	Private	CNN-based Models	Unsupervised Learning	No	Auto	ACC, SEN, SPEC	ACC: 94%	Offline research
69	Pre	SOZ / EZ Localization, Lesion Detection / Classification	North America	Structural MRI	29 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	Tuber-DSC, Tuber-SEN, Tuber-SPEC	Tuber-DSC: 0.70, Tuber-SEN: 0.90, Tuber-SPEC: 0.57	Offline research
70	Pre	SOZ / EZ Localization	Asia, Europe	Electrophysiology	18 Patients	Public, Private	Hybrid CNN–RNN Models	Semi-supervised Learning	Single	Auto	ACC, SEN, SPEC	ACC: 87.83, SEN: 91.10, SPEC: 85.19	Offline research
71	Pre	SOZ / EZ Localization	North America	Functional MRI	2164 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC	LTLE/RTLE: ACC: 90%/91.7%	Offline research
72	Post	Post-operative Assessment & Outcome Prediction	North America	Structural MRI	118 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	Single	Auto	DSC, HD	DSC: 0.74	Decision tools

73	Pre	SOZ / EZ Localization	Europe, North America	Electrophysiology	38 Patients	Public, Private	Hybrid CNN–RNN Models	Supervised Learning	Single	Auto	PREC, REC, Harmonic Mean, LE, Spatial Dispersion, Temporal Correlation	PREC: 0.81± 0.17, REC: 0.85± 0.18, LE: 1.41 ± 1.87 mm	Decision tools
74	Pre	SOZ / EZ Localization	North America	Functional MRI	14 Patients	Private	GNN-based Models	Supervised Learning	No	Auto	SEN, SPEC, PREC, F1, ACC, AUC	ACC: 0.88 ± 0.03, AUC: 0.73 ± 0.03	Offline research
75	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	CNN-based Models	Transfer Learning	No	Auto	ACC, REC, SPE, PREC, F1	ACC: 92.27 %, SPEC: 92.93 %, PREC: 92.84 %, REC: 91.60 %, F1: 92.21 %	Offline research
76	Pre	SOZ / EZ Localization, Surgical Planning & Navigation	Asia	Electrophysiology	7 Patients	Private	GAN-based Models	Unsupervised Learning	No	Auto	DTW, HD, PSD	DTW: 0.414, HD: -0.221, PSD: −1.480	Offline research
77	Post	Post-operative Assessment & Outcome Prediction	Europe	CT	18 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	DICE, IoU, PPV, TPR	DICE: 0.862. IoU: 0.764, PPV: 0.986, TPR: 0.996	Offline research
78	Pre	Lesion Detection / Classification	North America	Structural MRI	101 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	Single	Auto	SEN, SPEC, Lesional Sensitivity, Lesional Specificity, DICE, PREC	MR-positive/MR-negative: SEN: 98%/92%, DICE: 57%	Offline research
79	Pre	SOZ / EZ Localization	Asia	Electrophysiology	8 Patients	Private	GNN-based Models	Semi-supervised Learning	No	Auto	REC, PREC	REC: 90.35%, PREC: 44.83%	Offline research
80	Pre	SOZ / EZ Localization	North America	Electrophysiology	10 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	SEN, SPEC, YI	SEN: 78.1%, SPEC: 74.6%, YI: 52.7	Offline research

81	Post	Post-operative Assessment & Outcome Prediction	Asia	Structural MRI, CT, PET	141 Patients	Private	CNN-based Models	Transfer Learning	No	Auto	ACC, SEN, SPEC, AUC	ACC: 91.49%, SEN: 96.20%, SPEC: 85.48%, AUC: 0.952	Decision tools
82	Pre	SOZ / EZ Localization	North America	Structural MRI, Diffusion MRI	41 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	BACC, AUC, SEN, SPEC, Cohen's d	Lesional/Non-lesional: BACC: 0.75/0.67, SEN: 0.64/0.56, SPEC: 0.85/0.78, Cohen's d: 1.21	Offline research
83	Pre	SOZ / EZ Localization	North America	Electrophysiology	141 Patients	Private	CNN-based Models	Supervised Learning	Multiple	Auto	AUC-ROC, AUC-PR, PPV, SEN, SPEC, ACC	AUC-ROC: 0.88–0.95	Decision tools
84	Pre	SOZ / EZ Localization	North America	Electrophysiology	19 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC, F1, AUC	Artifact Detection/HFO Classification: ACC: 96.3%/86.5%, F1: 96.8%/80.8%	Offline research
85	Pre	SOZ / EZ Localization	Asia, Europe, North America	Electrophysiology	40 Patients	Public, Private	Hybrid CNN–RNN Models	Supervised Learning	Multiple	Auto	MAUROC, MAUPRC, ACC, TPR, FPR, TNR.	MAUROC: 88.8 %, MAUPRC: 80.3 %, ACC: 93.85 %	Offline research
86	Pre	SOZ / EZ Localization	Asia	Electrophysiology	6 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, PREC, REC, SPEC, F1, MCC	ACC: 87–97%, F1: 44–76%, MCC: 0.38–0.73	Offline research
87	Pre	SOZ / EZ Localization	North America	Electrophysiology	20 Patients	Private	Transformer-based Models	Supervised Learning	No	Auto	ACC, PREC, SEN, SPEC, F1	ACC: 96.15%, PREC: 100%, SEN: 92.86%, SPEC: 100%, F1: 0.963	Offline research
88	Pre	Lesion Detection / Classification	Asia	Structural MRI	12 Patients	Private	RNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC	ACC: 92.3%, SEN: 91.8%, SPEC: 92.2%	Offline research

89	Pre	Lesion Detection / Classification	Europe	Image	184 Patients	Private	CNN-based Models	Supervised Learning	Single	Auto	ACC, PREC, REC, F1	ACC: 98.8%, F1: 0.82, PREC: 0.90, REC: 0.78	Decision tools
90	Pre	Lesion Detection / Classification	Asia	Structural MRI, PET	28 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	DICE, SEN, PREC, BACC, Detection Rate	DICE: 52.58%, SEN: 60.35%, PREC: 50.67%, Detection Rate: 78.57%, BACC: 78.93%	Offline research
91	Pre	SOZ / EZ Localization	Asia	Electrophysiology	48 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	Single	Auto	PREC, F1, Lobar Concordance, Dmin (mm), Processing time	PREC: 0.93 ± 0.04, F1: 0.88 ± 0.05, Lobar Concordance: 87.18%, Dmin: 11–25 mm, Processing time: 12 min/patient	Decision tools
92	Pre	Lesion Detection / Classification	Asia	Structural MRI	183 Patients	Private	CNN-based Models	Transfer Learning	No	Auto	ACC, AUC, F1, PREC, REC	AUC: 0.894, ACC: 82.88%, F1: 84.08%, PREC: 84.62%, REC: 83.54	Offline research
93	Post	Post-operative Assessment & Outcome Prediction	North America	Structural MRI	76 patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	DICE	DICE: 0.88 ± 0.06	Offline research
94	Pre	SOZ / EZ Localization	Asia	Electrophysiology	9 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	AUC, SEN, SPEC	AUC: 0.92, SEN: 0.82, SPEC: 0.83	Offline research
95	Pre	SOZ / EZ Localization	Europe, North America	Structural MRI	359 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, AUC, SEN	ACC: 78.0%, AUC: 0.857	Offline research
96	Pre	Lesion Detection / Classification	Asia	Structural MRI	240 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	ACC, SEN, SPE, AUC, DICE, IoU	ACC: 0.913 (73/80), AUC: 0.937, SEN: 0.920, SPE: 0.909	Offline research
97	Pre	SOZ / EZ Localization	North America	Electrophysiology	29 Patients	Private	Hybrid CNN–RNN Models	Pretraining + Fine-tuning	Multiple	Auto	SEN, SPEC, F1, SD, LE	LE: 15.78 ±5.54 mm	Decision tools

98	Pre	SOZ / EZ Localization	North America	Electrophysiology	10 Patients	Private	CNN-based Model	Supervised Learning	No	Auto	ACC, F1	DNN/CNN: ACC: 99%/87%, F1: 0.99/0.87	Offline research
99	Pre	SOZ / EZ Localization	Europe	Structural MRI	57 Patients	Public, Private	GAN-based Models	Supervised Learning	No	Auto	RZ Localization Rate, MAE = 0.0042, PSNR = 35.1, SSIM = 0.991	RZ Localization Rate 60%, MAE = 0.0042 ± 0.0021, PSNR =35.14 ± 3.846, SSIM = 0.991 ± 0.0025.	Offline research
100	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	DNN / MLP-based Models	Supervised Learning	No	Auto	ACC, SEN, SPEC	ACC: 90.0, SEN: 90.0, SPEC: 90.0	Offline research
101	Pre	SOZ / EZ Localization	Asian, Europe	Electrophysiology	16 Patients	Public, Private	CNN-based Models	Transfer Learning	Single	Auto	ACC, SEN, SPEC, PPV, NPV	Bern/Bonn: ACC: 94.5%/97.5%, SN 95.0%/98.0%, SP: 93.9%/97.0%, PPV 94.2%/ 97.0%, NPV: 94.7%/98.0%	Offline research
102	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	DNN / MLP-based Models	Reinforcement Learning	No	Auto	ACC, SEN, SPEC	ACC: 89.28%, SEN: 89.88%, SPEC: 88.68%	Offline research
103	Pre	SOZ / EZ Localization	Asia	Electrophysiology	18 Patients	Private	Autoencoder-based Models	Unsupervised Learning	No	Auto	ACC, F1, NMI	ACC: 76.67%, F1: 66.74%, NMI: 20.74%	Offline research
104	Pre	SOZ / EZ Localization	Europe	Electrophysiology	32 Patients	Public, Private	RNN-based Models	Supervised Learning	Single	Auto	ACC, SEN, SPEC	ACC: 96.10%, SEN: 100%, SPEC: 93.80%	Offline research
105	Pre	SOZ / EZ Localization	Europe	Electrophysiology	15 Patients	Public	RNN-based Models	Supervised Learning	Single	Auto	ACC, SEN, SPEC	ACC: 99.76%	Offline research
106	Pre	SOZ / EZ Localization	Europe	Electrophysiology	5 Patients	Public	Hybrid CNN–RNN Models	Supervised Learning	No	Auto	ACC, SEN, SPEC	ACC: 97.13, SEN: 96.11, SPEC: 96.21	Offline research
107	Pre	SOZ / EZ Localization	North America	Electrophysiology	15 Patients	Private	CNN-based Models	Semi-supervised Learning	No	Auto	ROC Curve, AUC	AUC: 0.89	Offline research

108	Pre	Lesion Detection / Classification	Asia, Europe, North America, Oceania, South America	Structural MRI	1015 Patients	Private	GAN-based Models	Supervised Learning	Single	Auto	AUC, SEN, SPEC	AUC: 0.74, SEN: 67%, SPEC: 71%	Offline research
109	Pre	SOZ / EZ Localization	North America	Functional MRI	14 Patients	Private	GNN-based Models	Semi-supervised Learning	Single	Auto	SEN, SPEC, ACC, AUC	SEN: 0.42, SPEC: 0.94, ACC: 0.89, AUC: 0.74	Offline research
110	Pre	Lesion Detection / Classification	Europe, North America	Structural MRI	1178 Patients	Private + public	CNN-based Models	Supervised Learning	No	Auto	ACC, F1, SEN, SPEC, PPV, NPV	ACC: 86.4%, F1: 86.1%	Offline research
111	Post	Post-operative Assessment & Outcome Prediction	Oceania	Structural MRI	50 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	Multiple	Auto	Detection Rate (DICE>0 and >0.5)	Detection Rate: ResectVol (n =44, 88 %), Epic-CHOP (n =42, 84 %)	Offline research
112	Pre	SOZ / EZ Localization	Asia	Text	16 Patients	Private	LLM (ChatGPT-4)	Retrieval-Augmented Generation (RAG)	No	Manual	ACC	ACC: 93.8%	Offline research
113	Pre	Lesion Detection / Classification	Asia	Structural MRI, PET	31 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, SEN, PREC、DICE	ACC: 0.99, DICE: 0.97	Offline research
114	Pre	Lesion Detection / Classification	Asia	Structural MRI	65 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	DICE, SEN	DICE: 0.57, SEN: 0.73	Offline research
115	Post	Post-operative Assessment & Outcome Prediction	North America	Diffusion MRI	38 Patients	Private	CNN-based Models	Supervised Learning	Single	Auto	F1, ICC, BACC, SEN, SPEC	F1: 0.951, ICC: 0.933	Offline research
116	Pre	Lesion Detection / Classification	Europe	Structural MRI	651 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	SEN, SPEC, ACC, Dice, AUC	SEN: 90%, SPEC: 70%, Dice: 0.56, AUC: 0.98	Integrated system

117	Pre	SOZ / EZ Localization	Europe	Electrophysiology	3 Patients	Private	Hybrid CNN–RNN Models	Supervised Learning	Single	Auto	DLE, NHD	DLE: 1.39 cm, NHD: 0.28	Decision tools
118	Pre	SOZ / EZ Localization	North America	Electrophysiology	500 Patients	Public	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	ACC, PREC, REC, Dice, AUC	ACC: 97.04%, PREC: 94.12%, DICE: 2.96%, AUC: 99.56%	Offline research
119	Pre	SOZ / EZ Localization	North America	Functional MRI	76 Patients	Private	CNN-based Models	Supervised Learning	Single	Auto	ACC, PREC, SEN, SPC, F1	ACC: 87.5%, PREC: 91.3%, SEN: 95.4%	Decision tools
120	Pre	Lesion Detection / Classification	Europe	Structural MRI	85 Patients	Public	Transformer-based Models	Supervised Learning	No	Auto	sSens, nFPC, Dice	sSens: 0.824, nFPC: 0.176 ± 0.381, Dice: 0.410 ± 0.288	Offline research
121	Post	Post-operative Assessment & Outcome Prediction	North America	Electrophysiology	79 Patients	Public	DNN / MLP-based Models	Supervised Learning	No	Auto	ACC, AUC	ACC: 94.3%, AUC: 0.94	Offline research
122	Pre	SOZ / EZ Localization	Oceania	Structural MRI, PET	48 Patients	Private	GAN-based Models	Supervised Learning	No	Auto	RMSE, SSIM, PSNR	RMSE: 0.10, SSIM: 0.87–0.88, PSNR: 26 dB	Offline research
123	Pre	SOZ / EZ Localization	Asia	Structural MRI	428 Patients	Private	U-Net / FCN Segmentation Models	Supervised Learning	No	Auto	ACC, PREC, REC, F1	ACC: 0.59, PREC: 0.57, REC: 0.98, F1: 0.72	Offline research
124	Pre	SOZ / EZ Localization	Europe	Electrophysiology	35 Patients	Public	Transformer-based Models	Supervised Learning	No	Auto	AUROC, AUPRC, SPEC, SEN, YI	AUROC: 0.730, SPEC: 0.731, SEN: 0.589, YI: 0.319	Offline research
125	Pre	SOZ / EZ Localization	North America	Structural MRI, Diffusion MRI	68 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	BACC	BACC: 0.86 (left TL), 0.78 (right TL)	Offline research
126	Pre	Lesion Detection / Classification	Asia, Europe	Structural MRI, PET	102 Patients	Public, Private	U-Net / FCN Segmentation Models	Supervised Learning	Single	Auto	DSC, PREC, F1	DSC: 42.12%, PREC: 47.43%, F1: 44.55%	Offline research
127	Pre	SOZ / EZ Localization	Asia	Electrophysiology	5 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC、SEN、	HFO Acc: 78.03%, F1: 0.42; IED Acc:	Offline research

											SPEC、F1、AUC	81.19%, F1: 0.65	
128	Pre	SOZ / EZ Localization	Asia	Electrophysiology	14 Patients	Public, Private	CNN-based Models	Supervised Learning	Single	Auto	ACC, SEN, SPEC	ACC: 98.70%, SEN: 97.53%, SPEC: 98.98%	Offline research
129	Pre	SOZ / EZ Localization	North America	Electrophysiology	4 Patients	Public	GNN-based Models	Supervised Learning	No	Auto	ACC, ROC-AUC	ACC: 89–91%, ROC-AUC: 0.79–0.82	Offline research
130	Pre	SOZ / EZ Localization	North America	Electrophysiology	33 Patients	Private	DNN / MLP-based Models	Supervised Learning	No	Auto	SPEC, SEN, DISP	SPEC: 96%, DISP: 3.8 mm	Offline research
131	Pre	SOZ / EZ Localization	North America	Functional MRI	52 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC、PREC、SEN、F1	ACC: 84.8 ± 4.5%，F1: 91.7 ± 2.6%	Offline research
132	Pre	SOZ / EZ Localization	North America	Electrophysiology	23 Patients	Public	RNN-based Models	Supervised Learning	No	Auto	ACC, PREC, SEN, SPC, F1	ACC: 95.43%, PREC: 95.46%, SEN: 95.59%, F1: 95.48%, SPC: 95.25%	Offline research
133	Pre	SOZ / EZ Localization	Asia, Europe, North America	Text	1036 Patients	Public, Private	LLM (ChatGPT-4)	LLM prompting	Single	Auto	RSens, Wsens	Rsens: 80–90%, WSens > 0.67	Offline research
134	Pre	Presurgical Functional Mapping	Europe	Diffusion MRI	50 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	TRR, FUIS	TRR: 96.8 %	Offline research
135	Pre	SOZ / EZ Localization	North America	Electrophysiology	78 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPC	ACC: 73.8%, SEN: 70.2%, SPC: 74.1%	Offline research
136	Pre	SOZ / EZ Localization	Europe	Electrophysiology	38 Patients	Private	CNN-based Models	Supervised Learning	Single	Auto	PREC, SEN, F1	PREC: 97.7 %, SEN: 99.5 %, F1: 98.6%	Integrated system
137	Pre	Lesion Detection / Classification	Asia, Europe, North America, Oceania,	Structural MRI	1185 Patients	Public	GNN-based Models	Supervised Learning	Multiple	Auto	SEN, SPC, PPV, IoU	PPV: 67% (test data), 76% (on independent multicenter validation)	Decision tools

			South America										
138	Pre	Presurgical Functional Mapping	North America	Audio	15 Patients	Private	CNN-based Models	Supervised Learning	No	Auto	ACC	ACC: 98.3–99.3%	Offline research
139	Pre	SOZ / EZ Localization	Europe	Structural MRI, PET	92 Patients	Public, Private	GAN-based Models, Autoencoder-based Models	Unsupervised Learning	No	Auto	SSIM, PSNR	SSIM: 0.9, PSNR: 23.8	Offline research
140	Pre	Lesion Detection / Classification	Europe	Structural MRI	14 Patients	Private	DNN / MLP-based Models	Supervised Learning	Single	Manual	SEN, FPR	SEN: 69.2%, FPR: 64%	Integrated system
141	Pre	Surgical Planning & Navigation	Europe	Electrophysiology, Structural MRI	80 Patients	Private	GNN-based Models	Supervised Learning	No	Auto	AUPRC, AUROC, SEN, SPC, PPV	AUPRC: 0.68, AUROC: 0.91, SEN: 66%, SPC: 91%, PPV: 44%	Offline research
142	Pre	SOZ / EZ Localization	Europe	Electrophysiology	1 Patient	Private	RNN-based Models	Supervised Learning	No	Auto	ACC, SEN, SPC	ACC: 93–95%, SEN: 90–94%, SPC: 86–91%	Offline research
143	Pre	SOZ / EZ Localization	Europe	Electrophysiology	21 Patients	Public, Private	CNN-based Models	Supervised Learning	No	Auto	ACC, F1, SEN, SPC	ACC: 94.07%, F1: 94.07%, SEN: 94.07%, SPC: 96.66%	Offline research
144	Pre	SOZ / EZ Localization	Asia	Electrophysiology	25 Patients	Private	CNN-based Models	Semi-supervised Learning	No	Auto	ACC, PREC, REC, NPV, SPC	ACC: 83.1%, REC: 83.3%	Offline research
145	Pre	SOZ / EZ Localization	Asia	Electrophysiology	5 Patients	Private	Autoencoder-based Models	Unsupervised Learning	No	Auto	ACC, SEN, SPC	ACC: 93.02%, SEN:94.48%, SPC:92.06%	Offline research

Supplementary Table 5: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	P1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	P1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	P2, P3, P4
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	P4, P5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	P20
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	P20, P21
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	P20
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	P20, Supplementary Table 1
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	P20, P21
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	P21, Supplementary Table 2
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	P21, Supplementary Table 2

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	P21
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	P7, P20 (Fig. 7)
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	P7-14, Supplementary Table 3, 4
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Supplementary Table 3, 4
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	P6-14
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	P15-19
Limitations	20	Discuss the limitations of the scoping review process.	P19
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	P18, P19
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	P22

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

Supplementary Note 1: Flaticon icon attributions

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