|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Studies domain analysis | | | | | | | General Information | | | | | |
| Doctor in the loop approaches | Knowledge Resources | Country | Device interface | Type of recommendation | Target population | Therapeutic area | Score | Database | Publisher | year | Title | ID |
| No | Content (Item attribute, Domain knowledge) | USA | Mobile and Web  (Web app) | Doctor profiles | General public | Generic health | 6 | Scopus | IMIR | 2016 | Which Doctor to Trust: A Recommender System for Identifying the Right Doctors | 01 |
| No | Individual (  User requirement)  Content (Doman Knowledge) | Thailand | offline | action for survival | Medical expderts | Generic health | 4.5 | Scopus | Springer | 2007 | Web Based Health Recommender System Using Rough Sets, Survival Analysis and Rule-Based Expert Systems | 02 |
| No | PHR | France | Web apps | medical procedures | Medical experts | Diabetes | 4.5 | Science direct | Elsevier | 2017 | Visual instance-based recommendation system for medical data mining | 03 |
| No | User requirement (preference), contextual knowledge, Item attribute | Taiwan | Mobile apps | Medical clinic | General public | Generic health | 5.5 | Scopus | Springer | 2016 | Ubiquitous Multicriteria Clinic Recommendation System | 04 |
| Yes | Item attribute,  Domain knowledge,  PHR | Spain | Web app | Messages (exercise) | Adults | Low back pain | 6.5 | Science Direct | Elsevier | 2014 | TPLUFIB-WEB: A fuzzy linguistic Web system to help in the treatment  of low back pain problems | 05 |
| No | Domain knowledge , contextual knowledge, user demographic, user requirement | USA | Mobile app | Messages(physical activity, healthy behavior) | N/A | Nutrition  Lifestyle  Exercise | 7 | Science Direct | Springer | 2017 | Towards Health Recommendation Systems: An  Approach for Providing Automated Personalized  Health Feedback from Mobile Data | 06 |
| No | Domain knowledge,  PHR,  User Demographics | Germany | N/A | the therapy message | Skin patients | skin disease (Psoriasis) | 6 | Science Direct | Elsevier | 2017 | Therapy Decision Support Based on Recommender System Methods | 07 |
| No | Domain knowledgeو User requirement | Portugal | Mobile app | personalized meal plan | Older Adults | Nutrition  Lifestyle | 5.5 | IEEExplore | IEEE | 2017 | SousChef: Mobile Meal Recommender System for Older Adults | 08 |
| No | Domain knowledge | Italy | Mobile app | Exercise plan | General public | Exercise  Lifestyle | 5 | ACM | ACM | 2017 | Recommendation in Persuasive eHealth Systems:  an Effective Strategy to Spot Users’ Losing Motivation to  Exercise | 09 |
| No | Domain knowledge (Ontology) | Spain | Online TV | TV advertisement | chronic diseases,  Diabetes | Lifestyle  chronic diseases,  Diabetes | 6.5 | Science Direct | Elsevier | 2012 | Property-based collaborative filtering for health-aware recommender systems | 10 |
| No | User Demographics,  Domain Knowledge | USA | Web | Specialist address | Diabetes | Diabetes | 6 | Science Direct | Elsevier | 2015 | Personalized healthcare cloud services for disease risk  assessment and wellness management using social media | 11 |
| No | User Requirements,  User Ontology,  Domain knowledge (Ontology) | Spain | Web | healthy diet plans | Elderly | Nutrition | 5.5 | Scopus | Wiley | 2015 | Nutrition for Elder Care: a nutritional semantic recommender system for the elderly | 12 |
| No | User Demographics,  User Requirements  Domain Knowledge | Korea | Mobile app | physical activity Plan | Adults | Lifestyle of  general public  Exercise | 7 | Science Direct | Elsevier | 2016 | Multimodal hybrid reasoning methodology for personalized wellbeing services | 13 |
| No | User Demographics,  PHR,  User Requirements  Domain Knowledge (Food ontology) | Romania | Web | healthy diet plans | Elderly  diabetes | Lifestyle  chronic diseases,  Diabetes | 5 | Science Direct | Springer | 2015 | Lifestyle Recommendation System for Treating Malnutrition | 14 |
| No | Domain Knowledge (ontology) | Qatar | Web | health videos | General public | Generic health | 5 | Scopus | BMC | 2017 | HealthRecSys: A semantic content-based recommender system to complement health videos | 15 |
| No | Peer Opinion  Domain Knowledge  Item Attribute | Australia | Web | Health recipe | General public | Lifestyle | 5.5 | ACM | ACM | 2010 | Group-Based Recipe Recommendations: Analysis of Data  Aggregation Strategies | 16 |
| Yes | Expert Opinion  Item Attribute  Domain Knowledge  PHR | Spain | Web | Healthy plan | diabetes | Lifestyle  chronic diseases,  Diabetes | 6.5 | Science Direct | Elsevier | 2014 | glUCModel: A monitoring and modeling system for chronic diseases applied to diabetes | 17 |
| Yes | User Opinion  Domain Knowledge  Expert Opinion | China | Mobile app | emotional improvement  suggestions | depression or other emotional patients | depression diseases | 6 | Science Direct | Springer | 2017 | emHealth: Towards Emotion Health Through Depression  Prediction and Intelligent Health Recommender System | 18 |
| No | PHR  Domain Knowledge | Germany | Web | Healthy plan | pregnant women | pregnant risks | 6 | Science Direct | Springer | 2012 | Determining Pattern Similarity in a Medical Recommender System | 19 |
| Yes | Domain Knowledge  PHR  Expert Opinion | Taiwan | Mobile app | care guideline | caregivers of chronic patients | chronic patients | 5.5 | Scopus | mdpi | 2014 | Design of a Real-Time and Continua-Based Framework for Care Guideline Recommendations | 20 |
| No | Domain Knowledge  User Demographics | Taiwan | Web | Healthy plan | General public | Generic health | 6 | Science Direct | Elsevier | 2015 | Design and evaluation of a cloud-based Mobile Health Information Recommendation system on wireless sensor networks | 21 |
| No | Domain Knowledge  User Demographics | China | Web | Medicine and their properties | Doctors | Generic health | 5.5 | IEEExplore | IEEE | 2016 | An Intelligent Medicine Recommender System Framework | 22 |
| No | Domain Knowledge  User Demographics | Iran | Web | health products | Generic health | Generic health | 5.5 | ADL | UTM | 2018 | A Recommendation Agent for Health Products Recommendation Using Dimensionality Reduction and Prediction Machine Learning Techniques | 23 |
| No | Domain Knowledge  PHR | Thailand | Mobile app | care guideline | Pregnant | obstetrics and  gynecology | 6 | Science Direct | Springer | 2020 | A Mobile Recommender System for Location-Aware Telemedical Diagnostics | 24 |
| No | Domain knowledge , contextual knowledge, user demographic, | India | Web | Healthy plan | General public | Generic health | 5 | IEEExplore | IEEE | 2019 | DLRS: Deep Learning-based Recommender System for Smart Healthcare Ecosystem | 25 |
| No | User Requirements  Domain knowledge | Spain | Web | psychological disease | psychiatric  patients | psychiatric disorders | 6.5 | Science Direct | Elsevier | 2020 | A conversational recommender system for diagnosis using fuzzy rules | 26 |
| No | simulator | Spain | Web | estimating the required insulin | Diabetes  patients | Diabetes | 6 | Science Direct | Elsevier | 2019 | Case-base maintenance of a personalised and adaptive CBR bolus insulin recommender system for type 1 diabetes | 27 |
| No | Domain knowledge | India | Web | Hospital | General public | Generic health | 5.5 | MDPI | MDPI | 2019 | DeepReco: Deep Learning Based Health Recommender System Using Collaborative Filtering | 28 |
| No | Domain Knowledge  PHR | India | Web | heart disease diagnosis | heart patients | heart disease | 6 | Science Direct | Springer | 2017 | Hybrid Recommendation System for Heart Disease Diagnosis based on Multiple Kernel Learning with Adaptive Neuro-Fuzzy Inference System | 29 |
| No | Individual (User opinion,  User Requirements)  User selection | USA | Web apps | expedient to design a smart healthy eating system adoption for Reduce the progression of diabetes Older Adult | Older Adult and Adult | Diabetes | 5 | Springer link | Springer | 2020 | Choice-Based User Interface Design of a Smart Healthy Food Recommender System for Nudging Eating Behavior of Older Adult Patients with Newly Diagnosed Type II Diabetes | 30 |
| No | Social (Peer Demographics),  User Requirements (Preference),  User Demographics | Italy | Web app | Food and  Personalized recipe | General Public | Nutrition  Health | 5 | ACM Digital Library | ACM | 2020 | Towards a Knowledge-aware Food Recommender System Exploiting Holistic User Models | 31 |
| No | Individual  User Demographic  PHR | China  Pakistan  UAE  Korea | N/A | Prediction  Of  Diabetes | Diabetes Patients | Diabetes | 5 | hindawi.com | Hindawi | 2021 | A Smart Healthcare Recommendation System for Multidisciplinary Diabetes Patients with Data Fusion Based on Deep Ensemble Learning | 32 |
| Yes | Expert demographics  Body sensors – smart devices – smart phone - | India | application | Remote health monitoring | Generic public | Generic healthcare | 5.5 | IEEE explore | IEEE | May 2019 | DLRS: Deep Learning-based Recommender System for Smart Healthcare Ecosystem | 33 |
| Yes | Item Attribute  Contextual  Knowledge  Domain  Knowledge  User  Demographics  PHR  User  Requirements | Bangladesh | Web apps (IBM Cloud) | taking immediate actions to reduce the mortality rate icu patients | ICU Patients | Generic health | 5.5 | Scopus | * Springer | 2019 | Content-Based Health Recommender System for ICU Patient | 34 |
| No | Domain Knowledge  User opinion | Denmark | Smartphone  IOS / Android | To do list  Life style | depressed patients | Psychiatry  depressed patients, | 5.5 | Firebase | Department of health technology technical University of Denmark  Association for Computing Machinery | 2020 | MUBS: A Personalized Recommender System for Behavioral Activation in Mental Health | 35 |
| No | Content(Domain knowledge) | Switzerland, Netherlands | Mobile app | message (Physical activity ) | Elderly people | promote physical activeness in elderly people | 7 | Springer link | Springer | 2020 | Recommender System for Responsive Engagement of Senior Adults in Daily Activities | 36 |
| No | User demographics  User opinion | Usa | Online  (web)  Offline  (phone) | Motivational messaging (recommender system) | Smokers | Generic health | 5.5 | Springer Link | springer | 2021 | Evaluating the use of a recommender system for selecting optimal messages for smoking cessation: patterns and effects of user-system engagement | 37 |
| No | Content (item Attribute, contextual knowledge)  Individual (user Demographics, user requirements) | Nicaragua & Spain | N/A | Food diet | Overweight people | Nutrition  lifestyle | 5 | MDPI | MDPI | 2021 | Ontology-Based Nutritional Recommender System | 38 |
| No | Content (Domain-Knowledge) | Portugal | N/A | recommend entities related to the COVID-19 | researchers | COVID-19 | 5.5 | Geno info | Genomics & Informatics (G&I) | 2021 | COVID-19 recommender system based on an annotated multilingual corpus | 39 |
| No | domain knowledge)Feature ontology)  Invidual(PHR)  User Requarment(Preferences) | Portugal | Google Colab | ranking of the most cancer efficient drugs | Cancer Patient | Cancer disease | 5.5 | Science direct | Elsevier | 2021 | Wavelet-based cancer drug recommender system | 40 |
| No | domain Knowledge | UK | Online|Web Application | physical activity and dietary plan | Adult | Generic health | 6 | Springer Link | springer | 2021 | EvoRecSys: Evolutionary Framework for Health and Wellbeing Recommender Systems | 41 |
| No | domain Knowledge  itemAttribute  PHR | Pakistan | Online|Web Application | physical activity and dietary plan | Adult | cardiovascular disease | 5 | Springer Link | springer | 2019 | An IoT based efficient hybrid recommender system for cardiovascular disease | 42 |
| No | Individual(User Demographics, PHR, )  Expert(Expert opinion) | USA | N/A | Medical prediction | outpatients referred | adult Endocrinology | 5 | Cornell University | arXiv | 2020 | Clinical Recommender System: Predicting Medical Specialty Diagnostic Choices with Neural Network Ensembles | 43 |
| No | PHR | India | N/A | Action to diagnose & prognosis the disease | women | Breast Cancer | 5 | Wiley Online Library | Scrivener Publishing LLC | 17 June 2020 | Machine Learning-Based Recommender System for Breast Cancer Prognosis | 44 |
| No | individual  User Demographics | USA | Web app  (twitter) | Recommending the possible emergence of diseases to the authorities  Based on social data[[1]](#footnote-1) | General public | respiratory diseases | 5.5 | springer | ASP | 2019 | Developing a Healthcare Recommender System Using an Enhanced Symptoms-Based Collaborative Filtering Technique | 45 |
| No | Content (Domain-Knowledge) or PHR | India | No | generate protocol to prevent diabetes | Diabet | Diabet | 5.5 | Wiley Online Library | Scrivener Publishing LLC | * September 2020 | Development of a Recommender System HealthMudra Using Blockchain for Prevention of Diabetes | 46 |
| No | Individual(user requirments)  PHR | Spain | N/A | differential diagnosis of schizophrenia | N/A | Mental disorders (Schizophrenia, Schizoaffective, Bipolar disorders) | 5.5 | Science  direct | Elsevier | 2020 | A conversational recommender system for diagnosis using fuzzy rules | 47 |
| Yes | Individual (User’s interests and need), | China | separate Web service connected with patients' smartphones | Provide Personalized Educational Materials for Chronic Disease Patients | patients in China  [General Public] | Chronic Disease | 6.5 | JMIR  (PubMed  Scopus  SCIE) | JMIR Med Inform | 2020 Apr 23 | Using Natural Language Processing Techniques to Provide Personalized Educational Materials for Chronic Disease Patients in China: Development and Assessment of a Knowledge-Based Health Recommender System | 48 |
| No | Domain Knowledge | Pakistan | N/A | diet plan | Diabetic’s Patients | Diabetes | 5.5 | Scopus | Tech Science Press | 2021 | Intelligent Nutrition Diet Recommender System for Diabetic's Patients | 49 |
| No | domain knowledge(feature ontology ,domain constraints) | US | Mobile(Android) | Personalized meal plan | General public | Lifestyle nutrition | 5 | marcgiannuzzi | marcgiannuzzi | 2019 | Health Based Ingredient Recommender System for Recipes | 50 |
| Yes | Domain Knowledge,  PHR | Taiwan | Mobile App | - The motivational messages  - | Adults | Generic Health | 6.5 | Springer-nature  [link](https://tmu.pure.elsevier.com/en/publications/a-recommender-system-to-quit-smoking-with-mobile-motivational-mes/datasets/) | Springer  [link](https://link.springer.com/article/10.1186/s13063-018-3000-1) | 2018 | A recommender system to quit smoking  with mobile motivational messages: study  protocol for a randomized controlled trial | 51 |
| Yes | Individual (user demographic)  Expert (expert opinion)  Domain knowledge | India | Wearable devices (smart watches, fitness trackers) | Notification (physical activity, health action) | General public | Generic health | 5 | Scopus | Springer | 2020 | A Novel Approach for Smart-Healthcare Recommender System | 52 |
| No | Domain Knowledge | Iran | Web | Medicine | physicians | hypertension | 4.5 | Science direct | Elsevier | 2022 | RecoMed: A knowledge-aware recommender system for hypertension medications | 53 |
| No | Domain Knowledge,  Feature Ontology | UK | N/A | Messages | General Public | General Health | 5.5 | ACM Digital Library | ACM | 2019 | Aligning Daily Activities with Personality: Towards A  Recommender System for Improving Wellbeing | 54 |
| Yes | Individual (user demographic)  Expert (expert opinion)  Domain knowledge  PHR | Tunisia | N/A | Messages | Covid-19 Patients | Covid-19 Crisis | 4.5 | Science direct | Elsevier | 2022 | A graph based recommender system for managing Covid-19 Crisis | 55 |
| No | Domain Knowledge | UK | Web | Messages | General Public | General Health | 4.5 | Cornell University | arXiv | 2022 | Using coevolution and substitution of the fittest for health and well-being  recommender systems | 56 |
| No | Domain Knowledge | India | Web | treatments | Diabetic’s Patients | Diabetes | 4.5 | Faculty of Engineering, Chulalongkorn University | ENGINEERING JOURNAL | 2022 | Prescription Based Recommender System for Diabetic Patients Using Efficient Map Reduce | 57 |
| Yes | Individual (user demographic)  Domain knowledge  PHR | India | Web | diet plan | Diabetic’s Patients | Diabetes | 5 | Wiley Online Library | WILEY | 2022 | An intelligent fuzzy inference rule-based expert  recommendation system for predictive diabetes diagnosis | 58 |
| Yes | Individual (user demographic)  Expert (expert opinion)  Domain knowledge  PHR | Pakistan | Web | treatments | physicians | General Health | 5.5 | Science direct | Springer | 2022 | Automated disease diagnosis and precaution  recommender system using supervised machine  learning | 59 |
| No | Domain Knowledge (ontology) | Indonesia | Web | health videos | General public | Generic health | 4.5 | IEEE Xplore | IEEE | 2022 | Diseases Video Recommender System using  Keyword-Based Vector Space on YouTube and  Vimeo | 60 |
| No | Individual (user demographic)  Expert (expert opinion)  Domain knowledge  PHR | India | Web | Messages | Covid-19 Patients | Covid-19 Crisis | 4.5 | Scopus | IGI Global | 2022 | Clustering-Based Recommendation  System for Preliminary Disease Detection | 61 |
| Yes | Individual (user demographic)  Expert (expert opinion)  Domain knowledge | USA | Web | treatment | doctors, medicines | Covid-19 Crisis | 6 | Scopus | MPDI | 2022 | Recommender System for the Efficient Treatment of COVID-19  Using a Convolutional Neural Network Model  and Image Similarity | 62 |
| Yes | users’ demographics and smoking  habits  Domain knowledge | Spain | Mobile App | Messages | Smokers | Smoking Cessation | 6 | MPDI | MPDI | 2022 | Applying Collective Intelligence in Health Recommender  Systems for Smoking Cessation: A Comparison Trial | 63 |
| Yes | Individual (user demographic)  Expert (expert opinion)  Domain knowledge | Mexico | Mobile App | Messages | Covid-19 Patients | Covid-19 Crisis | 5.5 | MPDI | MPDI | 2022 | Healthcare Recommender System Based on Medical Specialties,  Patient Profiles, and Geospatial Information | 64 |

1. [↑](#footnote-ref-1)