INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Software using GPR to Predict Patient Outcomes

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OVERVIEW

A powerful software tool uses advanced machine learning to accurately predict patient response to anti-TNF therapy in rheumatoid arthritis by integrating clinical and genetic data.

- Combines routine clinical markers and selected genetic information to identify likely responders and non-responders before therapy begins.
- Offers rheumatologists a decision-support tool to avoid costly and ineffective treatments, targeting a significant unmet need in precision medicine.

BACKGROUND

Rheumatoid arthritis (RA) is a chronic autoimmune disease affecting millions worldwide, with treatment often requiring trial-and-error selection of drugs. Anti-TNF therapies represent a major second-line treatment, but up to 30% of patients see little benefit, enduring persistent disease and unnecessary side effects while incurring high costs. Identifying in advance who will or will not respond remains a major challenge, as simple clinical factors or genetic markers alone have proved insufficient; extensive patient heterogeneity complicates efforts to develop robust predictive tools. The market for precision, personalized approaches to drug selection is growing rapidly alongside rising healthcare costs, and payors as well as providers are demanding more data-driven solutions that improve outcomes and reduce waste.

INNOVATION

Our software leverages Gaussian process regression (GPR), a machine learning approach that learns from thousands of RA patients' clinical histories and genetic profiles. Instead of relying on fixed rules or narrow biomarkers, the software analyzes the similarities between new patients and large-scale, anonymized reference data to find patterns and subgroups. This approach accommodates the complex differences seen across real-world populations, enabling accurate predictions for change in disease activity and risk of non-response. Unlike current models, our software integrates both clinical and genetic data, and outperformed all competitors in an international RA prediction challenge. The innovation lies in its ability to tailor predictions to each patient's unique combination of markers, providing actionable results to physicians and researchers that have not been attainable with simpler statistical methods.