中国工程科技知识中心
China Knowledge Centre for Engineering Sciences and Technology

《人工智能在医药健康领域战略研究（2035）》参考

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中国工程科技知识中心医药卫生专业分中心
中国医学科学院医学信息研究所 2020 年 11 月 20 日

[动态信息]

1. 人工智能领域融资流向头部企业态势明显

【新华网】企查查日前推出的《2020 中国新基建大数据分析报告》显示，截至 10 月份，今年我国人工智能领域发生了 381 起融资事件，融资额合计超过 3000 亿元。伴随企业生长周期的演进和市场逐渐成熟，人工智能领域融资阶段开始向成长期和成熟期偏移，资金集中流向头部企业态势明显。

链接：http://field.10jqka.com.cn/20201116/c624752904.shtml

2. AI 皇冠上的明珠：人工智能自然语言处理技术

【智能制造网】近几年，全球范围内越来越多的政府和企业组织逐渐认识到人工智能在经济和战略上的重要性，并从国家战略和商业活动上涉足人工智能，并借助其推进自身的智能化、产业化进程。

链接：https://baijiahao.baidu.com/s?id=1683503475518958550&wfr=spider&for=pc

3. 临床疾病的预测，人工智能是认真的

【国际科学编辑】临床诊断就像是与疾病"赛跑"，医生和患者都想尽快知道答案，要快一点、再快一点、更快一点。但诊断往往靠的是积累，一个人或者几个人的经验，难以覆盖方方面面的情况，而人工智能正在帮助医生逐步弥补这个局限。

链接：https://baijiahao.baidu.com/s?id=1683502410389028982&wfr=spider&for=pc

4. 南京医科大学人工智能影像实验室成立，将聚焦疾病智能分类等研究

【健康界】2020 年 11 月 11 日下午，南京医科大学医学影像学院人工智能影像实验室成立仪式在南京成功举行。随着计算机技术的飞速发展，人工智能与医学影像的深度结合已经成为趋势，医学影像学院准确把握技术潮流，成立人工智能影像实验室。

链接：https://dy.163.com/article/FRIJ9TF8051480V3.html

5. 麻省理工学院将深度学习人工智能引入物联网设备

【腾讯网】麻省理工学院的研究人员开发了一种叫做 MCUNet 的系统，将机器学习引入到微控制器中，这一进展可以提高物联网设备的功能和安全性，先进技术可以在家用电器上实现人工智能，同时提高数据安全性和能源效率。

链接：https://new.qq.com/omn/20201116/20201116A04JBQ00.html

6. Google Launches New Artificial Intelligence Tools for Healthcare

【healthitanalytics】Google Cloud recently launched new artificial intelligence tools for healthcare users intended to combat challenges with healthcare data and unstructured digital text during the COVID-19 pandemic.

链接：

https://hitinfrastructure.com/news/google-launches-new-artificial-intelligence-tools-for-healthcare

7. StemBioSys and Cartox Announce Publication of Research Demonstrating CELLvo™ Matrix Plus Significantly Enhances the Functionality of hiPSC Cardiomyocytes

【news-medical】StemBioSys, Inc. and CarTox, Inc. announced today the publication of research in Nature Scientific Reports demonstrating that CELLvo™ Matrix Plus, an extracellular matrix (ECM) technology derived from human perinatal stem cells, supports rapid functional and structural maturation of human-induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CMs) in culture and enables

high throughput cardiotoxicity screening using mature human cardiomyocytes.

链接：

https://www.news-medical.net/news/20201112/StemBioSys-and-Cartox-Announce-Publication-of-Research-Demonstrating-CELLvoe284a2-Matrix-Plus-Significantly-Enhances-the-Functionality-of-hiPSC-Cardiomyocytes.aspx

8. New Pathway Could Advance Artificial Intelligence in Radiology

【 hitinfrastructure 】 Combining formal instruction with practical problem-solving for fourth-year residents could accelerate the use of artificial intelligence in radiology, according to a report published in Radiology: Artificial Intelligence.

链接：

https://healthitanalytics.com/news/new-pathway-could-advance-artificial-intelligence-in-radiology

9. **Machine-learning based analysis of mitochondria interaction networks to advance PD diagnosis**

【news-medical】In a new study led by the Immune Systems Biology research group of the LIH Department of Infection and Immunity, researchers adopted a holistic machine-learning approach to elucidate how the interactions between neuronal mitochondria can serve as a powerful tool to distinguish nerve cells from Parkinson’s patients from those belonging to healthy subjects, thereby providing new insights in the pathogenesis, diagnosis and treatment of this neurodegenerative disorder. The results were published today in the renowned journal ‘Nature Partner Journals Systems Biology and Application’.

链接：

https://www.news-medical.net/news/20201112/Machine-learning-based-analysis-of-mitochondria-interaction-networks-to-advance-Parkinsone28099s-diagnosis.aspx

10. Artificial Intelligence Identifies Asymptomatic COVID-19 Infections

【**healthitanalytics**】Researchers may be able to use artificial intelligence to distinguish asymptomatic individuals from healthy people, resulting in a noninvasive screening tool for providers, a study published in IEEE Journal of Engineering in Medicine and Biology revealed.

链接：

https://healthitanalytics.com/news/artificial-intelligence-identifies-asymptomatic-covid-19-infections

[文献速递]

1. 人工智能在癌症筛查中的研究进展

作者：孙惠昕

文献来源：*肿瘤预防与治疗*

摘要：人工智能(artificial intelligence,AI)应用于医疗领域近年来已经成为现代科技的热点,AI 可以在疾病诊断、治疗和管理等多个环节中发挥重要作用.癌症的早诊早治可以利用癌症筛查手段达到早期发现、早期诊断和早期治疗,但是癌症筛查由于假阳性率较高,导致目前大部分癌种还没有统一的筛查指南,AI 可以通过计算机辅助诊断等技术联合癌症筛查提高其早诊率、准确率和灵敏度.本文将 AI 在高发癌症筛查中的相关研究进展做一综述.

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67299

2. 脑膜瘤影像人工智能应用进展

作者：郑飞

文献来源：*磁共振成像*

摘要：人工智能在医学影像中的应用飞速发展,目前已用于脑膜瘤影像瘤周水肿的准确分割、预判脑膜瘤的病理级别及鉴别诊断等.笔者就人工智能技术在脑膜瘤影像的应用现状和未来发展进行综述.

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67295

3. 人工智能在糖尿病饮食管理领域的应用进展

作者：董鑫

文献来源：*中华内分泌代谢杂志*

摘要：糖尿病饮食管理在糖尿病的治疗过程中起着重要作用。"控制饮食"是糖尿病治疗中最基础也是最重要的一个环节，轻度糖尿病患者可通过食疗，有效控制血糖。有效的饮食管理评估可及时发现糖尿病患者饮食自我管理存在的不足。人工智能在医学领域应用广泛，本文将简述人工智能技术在糖尿病饮食管理方面，包括饮食推荐和自动监测中发挥的作用及应用进展。

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67289

4. 睑板腺缺失面积的图像深度处理分析研究

作者：周奕文

文献来源：*中华眼科杂志*

摘要：目的:探讨睑板腺图像深度处理分析方法的临床应用价值。方法:诊断评价研究。采集 2017 年 1 月至 2018 年 12 月就诊于武汉大学人民医院眼科中心年龄（40.03±11.46）岁的干眼患者的 2 304 幅睑板腺图像构建睑板腺图像数据库，由 2 名临床医师对图像进行标记，利用深度学习算法建立模型，检测模型对睑板腺识别及标注的准确性并计算睑板腺缺失率。采用平均精度均值（mAP）及验证集损失值评价模型对特征区域识别的准确性。并随机选取 64 幅数据库以外的睑板腺图像，由 7 名受试医师独立评估后与模型评估结果进行统计性 t 检验。结果:模型对睑结膜进行标记的 mAP>0.976，验证集损失值<0.35；对睑板腺标记的 mAP>0.922，验证集损失值<1.0。模型标记的睑板腺比例为 53.24%±11.09%，人工标记为 52.13%±13.38%，差异无统计学意义（t=1.935，P>0.05）。模型评价每幅图像仅需 0.499 s，而临床医师用时平均超过 10 s。结论:该睑板腺图像深度处理方法可提高临床检查结果的准确性，提高诊断效率，可用于睑板腺功能障碍相关疾病的临床辅助诊断和筛查。

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67288

5. 尺骨鹰嘴骨折-脱位解剖力学、损伤特点、固定修复及 3D 技术应用的相关问

题

作者：王德斌

文献来源：*中国组织工程研究*

摘要：背景:尺骨鹰嘴骨折-脱位为复杂肘关节骨折脱位之一,给临床诊疗增加一定的挑战性.虽然不断提升的医疗水平使尺骨鹰嘴骨折-脱位的临床诊疗得到了一定发展,但也存在一些争议问题需要进一步探讨.目的:查阅和整理关于尺骨鹰嘴骨折-脱位临床诊疗研究的相关文献,并进行总结.方法:第一作者检索 Web of Science、PubMed 和中国知网(CNKI)数据库 2000 至 2020 年收录的相关文献,中英文检索词分别为“鹰嘴,肘关节,骨折脱位,3D 打印”和“olecranon,elbow,fracture dislocation,3D printing”.查阅收集大量文献,从解剖力学、损伤特点、诊断分型和手术治疗等方面分类整理和分析.结果 与结论:①鹰嘴、冠状突、桡骨头的解剖形态以及软组织之间的解剖力学特点影响着尺骨鹰嘴骨折-脱位的临床诊疗;②前、后脱位均有其自身损伤特点,同时易与孟氏骨折相混淆,准确把握体格检查与辅助影像检查有利于临床诊断;③手术入路中仍以后正中入路更为常用,必要时需联合其他入路;恰当固定修复骨与软组织,以及适时的辅助外固定架,均有利于改善尺骨鹰嘴骨折-脱位的临床疗效;④但是后方尺骨鹰嘴骨折-脱位的损伤机制还需更深层次探究,以及是否建立尺骨鹰嘴骨折-脱位独立分型尚需进一步讨论;鹰嘴后方间接固定冠状突的有效性问题,仍需进一步深入研究;⑤此外,兴起的 3D 打印技术对骨创伤术前规划和模拟操作具有重要意义,将会更有利于尺骨鹰嘴骨折-脱位临床诊疗工作的开展.

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67291

6. **Comparing machine and deep learning-based algorithms for prediction of clinical improvement in psychosis with functional magnetic resonance imaging**

作者：Smucny, J

文献来源：*Hum Brain Mapp*

摘 要 ： Previous work using logistic regression suggests that cognitive control-related frontoparietal activation in early psychosis can predict

symptomatic improvement after 1 year of coordinated specialty care with 66% accuracy. Here, we evaluated the ability of six machine learning (ML) algorithms and deep learning (DL) to predict "Improver" status (>20% improvement on Brief Psychiatric Rating Scale [BPRS] total score at 1-year follow-up vs. baseline) and continuous change in BPRS score using the same functional magnetic resonance imaging-based features (frontoparietal activations during the AX-continuous performance task) in the same sample (individuals with either schizophrenia (n = 65, 49M/16F, mean age 20.8 years) or Type I bipolar disorder (n = 17, 9M/8F, mean age 21.6 years)). 138 healthy controls were included as a reference group. "Shallow" ML methods included Naive Bayes, support vector machine, K Star, AdaBoost, J48 decision tree, and random forest. DL included an explainable artificial intelligence (XAI) procedure for understanding results. The best overall performances (70% accuracy for the binary outcome and root mean square error = 9.47 for the continuous outcome) were achieved using DL. XAI revealed left DLPFC activation was the strongest feature used to make binary classification decisions, with a classification activation threshold (adjusted beta = .017) intermediate to the healthy control mean (adjusted beta = .15, 95% CI = -0.02 to 0.31) and patient mean (adjusted beta = -.13, 95% CI = -0.37 to 0.11). Our results suggest DL is more powerful than shallow ML methods for predicting symptomatic improvement. The left DLPFC may be a functional target for future biomarker development as its activation was particularly important for predicting improvement.

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67290

7. **Letter to the Editor. Reply to Ahn JC, Connell A, Simonetto DA, Hughes C, Shah VH. The application of artificial intelligence for the diagnosis and treatment of liver diseases**

作者：Crax, L

文献来源：*Hepatology*

摘要：Among the forthcoming articles to be published in Hepatology, I noticed the extensive review by Ahn, Connell, Simonetto, Hughes & Shah concerning "The application of artificial intelligence for the diagnosis and treatment of liver diseases" [1]. As a bioethicist, I need to raise some concern about the perspective given by this review, which disregards some important issues concerning ethical aspects and patient-physician relationship.

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67293

8. **On the convergence of projective-simulation-based reinforcement learning in Markov decision processes**

作者：Boyajian, W L

文献来源：*Quantum Mach Intell*

摘要：In recent years, the interest in leveraging quantum effects for enhancing machine learning tasks has significantly increased. Many algorithms speeding up supervised and unsupervised learning were established. The first framework in which ways to exploit quantum resources specifically for the broader context of reinforcement learning were found is projective simulation. Projective simulation presents an agent-based reinforcement learning approach designed in a manner which may support quantum walk-based speedups. Although classical variants of projective simulation have been benchmarked against common reinforcement learning algorithms, very few formal theoretical analyses have been provided for its performance in standard learning scenarios. In this paper, we provide a detailed formal discussion of the properties of this model. Specifically, we prove that one version of the projective simulation model, understood as a reinforcement learning approach, converges to optimal behavior in a large class of Markov decision processes. This proof shows that a physically inspired approach to reinforcement learning can guarantee to converge.

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67292

9. Artificial neural networks and pathologists recognize basal cell carcinomas based on different histological patterns

作者：Kimeswenger, S

文献来源：*Mod Pathol*

摘要：Recent advances in artificial intelligence, particularly in the field of deep learning, have enabled researchers to create compelling algorithms for medical image analysis. Histological slides of basal cell carcinomas (BCCs), the most frequent skin tumor, are accessed by pathologists on a daily basis and are therefore well suited for automated prescreening by neural networks for the identification of cancerous regions and swift tumor classification.In this proof-of-concept study, we implemented an accurate and intuitively interpretable artificial neural network (ANN) for the detection of BCCs in histological whole-slide images (WSIs). Furthermore, we identified and compared differences in the diagnostic histological features and recognition patterns relevant for machine learning algorithms vs. expert pathologists.An attention-ANN was trained with WSIs of BCCs to identify tumor regions (n = 820). The diagnosis-relevant regions used by the ANN were compared to regions of interest for pathologists, detected by eye-tracking techniques.This ANN accurately identified BCC tumor regions on images of histologic slides (area under the ROC curve: 0.993, 95% CI: 0.990-0.995; sensitivity: 0.965, 95% CI: 0.951-0.979; specificity: 0.910, 95% CI: 0.859-0.960). The ANN implicitly calculated a weight matrix, indicating the regions of a histological image that are important for the prediction of the network. Interestingly, compared to pathologists' eye-tracking results, machine learning algorithms rely on significantly different recognition patterns for tumor identification ($p < 10(-4)$).To conclude, we found on the example of BCC WSIs, that histopathological images can be efficiently and interpretably analyzed by state-of-the-art machine learning techniques. Neural networks and machine

learning algorithms can potentially enhance diagnostic precision in digital pathology and uncover hitherto unused classification patterns.

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67300

10. Artificial Intelligence-Electrocardiography to Predict Incident Atrial Fibrillation: A Population-Based Study

作者：Christopoulos, G

文献来源：*Circ Arrhythm Electrophysiol*

摘要：Background - An artificial intelligence (AI) algorithm applied to electrocardiography (ECG) during sinus rhythm (SR) has recently been shown to detect concurrent episodic atrial fibrillation (AF). We sought to characterize the value of AI-ECG as a predictor of future AF and assess its performance compared to the CHARGE-AF score in a population-based sample. Methods - We calculated the probability of AF using AI-ECG, among participants in the population-based Mayo Clinic Study of Aging who had no history of AF at the time of the baseline study visit. Cox proportional hazards models were fit to assess the independent prognostic value and interaction between AI-ECG AF model output and CHARGE-AF score. Concordance (C) statistics were calculated for AI-ECG AF model output, CHARGE-AF score and combined AI-ECG and CHARGE-AF score. Results - A total of 1,936 participants with median age 75.8 (interquartile range [IQR] 70.4, 81.8) years and median CHARGE-AF score 14.0 (IQR 13.2, 14.7) were included in the analysis. Participants with AI-ECG AF model output of >0.5 at the baseline visit had cumulative incidence of AF 21.5% at 2 years and 52.2% at 10 years. When included in the same model, both AI-ECG AF model output (hazard ratio [HR] 1.76 per standard deviation (SD) after logit transformation, 95% confidence interval [CI] 1.51, 2.04) and CHARGE-AF score (HR 1.90 per SD, 95% CI 1.58, 2.28) independently predicted future AF without significant interaction (p=0.54). C statistics were 0.69 (95% CI 0.66, 0.72) for AI-ECG AF model output, 0.69 (95% CI 0.66, 0.71) for CHARGE-AF and 0.72 (95% CI 0.69, 0.75)

for combined AI-ECG and CHARGE-AF score. Conclusions - In the present study, both the AI-ECG AF model output and CHARGE-AF score independently predicted incident AF. The AI-ECG may offer a means to assess risk with a single test and without requiring manual or automated clinical data abstraction.

链接：http://pan.ckcest.cn/rcservice//doc?doc_id=67294

[专利]

1. **Vaginal temperature sensing apparatus and methods**

申请人：Prima Temp Inc

发明人：*Wade Webster*

摘要：Embodiments of a vaginal temperature sensing apparatus, a visually sense-able battery power-on indicator (16), manufacturing with cure temperatures that protect a battery, substantially error-free, user-initiated device activation componentry (30) to start battery power, and a timer to automatically terminate flow of battery power. Data can by an automatic data transform recalculator (138) with body temperature dips in transformed and recalculated diurnal high body temperatures predict an ovulation event and provide an indication through a zenith based ovulation indicator (106). Systems can include neural network based artificial intelligence to automatically self-improve by using historical or even other, multi user data and user input and improve its indication result.

链接：https://www.incopat.com/detail/init#1

2. **Applied artificial intelligence technology for hormone therapy treatment**

申请人：James Glenn Norman

发明人：*James Glenn Norman*

摘要：Disclosed herein are a number of techniques that systematically integrate a person' s biochemical, symptomatic, and genetic status to generate recommended hormone therapy treatment prescriptions.

链接：https://www.incopat.com/detail/init#2

[研究报告]

1. 人工智能在医疗行业中的应用前景

发布源：健康必读

发布时间：2020 年

摘要：近些年来,随着科学技术的不断发展,人工智能领域的发展也呈现出多元化的趋势.机器学习和深度学习应用领域的拓展以及大数据的兴起使得人工智能的应用领域变得越来越广泛.目前,人工智能在医疗行业中已经得到了广泛的应用,本文将对其应用前景进行分析,希望可以为其持续健康发展提供一定的参考借鉴.

链接：
http://d.wanfangdata.com.cn/periodical/ChlQZXJpb2RpY2FsQ0hJTmV3UzIwMjAxMDI4EhBqa2JkMDAxMjAyMDAyNTcyGghkbmVlempyaw%3D%3D

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