# AI framework developed to diagnose multiple diseases from a single blood sample



In a significant advancement in the field of medical diagnostics, researchers have developed an artificial intelligence framework capable of diagnosing multiple diseases from a single blood sample. This system, known as the machine learning for immunological diagnosis (Mal-ID), represents a fusion of DNA sequencing and machine learning technology. The study detailing this innovative tool was published in the journal Science on February 20.

The collaborative effort was led by researchers from Stanford University and the University of Cambridge. According to Dr Maxim Zaslavsky, who oversees a research team at Stanford, the Mal-ID framework leverages the immune system’s records of past infections, diseases, and vaccinations, potentially enabling clinicians to use a single blood test for multiple diagnoses. He stated, "Our study shows it’s possible to unlock the hidden information in immune receptor sequences in a robust way for many different types of diseases and immune states," as reported by Inside Precision Medicine.

The tool works by analysing the gene sequences that encode the receptors of B and T cells, which are crucial components of the immune system. B cells produce antibodies to fight infections, while T cells are responsible for killing infected cells or activating other immune responses. This analysis allows the AI to identify immune system activity and patterns associated with various diseases, including COVID-19, HIV, lupus, and type 1 diabetes, and even those conditions for which there are currently no definitive tests.

In conducting the research, Zaslavsky’s team analysed samples from 542 participants, achieving a high accuracy rating of 0.986 for their diagnostic predictions. The team combined both B-cell and T-cell receptor data to yield the most accurate results, noting that autoimmune diseases like type 1 diabetes and lupus displayed distinct patterns in T-cell receptor sequences, while infections were more accurately identified through B-cell receptor data.

Lead researcher Sarah Teichmann, a molecular biologist at the University of Cambridge, described the potential of the tool, explaining that it captures "everything that your immune system has been exposed to", allowing for a comprehensive understanding of an individual's health status. This development could reshape the approach to diagnosing overlapping conditions and managing complex diseases, as highlighted by Zaslavsky: "What we have today is a proof of concept and requires further validation."

Although the tool has shown promising results in research settings, experts emphasise that it is not yet ready for clinical application. Victor Greiff, a computational immunologist at the University of Oslo, pointed out that the AI tool must demonstrate superior performance compared to existing diagnostic methods to gain acceptance in medical practice.

The possibilities of the Mal-ID system extend beyond mere diagnosis; it may also pave the way for personalised treatments. Immunologist Scott Boyd from Stanford University School of Medicine suggested that investigating cases where the AI misclassifies diseases could uncover undetected subcategories of immunological conditions, facilitating more tailored therapeutic strategies for patients.

As the research progresses, the goal remains to validate and enhance the current findings, potentially transforming the landscape of diagnostic medicine by providing a powerful tool in the identification and management of various diseases.

Source: [Noah Wire Services](https://www.noahwire.com)

## References

* <https://www.miragenews.com/ai-boosts-immunological-disease-diagnosis-1412348/> - This article supports the development of the Mal-ID framework, which uses machine learning to analyze immune receptor datasets for diagnosing various diseases. It highlights the framework's high accuracy in identifying distinct disease states.
* <https://www.insideprecisionmedicine.com/topics/precision-medicine/machine-learning-unlocks-immune-system-secrets/> - This source corroborates the Mal-ID system's ability to unlock immune system secrets by analyzing B and T cell receptor sequences, potentially leading to a single blood test for multiple diagnoses.
* <https://pubmed.ncbi.nlm.nih.gov/35547855/> - This publication details the development of Mal-ID, an interpretive framework for screening multiple illnesses using immune receptor datasets. It emphasizes the tool's potential for precise diagnosis of infections and autoimmune disorders.
* <https://www.noahwire.com> - This source provides an overview of the Mal-ID system's development and its potential to transform diagnostic medicine by leveraging AI and DNA sequencing.
* <https://www.science.org> - Although not directly linked, this is the journal where the study detailing the Mal-ID framework was published, supporting the claim that the research was published in a prestigious scientific journal.
* <https://www.stanford.edu> - This is the website of Stanford University, where Dr. Maxim Zaslavsky leads a research team involved in the development of the Mal-ID framework, supporting the involvement of Stanford researchers in the project.