# New AI tool MUNIS revolutionises vaccine development



A significant advancement in vaccine development has emerged from a collaboration between the Ragon Institute and the Jameel Clinic at MIT. Researchers have introduced MUNIS, a deep learning tool aimed at predicting CD8+ T cell epitopes with exceptional accuracy, as detailed in a recent publication in *Nature Machine Intelligence*.

The project, notable for being the first major outcome from the Mark and Lisa Schwartz AI/ML Initiative at the Ragon Institute, seeks to utilise cutting-edge artificial intelligence (AI) and machine learning alongside translational immunology to tackle infectious diseases that pose a considerable risk globally. Leading the research are Ragon faculty member Gaurav Gaiha, MD, DPhil, and MIT Professor Regina Barzilay, PhD, who spearheads the AI initiatives at the Jameel Clinic for AI and Health.

The research team, co-led by first authors Jeremy Wohlwend, PhD, and Anusha Nathan, PhD, aimed to overcome the challenges of vaccine development, particularly regarding the efficient identification of T cell epitopes in various pathogens. Epitopes are integral to the immune response, allowing the body's immune cells to recognise and combat foreign agents. Traditional techniques for predicting these epitopes, however, have often been hindered by limitations in both speed and precision.

MUNIS has been developed using a comprehensive dataset encompassing over 650,000 unique human leukocyte antigen (HLA) ligands combined with advanced AI methodologies. The new tool demonstrated superior performance compared to existing epitope prediction models and was validated with experimental data from viruses such as influenza, HIV, and Epstein-Barr virus (EBV). Notably, MUNIS successfully identified novel immunogenic epitopes in EBV, which has drawn considerable attention from researchers for its intricate behaviour.

A particularly remarkable aspect of MUNIS is its accuracy, which has approached levels typically achieved through experimental stability assays, signifying its potential to alleviate laboratory workloads and enhance vaccine design processes.

In discussing the collaboration, Barzilay remarked, “This is our first paper at the intersection of AI and immunology. Through this collaboration with Dr. Gaiha and his team, we learned a lot about this fascinating field and are excited about the immense possibilities in using AI algorithms to model the intricacies of the immune system.” Gaiha also highlighted the benefits of this partnership, stating, “This is a wonderful application of artificial intelligence that benefited greatly from insights shared by both computer scientists and immunologists.”

The development of MUNIS exemplifies the integration of diverse expertise to innovate in the complex field of immunology. Its potential applications extend beyond vaccine research into vital areas such as cancer T cell immunotherapy and autoimmunity research, offering a formidable strategy for managing emerging infectious diseases.

The Ragon Institute continues to pursue advancements that bridge immunology and technology, thus contributing to global health and the ongoing battle against infectious diseases. In conclusion, MUNIS represents a pivotal step towards enhancing the methodologies employed in vaccine development, promising to make significant impacts in various fields of health sciences.

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

## References

* <https://bioengineer.org/harnessing-ai-to-enhance-vaccine-development-a-breakthrough-in-t-cell-epitope-prediction-by-ragon-institute-and-mit/> - This article provides detailed information about the collaboration between the Ragon Institute and MIT's Jameel Clinic, focusing on the development of MUNIS for predicting CD8+ T cell epitopes.
* <https://www.nature.com/journals> - This is the homepage for Nature journals, where the publication detailing MUNIS and its applications in vaccine development is likely featured.
* <https://ragoninstitute.org/> - The official website of the Ragon Institute, which provides background information on their mission and research initiatives, including collaborations with other institutions.
* <https://jameelclinic.mit.edu/> - The Jameel Clinic at MIT is involved in AI research for health, and this site offers insights into their projects and collaborations.
* <https://www.noahwire.com> - The source article was mentioned to be from Noah Wire Services, but no specific URL is provided for the article itself.
* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1234567/> - This is a placeholder for scientific articles related to T cell epitope prediction and vaccine development. Actual articles would need to be searched based on specific keywords.
* <https://www.immune.org/> - General information on immunology and vaccine development can be found on websites related to immunology research.
* <https://www.who.int/news-room/q-and-a/detail/vaccines-and-immunization> - The World Health Organization provides information on vaccines and immunization strategies, which can support discussions on vaccine development advancements.
* <https://www.cancer.gov/research/cancer-statistics> - For information on cancer research and potential applications of T cell immunotherapy, this site offers relevant data and insights.