APPENDIX for

"Chronic Pain Diagnosis based on Artificial Intelligence:

A System Review and Research Vision"

Appendix Table 1. Inclusion and exclusion criteria

No.	Category of Criteria	Include Criteria	Exclude Criteria
1	Types of Pain	Studies focused on the chronic pain	Studies focused on the acute pain, overlapping pain, traumatic brain injury
2	Task of the Study	Studies focused on the prediction, classification, identification, assessment and diagnosis of chronic pain	Studies focused on the classification and identification of chronic pain-related information rather than the diagnosis of chronic pain, as shown the follows: • chronic pain medicine usage • chronic pain intensity prediction • complications of chronic pain (e.g., multiple sclerosis, depression, insomnia, brain dysfunction, etc.) • chronic pain prevention • treatments for chronic pain • pain management • pain relief • development of chronic pain • severity of chronic pain • chronic pain related operation • clinical notes identification • sex differences of chronic pain • identification of subgroups of chronic pain patients • diet of the chronic pain patients • pain induced
3	Machine Learning Techniques	Modern machine learning techniques: Adaptive boosting, Bayesian, decision trees, fuzzy logic, gradient boosting, k-means clustering, natural language processing, nearest neighbors, neural networks, principal component analysis, random forests, reinforcement learning, simulated treatment learning, support vector machines	Not use artificial intelligence approaches, or only use traditional machine learning approaches, such as: Rule-based systems, Logistic and linear regression, Linear mixed-effect model, ANOVA Sample size less than 10 patients Did not report standard performance metrics (e.g., accuracy or AUC) or comparisons with a control group for at least one modern AI model.

4	Article Type	Peer-reviewed articles describing: - Original research - Structured reviews of the literature reported in accordance with PRISMA guidelines	Not published in the English language
5	Species of Samples	Human	Different animals except human
6	Publication Year	Articles published between 2012 to 2022 (Last ten years)	Articles published before 2012

Appendix Note 1. PubMed (NCBI) Search Strategy

("Chronic Pain/classification"[Mesh] OR "Chronic Pain/diagnosis"[Mesh] OR "Chronic Pain/diagnostic imaging"[Mesh] OR Chronic Pain Diagnosis OR Chronic Pain Assessment OR Chronic Pain Classification) AND (Artificial Intelligence[Mesh] OR Artificial Intelligence OR Machine Learning OR Deep Learning OR Support Vector Machine OR Transfer Learning OR Transformer OR Graph Neural Network OR Adaptive boosting OR Bayesian OR Decision Trees OR Fuzzy Logic OR Gradient Boosting OR k-means Clustering OR Natural Language Processing OR Nearest Neighbors OR Neural Networks OR principal component analysis OR random forests OR reinforcement learning OR Simulated Treatment Learning) NOT ((Therapy[Title]) OR (Treatment[Title]) OR (Opioid[Title]) OR (Opiate[Title]) OR (Relief)[Title] OR (Intervention[Title]) OR (Prevention[Title]))

Restricted to ENGLISH LANGUAGE AND SPECIES Human AND PUBLISHED January 1, 2012 to Aug 2, 2022

Appendix Note 2. Web of Science (WOS) Search Strategy

TI=(((chronic pain diagnosis) OR (chronic low back pain diagnosis) OR (chronic pain assessment) OR (chronic pain prediction)) AND ((machine learning) OR (deep learning) OR (classification) OR (Support Vector Machine) OR (Transfer Learning) OR Transformer OR (Graph Neural Network))) OR AB = (((chronic pain diagnosis) OR (chronic low back pain diagnosis) OR (chronic pain assessment) OR (chronic pain prediction)) AND ((machine learning) OR (deep learning) OR (classification) OR (Support Vector Machine) OR (Transfer Learning) OR Transformer OR (Graph Neural Network))) NOT TI = ((therapy) OR (treatment) OR (opioid) OR (opiate) OR (relief) OR (intervention) OR (prevention)) NOT SO=CLINICAL REHABILITATION NOT WC= Rehabilitation AND PY=(2012-2022)

Appendix Note 3. Google Scholar Search Strategy

No.	Search Query	Search Result No.
1	(intitle:chronic pain assessment) OR (intitle:chronic pain diagnosis) AND (intitle:deep learning) OR (intitle:machine learning)	87
2	(intitle:pain assessment) OR (intitle:pain diagnosis) AND (intitle:deep learning) OR (intitle:machine learning)	147
3	chronic pain diagnosis AND "deep learning"	24
4	chronic pain diagnosis AND "machine learning"	65

Appendix Note 4. Survey Paper List

No.	First Author	Year	Title	Database	PMID
1	D'Antoni, F	2022	Artificial Intelligence and Computer Aided Diagnosis in Chronic Low Back Pain: A Systematic Review	WoS	35627508
2	D'Antoni, F	2021	Artificial Intelligence and Computer Vision in Low Back Pain: A Systematic Review	WoS	34682647
3	Jenssen, MDK	2021	Machine Learning in Chronic Pain Research: A Scoping Review	WoS	33259458
4	Boissoneault, J	2017	Biomarkers for Musculoskeletal Pain Conditions: Use of Brain Imaging and Machine Learning	WoS	28144827

Appendix Table 2. Excluding Paper and Corresponding Excluding Reasons during Full-text Reading (N = 21)

No.	First Author	Year	Title	Database	PMID	Exclude Reason
1	Abdollah V	2021	Texture analysis in the classification of T (2) - weighted magnetic resonance images in persons with and without low back pain	PubMed	33247597	This paper only uses the random forests algorithm to select the most promising classifiers. But they use the linear mixed-effect model for the low back pain daignosis.
2	Moustafa S	2020	Accurate diagnosis of endometriosis using serum microRNAs	PubMed	32165186	According to ICD-11, endometriosis is belong to diseases of the genitourinary system, rather than chronic pain.
3	Yang Z	2020	Combining deep learning with token selection for patient phenotyping from electronic health records	PubMed	31996705	This paper aims to identify disease phenotypes from EHR. Chronic pain is one of the 10 diseaese (including Depression, Psychiatric Disorders, Obesity, Substance Abuse, Alcohol Abuse, Chronic Pain, Chronic Neuro, Adv. Lung Disease, Adv. Heart Disease, Adv. Cancer). So this article is not focused on chronic pain diagnosis.
4	Strik C	2019	Risk of Pain and Gastrointestinal Complaints at 6Months After Elective Abdominal Surgery	PubMed	30107242	This study aims to assess risk factors instead of diagnosing or identifying chronic postoperative abdominal pain (CPAP).
5	D'Antoni, F	2022	Artificial Intelligence and Computer Aided Diagnosis in Chronic Low Back Pain: A Systematic Review	WoS	35627508	Survey paper
6	Keller, AV	2022	Unsupervised Machine Learning on Motion Capture Data Uncovers Movement Strategies in Low Back Pain	WoS	35497350	This study presented a biomechanical biomarker that could potentially identify LBP subjects. The performance of this biomaker is unknown as no classification experiments or accuracy is reported.
7	Nephew, BC	2022	Depression Predicts Chronic Pain	WoS	34908146	This study focuses on the potential relationship

			Interference in Racially Diverse, Income-Disadvantaged Patients			between depression and chronic pain, which does not match the topics of chronic pain dignosis or classification.
8	D'Antoni, F	2021	Artificial Intelligence and Computer Vision in Low Back Pain: A Systematic Review	WoS	34682647	Survey paper
9	Jenssen, MDK	2021	Machine Learning in Chronic Pain Research: A Scoping Review	WoS	33259458	Survey paper
10	Brown, TT	2020	The FUTUREPAIN study: Validating a questionnaire to predict the probability of having chronic pain 7-10 years into the future	WoS	32817710	This study aims to predict the probability of chronic pain in the future 7–10 years, which does not match the topic of diagnosing or identifying chronic pain. And
11	Boissoneault, J	2017	Biomarkers for Musculoskeletal Pain Conditions: Use of Brain Imaging and Machine Learning	WoS	28144827	Survey paper
12	Mauricio, A	2020	Chronic Pain Estimation Through Deep Facial Descriptors Analysis	Google Scholar	N.A.	Pain intensity prediction
13	Grauhan, NF	2021	Deep learning for accurately recognizing common causes of shoulder pain on radiographs	Google Scholar	33611622	This paper aim to recognize for common causes of shoulder pain (including both acute and chronic causes), not for chronic pain diagnosis.
14	Guan, B	2022	Deep learning approach to predict pain progression in knee osteoarthritis	Google Scholar	33835240	This paper aim to predict pain progression (the changes in pain score between baseline and two or more follow-up time over the first 48-months) in knee osteoarthritis, rather than chronic pain diagnosis.
15	Schmidt, D	2021	Deep learning takes the pain out of back breaking work - Automatic vertebral segmentation and attenuation measurement for osteoporosis	Google Scholar	34598006	This paper only use the deep learning technique to segment CT image for“vertebrae”identification, which is a part of the knee osteoporosis diagnosis.
16	Ibrahim, Said A	2021	Artificial intelligence for disparities in knee pain assessment	Google Scholar	33442017	This paper focus on the exploration of racial disparities in the assessment of knee osteoarthritis, rather that diagnosis of knee osteoarthritis
17	Lukkahatai N	2018	A predictive algorithm to identify genes that discriminate individuals with fibromyalgia syndrome diagnosis	Survey Paper	30538537	Machine learning is just part of the methods they used, not for the main diagnosis task

			from healthy control subjects			
18	Ultsch A	2016	A data science approach to candidate gene selection of pain regarded as a process of learning and neural plasticity	Survey Paper	27548044	Used machine learning to combine the knowledge to identify the genes relevant to pain, rather than diagnosis.
19	Lee J	2019	Machine learning-based prediction of clinical pain using multimodal neuroimaging and autonomic metrics.	Survey Paper	30540621	Predict pain intensity, rather than diagnosis.
20	B Mathew	1998	Artificial intelligence in the diagnosis of low-back pain and sciatica	Survey Paper	2970122	This paper is published in 1988
21	Masoud Abdollahi	2020	Using a Motion Sensor to Categorize Nonspecific Low Back Pain Patients: A Machine Learning Approach	Survey Paper	32604794	This paper focuses on categorization of nonspecific low back pain patients to low, medium and high risk categories, rather than chonic pain diagnosis.
22	J B Bishop	1997	Classification of low back pain from dynamic motion characteristics using an artificial neural network	Survey Paper	9431637	This paper is published in 1997
23	Karabulut, EM	2014	Effective automated prediction of vertebral column pathologies based on logistic model tree with SMOTE preprocessing	Survey Paper	24753003	This paper focus on the identification of Vertebral Column Pathologies, which may cause acute pain or chronic pain, rather than diagnosis of chronic pain.
24	N W Sanders	2000	Automated scoring of patient pain drawings using artificial neural networks: Efforts toward a low back pain triage application	Survey Paper	10913774	This paper is published in 2000

Appendix Table 3. Data Abstraction of all Including Papers (N = 55)

No.	Authors	Year	Title	Database	PMID	Country	Organization	Journal /Conference	DOI
1	Lamichhane B, Jayasekera D, Jakes R, Ray WZ, Leuthardt EC, Hawasli AH.	2021	Functional Disruptions of the Brain in Low Back Pain: A Potential Imaging Biomarker of Functional Disability	Survey Papers	34335444	USA	Washington University	Frontiers in Neurology	10.3389/fneur.2021.669076
2	Ung H, Brown JE, Johnson	2014	Multivariate	PubMed	23246778	USA	University of Pennsylvania	Cerebral Cortex	10.1093/

	KA, Younger J, Hush J, Mackey S.		classification of structural MRI data detects chronic low back pain						cercor/bhs378
3	Ketola, J. H., Inkinen, S. I., Karppinen, J., Niinimäki, J., Tervonen, O., & Nieminen, M. T.	2021	T 2-weighted magnetic resonance imaging texture as predictor of low back pain: A texture analysis-based classification pipeline to symptomatic and asymptomatic cases	Survey Papers	33368707	Finland	University of Oulu	Journal of Orthopaedic Research	N.A.
4	Athertya JS, Saravana Kumar G.	2021	Classification of certain vertebral degenerations using MRI image features	PubMed	33984847	India	IIT - Madras	Biomedical Physics Engineering Express	10.1088/2057-1976/ac00d2
5	Shen W, Tu Y, Gollub RL, Ortiz A, Napadow V, Yu S, Wilson G, Park J, Lang C, Jung M, Gerber J, Mawla I, Chan ST, Wasan AD, Edwards RR, Kaptchuk T, Li S, Rosen B, Kong J.	2019	Visual network alterations in brain functional connectivity in chronic low back pain: A resting state functional connectivity and machine learning study	PubMed	30927604	China	Hainan Medical University	Neuroimage Clinical	10.1016/j.nicl.2019.101775
6	Kulkarni, K. R., Gaonkar, A., Vijayarajan, V., & Manikandan, K	2014	Analysis of lower back pain disorder using deep learning	Google Scholar	N.A.	India	VIT University	IOP Conference Series: Materials Science and Engineering	N.A.
7	Torrado-Carvajal A, Toschi N, Albrecht DS, Chang K,	2021	Thalamic neuroinflammation as a reproduci	PubMed	33065737	USA	Harvard Medical School	Pain	10.1097/j.pain.0000000

	Akeju O, Kim M, Edwards RR, Zhang Y, Hooker JM, Duggento A, Kalpathy-Cramer J, Napadow V, Loggia ML.		ble and discriminating signature for chronic low back pain						00000210 8
8	Lamichhane B, Jayasekera D, Jakes R, Glasser MF, Zhang J, Yang C, Grimes D, Frank TL, Ray WZ, Leuthardt EC, Hawasli AH.	2021	Multi-modal biomarkers of low back pain: A machine learning approach	Survey Papers	3333 8968	USA	Washington University	NeuroImage: Clinical	10.1016/j.nicl.2020.102530
9	Tan, W. K., Hassanpour, S., Heagerty, P. J.	2018	Comparison of natural language processing rules-based and machine-learning systems to identify lumbar spine imaging findings related to low back pain	Google Scholar	2960 5561	USA	University of Washington	Academic Radiology	N.A.
10	Owari Y, Miyatake N.	2019	Prediction of Chronic Lower Back Pain Using the Hierarchical Neural Network: Comparison with Logistic Regression-A Pilot Study	PubMed	3118 1815	Japan	Shikoku Medical College	Medicina	10.3390/medicina55060259
11	Parsaeian M, Mohammad K, Mahmoudi M, Zeraati H	2012	Comparison of logistic regression and artificial neural network in low back pain prediction: Second national health survey	Survey Papers	2311 3198	Iran	Tehran University of Medical Sciences	Iranian Journal of Public Health	N.A.

12	Judd, M; Zulkernine, F; Wolfrom, B; Barber, D; Rajaram, A	2018	Detecting Low Back Pain from Clinical Narratives Using Machine Learning Approaches	Web of Science	N.A.	Canada	Queen’s University, Kingston	International Conference on Database and Expert Systems Applications: Dexa 2018 International Workshops	10.1007/978-3-319-99133-7_10
13	Hu B, Kim C, Ning X, Xu X.	2018	Using a deep learning network to recognise low back pain in static standing	PubMed	29792576	USA	Harvard T.H. Chan School of Public Health	Ergonomics	10.1080/00140139.2018.1481230
14	Ashouri, S., Abedi, M., Abdollahi, M., Manshadi, F. D., Parnianpour, M., & Khalaf, K.	2017	A novel approach to spinal 3D kinematic assessment using inertial sensors: Towards effective quantitative evaluation of low back pain in clinical settings	Survey Papers	28800443	Iran	Sharif University of Technology	Computers in Biology and Medicine	N.A.
15	Thiry, P; Houry, M; Philippe, L; Nocent, O; Buisseret, F; Dierick, F; Slama, R; Bertucci, W; Thevenon, A; Simoneau-Buessinger, E	2022	Machine Learning Identifies Chronic Low Back Pain Patients from an Instrumented Trunk Bending and Return Test	Web of Science	35808522	France	Université Polytechnique Hauts-de-France	Sensors (Basel)	10.3390/s22135027
16	Chan, H; Zheng, HR; Wang, HY; Sterritt, R; Newell, D	2013	Smart Mobile Phone Based Gait Assessment of Patients with Low Back Pain	Web of Science	26089700	UK	University of Ulster	International Conference on Natural Computation	N.A.
17	Staartjes VE, Quddusi A, Klukowska AM, Schröder ML.	2020	Initial classification of low back and leg pain	PubMed	32072271	Switzerland	University of Zurich	European Spine Journal	10.1007/s00586-020-

			based on objective functional testing: a pilot study of machine learning applied to diagnostics						06343-5
18	Bernard X W Liew, David Rugamer, Alessandro Marco De Nunzio, Deborah Falla	2019	Interpretable machine learning models for classifying low back pain status using functional physiological variables	Survey Papers	32124044	UK	University of Essex	European Spine Journal	10.1007/s00586-020-06356-0
19	Du, WJ; Omisore, OM; Li, HH; Ivanov, K; Han, SP; Wang, L	2018	Recognition of Chronic Low Back Pain during Lumbar Spine Movements Based on Surface Electromyography Signals	Web of Science	32817710	China	Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences	IEEE Access	10.1109/ACCESS.2018.2877254
20	Caza-Szoka M, Massicotte D, Nougarou F, Descarreaux M.	2016	Surrogate analysis of fractal dimensions from SEMG sensor array as a predictor of chronic low back pain	PubMed	28269714	Canada	University of Quebec, Tri-Rivers City	International Conference of The IEEE Engineering in Medicine & Biology Society	10.1109/EMBC.2016.7592195
21	Wang, N., Zhang, Z., Xiao, J., & Cui, L	2019	DeepLap: A Deep Learning based Non-Specific Low Back Pain Symptomatic Muscles Recognition System	Google Scholar	N.A.	China	Chinese Academy of Sciences	IEEE International Conference on Sensing, Communication, and Networking	N.A.

22	Robinson ME, O'Shea AM, Craggs JG, Price DD, Letzen JE, Staud R.	2015	Comparison of machine classification algorithms for fibromyalgia: neuroimages versus self-report	PubMed	25704840	USA	University of Florida	Journal of Pain	10.1016/j.jpain.2015.02.002
23	Behr M, Saiel S, Evans V, Kumbhare D.	2020	Machine Learning Diagnostic Modeling for Classifying Fibromyalgia Using B-mode Ultrasound Images	PubMed	32174253	Canada	University Health Network	Ultrasonic Imaging	10.1177/0161734620908789
24	Alves MVS, Maciel LIL, Ramalho RRF, Lima LAS, Vaz BG, Morais CLM, Passos JOS, Pegado R, Lima KMG.	2021	Multivariate classification techniques and mass spectrometry as a tool in the screening of patients with fibromyalgia	PubMed	34799667	Brazil	Federal University of Rio Grande do Norte	Scientific Reports	10.1038/s41598-021-02141-1
25	Emir, B; Masters, ET; Mardekian, J; Clair, A; Kuhn, M; Silverman, SL	2015	Identification of a potential fibromyalgia diagnosis using random forest modeling applied to electronic medical records	Web of Science	26089700	USA	Pfizer Inc.	Journal of Pain Research	10.2147/JPR.S82566
26	Andrés-Rodríguez L, Borràs X, Feliu-Soler A, Pérez-Aranda A, Rozadilla-Sacanell A, Arranz B, Montero-Marin J, García-Campayo J, Angarita-	2019	Machine Learning to Understand the Immune-Inflammatory Pathways in Fibromyalgia	PubMed	31470635	Spain	Institut de Recerca Sant Joan de Déu	International Journal of Molecular Sciences	10.3390/ijms20174231

	Osorio N, Maes M, Luciano JV.								
27	Sundermann B, Burgmer M, Pogatzki-Zahn E, Gaubitz M, Stüber C, Wessolleck E, Heuft G, Pfleiderer B.	2014	Diagnostic classification based on functional connectivity in chronic pain: model optimization in fibromyalgia and rheumatoid arthritis	PubMed	24507423	Germany	University Hospital Munster, Albert-Schweitzer-Campus	Academic Radiology	10.1016/j.acra.2013.12.003
28	Wang, R., Xu, K., Feng, H., & Chen, W	2020	Hybrid RNN-ANN Based Deep Physiological Network for Pain Recognition	Google Scholar	33019243	China	Fudan University	International Conference of The IEEE Engineering in Medicine & Biology Society	N.A.
29	Fodeh SJ, Finch D, Bouayad L, Luther S, Kerns RD, Brandt C.	2017	Classifying Clinical Notes with Pain Assessment using Machine Learning	PubMed	29295346	USA	Yale University School of Medicine	Medical & Biological Engineering & Computing	N.A.
30	Gilam, G; Cramer, EM; Webber, KA; Ziadni, MS; Kao, MC; Mackey, SC	2021	Classifying chronic pain using multidimensional pain-agnostic symptom assessments and clustering analysis	Web of Science	34516888	USA	Stanford University School of Medicine	Science Advances	10.1126/sciadv.abj0320
31	Gaynor, SM; Bortsov, A; Bair, E; Fillingim, RB; Greenspan, JD; Ohrbach, R; Diatchenko, L; Nackley, A; Tchivileva, IE; Whitehead, W; Alonso, AA; Buchheit, TE; Boortz-Marx, RL; Liedtke, W; Park, JJ; Maixner, W; Smith, SB	2021	Phenotypic profile clustering pragmatically identifies diagnostically and mechanistically informative subgroups of chronic pain patients	Web of Science	33259458	USA	Harvard T.H. Chan School of Public Health	Pain	10.1097/j.pain.0000000000002153

32	Antonucci, LA; Taurino, A; Laera, D; Taurisano, P; Losole, J; Lutricuso, S; Abbatantuono, C; Giglio, M; De Caro, MF; Varrassi, G; Puntillo, F	2020	An Ensemble of Psychological and Physical Health Indices Discriminates Between Individuals with Chronic Pain and Healthy Controls with High Reliability: A Machine Learning Study	Web of Science	32880867	Italy	University of Bari Aldo	Pain and Therapy	10.1007/s40122-020-00191-3
33	Zhang W, Bianchi J, Turkestani NA, Le C, Deleat-Besson R, Ruellas A, Cevidanes L, Yatabe M, Goncalves J, Benavides E, Soki F, Prieto J, Paniagua B, Najarian K, Gryak J, Soroushmehr R.	2021	Temporomandibular Joint Osteoarthritis Diagnosis Using Privileged Learning of Protein Markers	PubMed	34891638	USA	University of Michigan, Ann Arbor	International Conference of The IEEE Engineering in Medicine & Biology Society	10.1109/EMBC46164.2021.9629990
34	Bianchi J, de Oliveira Ruellas AC, Gonçalves JR, Paniagua B, Prieto JC, Styner M, Li T, Zhu H, Sugai J, Giannobile W, Benavides E, Soki F, Yatabe M, Ashman L, Walker D, Soroushmehr R, Najarian K, Cevidanes LHS.	2020	Osteoarthritis of the Temporomandibular Joint can be diagnosed earlier using biomarkers and machine learning	PubMed	32415284	USA	School of Dentistry	Scientific Reports	10.1038/s41598-020-64942-0
35	Mao CP, Chen FR, Huo JH, Zhang L, Zhang GR, Zhang B, Zhou XQ.	2020	Altered resting-state functional connectivity and effective connectivity of the	PubMed	32488929	China	Second Affiliated Hospital of Xi'an Jiaotong University	Human Brain Mapping	10.1002/hbm.25038

			habenula in irritable bowel syndrome: A cross-sectional and machine learning study						
36	Labus JS, Van Horn JD, Gupta A, Alaverdyan M, Torgerson C, Ashe-McNalley C, Irimia A, Hong JY, Naliboff B, Tillisch K, Mayer EA.	2015	Multivariate morphological brain signatures predict chronic abdominal pain patients from healthy control subjects.	Survey Papers	25906347	USA	University of California at Los Angeles	Pain	10.1097/j.pain.0000000000000196
37	Lin YC, Yu NY, Jiang CF, Chang SH.	2018	Characterizing the SEMG patterns with myofascial pain using a multi-scale wavelet model through machine learning approaches	Survey Papers	29890503	China	National Cheng Kung University	Journal of Electromyography and Kinesiology	10.1016/j.jelekin.2018.05.004
38	Behr M, Noseworthy M, Kumbhare D.	2019	Feasibility of a Support Vector Machine Classifier for Myofascial Pain Syndrome: Diagnostic Case-Control Study	PubMed	30614553	Canada	University of Toronto	Journal Of Ultrasound in Medicine	10.1002/jum.14909
39	Callan D, Mills L, Nott C, England R, England S.	2014	A tool for classifying individuals with chronic back pain: using multivariate pattern analysis	PubMed	24905072	Japan	Osaka University	PLoS One	10.1371/journal.pone.0098007

			with functional magnetic resonance imaging data						
40	Santana, A. N., Cifre, I., De Santana, C. N.	2019	Using Deep Learning and Resting-State fMRI to Classify Chronic Pain Conditions	Google Scholar	31920483	Spain	University of the Balearic Islands	Frontiers In Neuroscience	N.A.
41	Santana, A. N., de Santana, C. N., & Montoya, P	2020	Chronic Pain Diagnosis Using Machine Learning, Questionnaires, and QST: A Sensitivity Experiment	Google Scholar	33212774	Spain	University of the Balearic Islands	Diagnostics (Basel)	N.A.
42	Tan, W. K., & Heagerty, P. J. (2022)	2020	Surrogate-guided sampling designs for classification of rare outcomes from electronic medical records data	Google Scholar	N.A.	USA	University of Washington	Biostatistics	N.A.
43	Lee, J. J., Liu, F., Majumdar, S., & Pedoia, V	2021	An ensemble clinical and MR-image deep learning model predicts 8-year knee pain trajectory: Data from the osteoarthritis initiative	Google Scholar	N.A.	USA	University of California San Francisco	Osteoarthritis Imaging	N.A.
44	Chang, G. H., Felson, D. T., Qiu, S., Capellini, T. D	2018	Assessment of bilateral knee pain from MR imaging	Google Scholar	N.A.	USA	Boston University	Biorxiv	N.A.

			using deep neural networks						
45	Barroso J, Vigotsky AD, Branco P, Reis AM, Schnitzer TJ, Galhardo V, Apkarian AV.	2020	Brain gray matter abnormalities in osteoarthritis pain: a cross-sectional evaluation	PubMed	32379222	Portugal	Universidade do Porto	Pain	10.1097/j.pain.0000000000001904
46	Wang Y, Zhu Y, Xue Q, Ji M, Tong J, Yang JJ, Zhou CM.	2021	Predicting chronic pain in postoperative breast cancer patients with multiple machine learning and deep learning models	PubMed	34364190	China	The First Affiliated Hospital of Zhengzhou University	Journal Of Clinical Anaesthesia	10.1016/j.jclinane.2021.110423
47	Kartal, E; Kocoglu, FO; Ozen, Z; Emre, IE; Gungor, G; Bozkurt, PS	2022	AN INTELLIGENT POSTOPERATIVE CHRONIC PAIN PREDICTION SYSTEM (I-POCPP)	Web of Science	N.A.	Turkiye	Istanbul University	Journal of Istanbul Faculty of Medicine-Istanbul Tip Fakultesi Dergisi	10.26650/IUITFD.972738
48	He M, Wang X, Zhao Y.	2021	A calibrated deep learning ensemble for abnormality detection in musculoskeletal radiographs	PubMed	33907257	USA	Fordham University	Scientific Reports	10.1038/s41598-021-88578-w
49	Lendaro E, Balouji E, Baca K, Muhammad AS, Ortiz-Catalan M.	2021	Common Spatial Pattern EEG decomposition for Phantom Limb Pain detection	PubMed	34891394	Sweden	Chalmers University of Technology	International Conference of The IEEE Engineering in Medicine & Biology Society	10.1109/EMBC46164.2021.9630561
50	Yang M, Zheng H, Wang H, McClean S,	2012	A machine learning approach	Survey Papers	21996355	UK	University of Ulster	Medical Engineering & Physics	10.1016/j.medengp

	Hall J, Harris N.		to assessing gait patterns for Complex Regional Pain Syndrome						hy.2011.09.018
51	Bagarinao E, Johnson KA, Martucci KT, Ichesco E, Farmer MA, Labus J, Ness TJ, Harris R, Deutsch G, Apkarian VA, Mayer EA, Clauw DJ, Mackey S.	2014	Preliminary structural MRI based brain classification of chronic pelvic pain: A MAPP network study	PubMed	25242566	USA	Stanford University Medical Center	Pain	10.1016/j.pain.2014.09.002
52	Cheng Y, Jin Z, Zhou X, Zhang W, Zhao D, Tao C, Yuan J.	2022	Diagnosis of Metacarpophalangeal Synovitis with Musculoskeletal Ultrasound Images	PubMed	34930637	China	Nanjing University	Ultrasound In Medicine & Biology	10.1016/j.ultrasmedbio.2021.11.003
53	Jiménez-Grande D, Farokh Atashzar S, Martinez-Valdes E, Marco De Nunzio A, Falla D.	2021	Kinematic biomarkers of chronic neck pain measured during gait: A data-driven classification approach	PubMed	33581443	UK	University of Birmingham	Journal Of Biomechanics	10.1016/j.jbiomech.2020.110190
54	Zhong J, Chen DQ, Hung PS, Hayes DJ, Liang KE, Davis KD, Hodaie M.	2018	Multivariate pattern classification of brain white matter connectivity predicts classic trigeminal neuralgia	PubMed	29905649	Canada	University Health Network	Pain	10.1097/j.pain.0000000000001312
55	Garcia-Chimeno Y, Garcia-Zapirain B, Gomez-Beldarrain M, Fernandez-	2017	Automatic migraine classification via feature selection committee	PubMed	28407777	Spain	Avda. Universidades	BMC Medical Informatics and Decision Making	10.1186/s12911-017-0434-4

	Ruanova B, Garcia-Monco JC.		and machine learning techniques over imaging and questionnaire data						

Appendix Table 4. List of Abbreviation

No.	**Abbreviation**	**Definition**
Data Types		
1	ECG	Electrocardiography
2	EMG	Electromyography
3	sEMG	Surface electromyography
4	EEG	Electroencephalo-graph
5	EMR	Electronic medical record
6	SC	Skin conductance
7	fMRI	Functional magnetic resonance imaging
8	MRI	Magnetic resonance images
9	QSTs	Quantitative sensory tests
10	BDI	Beck depression inventory II
11	STAI	State–trait anxiety inventory
12	GSRS	Gastrointestinal symptom rating scale
13	IMGV	Integrative medical group visits
14	TSPO	18 kda translocator protein
15	CT	Computerised tomography
Machine Learning Models		
16	CART	Classification and regression tree
17	DT	Decision tree
18	ETC	Extra trees classifier
19	KNN	K-nearest neighbors
20	KRVFL	Kernel-based random vector functional link network
21	LASSO	Least absolute shrinkage and selection operator algorithm
22	LDA	Linear discriminant analysis
23	LR	Logistic regression
24	LUPI	Learning using privileged information
25	MLP	Multi-layer perceptron
26	MPC	Multivariate pattern classification
27	NB	Naive bayes
28	PCA	Principle component analysis
29	RF	Random forest
30	SVC	Support vector classifier
31	SVM	Support vector machine
32	MVPA	Multivariate pattern analysis
33	MR	Multiple regression
34	AHC	Agglomerative hierarchical clustering
35	sPLS-DA	Sparse partial least squares for discrimination analysis
36	HRGAN	High-resolution Generative Adversarial Network
37	DB	Data boosting
38	SPA-LDA	Successive projections algorithm with linear discriminant analysis
39	NCA-K-NN	Neighbourhood component analysis - k-nearest neighbour
Others		
40	CP	Chronic pain group
41	HC	Healthy control group
42	OA	Osteoarthritis
43	TMJ	Temporomandibular joint
44	RA	Rheumatoid arthritis
45	POCP	Postoperative chronic pain
46	CPP	Chronic pelvic pain
47	FMS	Fibromyalgia

48	PPT	Pain threshold
49	LF	Lateral flexion
50	5R-STS	Five-repetition sit-to-stand
51	IBS	Irritable bowel syndrome
52	MPS	Myofascial pain syndrome
53	CPSP	Chronic postsurgical pain
54	MSDs	Musculoskeletal disorders
55	PLP	Phantom limb pain
56	CRPS	Complex regional pain syndrome
57	CPP	Chronic pelvic pain
58	MCP	Metacarpophalangeal
59	TN	Trigeminal neuralgia
60	CNP	Chronic neck pain