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THE MANY WAYS THAT AI ENTERS RHEUMATOLOGY

Human intelligence exhibited by machines

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Artificial intelligence (AI) is entering the mainstream. The term encompasses a wide variety of machines that can learn from data, identify patterns, and make decisions. But how can it support in healthcare? EULAR – The European Alliance of Associations for Rheumatology – has picked a number of abstracts for its 2025 congress in Barcelona that showcase how AI is influencing different areas in rheumatology – from diagnosis through to monitoring, risk prediction, and patient communication.

High-resolution computed tomography (HRCT) is the standard to diagnose and assess progression in interstitial lung disease (ILD), a key feature in systemic sclerosis (SSc). But AI-assisted interpretation has the potential to improve the quantification and characterisation of SSc-ILD, making it a powerful tool for monitoring. Francesca Motta offered new data from an observational study pitting AI-assisted analysis against two radiologists with expertise in thoracic imaging. Results showed that the AI outperformed visual scoring in assessing the progression of fibrosis in patients with SSc-ILD, and showed more significant correlation with values from pulmonary function tests – enabling detection of subtle changes over time.

Seulkee Lee also presenting findings around AI in diagnosis, investigating a deep learning model that integrates inflammatory and structural changes in sacrum MRI to address the gap between detection of bone marrow oedema (BME) and clinical diagnosis of axial spondyloarthritis. An end-to-end deep learning framework was developed, using short tau inversion recovery (STIR) and T1-weighted MRI sequences to reflect inflammatory and structural changes, respectively. Using data from 291 patients, the classification model demonstrated high sensitivity specificity, and accuracy. Of note, it was able to identify 6 out of 9 patients who met clinical but not ASAS-defined positive MRI criteria – indicating its ability to detect features beyond conventional criteria. These findings highlight the potential of AI not only to detect specific imaging features but also to predict clinical diagnoses, suggesting promising application in real-world clinical practice.

Also in the field of imaging, Claus Juergen Bauer and colleagues explored the role of a supervised deep learning model in ultrasound – specifically to assist in image classification for the presence or absence of lesions typical of giant cell arteritis. The developmental dataset included 3,800 images from 244 patients. The model outperformed two comparators, with superior diagnostic performance for both the axillary and superficial common temporal arteries – with the exception of smaller branches of the superficial temporal artery that demonstrated lower performance, reflecting inherent diagnostic challenges. Future work will focus on expanding datasets and incorporating multi-centre validation to optimise detection in smaller arteries, and enhance model generalisability.

Turning to risk factor identification, Antonio Tonutti showcased results from two machine learning models that were developed and tuned to predict interceptable cancers (those diagnosed syncronously or after the first non-Raynaud symptom) in people with SSc using clinical,

serological, and treatment data. Breast cancer was the most common malignancy (32%), followed by lung (16%), gynaecological (8%), colorectal (7.5%), and haematological cancers (7%). The models appeared to have good performance and accuracy of 73–79%, although there were differences in sensitivity, precision, and specificity between the two, with no one model winning out over the other in all parameters. Key predictors identified included baseline ILD, digital ulcers, oesophageal involvement, telangiectasia, and high CRP, while taking mycophenolate mofetil was protective in both models. Finetuning and validation of these AI models could offer hope for personalised screening strategies to improve early cancer detection in SSc patients.

Another group shared work on using large language models for risk assessments. Pallavi Vij and colleagues evaluated the effectiveness of these models and prompt engineering techniques in delivering osteoporosis care guidance through case-based scenarios to assess capability in risk stratification, treatment recommendations, and referral decisions in accordance with national guidelines. Findings suggest promising utility for risk stratification and referral triage – potentially reducing administrative burden. However, there was lower concordance in treatment recommendations, which highlights the necessity of clinical expertise for therapeutic decision-making. Further validation studies are needed to evaluate real-world implementation, workflow integration, and cost-effectiveness of these kinds of AI tools.

Marco Capodiferro presented a piece on digital biomarkers – based on a multicentric European cohort (Lausanne, Bari, Bern) – looking at how advances in deep learning and computer vision might provide opportunities to simplify hand-motion tracking via smartphones – offering significant potential for remote assessment of disease activity in rheumatoid arthritis. Participants in the study performed five rapid finger flexions with their dominant hand while being recorded on a smartphone camera. The algorithm quantified joint angle changes and time to maximal flexion to analyse kinetic variables. Findings suggest significant associations between these kinetic features and clinical measures, and the model was able to robustly predict low disease activity and remission. This technology offers a promising avenue for telemedicine and remote monitoring, complementing subjective assessments with objective metrics.

Finally, social robots might be able to carry some of the burden of patient communication – an important element of quality healthcare that can be impacted by time constraints and service overload. Daan van Gorssel reported on the potential of an AI-reinforced social robot to serve as an information tool for rheumatology patients. Through natural language processing and machine learning, the robot aims to address common patient questions, deliver accurate medical information, and enhance health literacy. Patients seem to find the robot acceptable, and appreciated its ability to provide information and respond to questions, but suggested that the communication style might need to be adjusted for different educational levels. Healthcare professionals generally also viewed the robot as being both acceptable and useful, particularly in areas such as patient education, triage, and routine follow-up, but expressed concerns about replacing human interaction, particularly where empathy and personalised care are crucial.

Source

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About EULAR

EULAR is the European umbrella organisation representing scientific societies, health professional associations and organisations for people with rheumatic and musculoskeletal diseases (RMDs). EULAR aims to reduce the impact of RMDs on individuals and society, as well as improve RMD treatments, prevention, and rehabilitation. To this end, EULAR fosters excellence in rheumatology education and research, promotes the translation of research advances into daily care, and advocates for the recognition of the needs of those living with RMDs by EU institutions.

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