

# An End-to-End Platform for Discovering and Validating Clinically Actionable Tumor Antigens

**A unique platform that combines comprehensive tumor antigen discovery with direct validation of HLA-presented peptides, bridging the gap between predicted targets and clinically actionable opportunities in immunotherapy and diagnostics.**

## Technology

This integrated platform (ImmunoVerse), developed by Dr. Yarmarkovich's lab at NYU Langone Health, enables the discovery and direct validation of clinically actionable tumor antigens, with built-in prioritization to support downstream immunotherapy and diagnostic development.

The discovery engine systematically analyzes tumor RNA-Seq data across diverse molecular events to uncover a broad repertoire of both canonical and non-canonical tumor antigens, significantly expanding the targetable landscape for immunotherapy. This approach has been validated across 21 cancer types, identifying over 15,000 tumor-specific antigens.

In parallel, the immunopeptidomics platform directly identifies HLA-presented peptides from patient tumors, including tumor- and microbial-derived antigens, ensuring biological and clinical relevance. Notably, in ovarian cancer patients, this approach uncovered peptides derived from a previously unrecognized tumor-associated bacterial strain (*N. circulans*), which were independently validated by LC-MS/MS spectral matching and orthogonal qPCR in freshly resected tumors.

Together, this integrated approach bridges the gap between predicted and truly presented antigens, enabling the discovery of novel, previously overlooked targets and supporting the development of next-generation immunotherapies, including neoantigen vaccines, TIL expansion, CAR-T, and TCR-based therapies. The immunopeptidomic platform can be accessed at <https://immuno-verse.com/>.

## Background

Current antigen discovery approaches often fail to translate clinically because they rely on predictions without confirming immune presentation. At the same time, there is a critical need for better biomarkers and early detection strategies, particularly in cancers with poor prognosis.

By integrating transcriptomic and immunopeptidomic data, this platform expands the antigen landscape while ensuring that identified targets are biologically relevant and actionable.

## Development Stage

Ongoing work is focused on clinical translation, including liquid biopsy applications and therapeutic development. NYU is seeking partners to advance this platform for immunotherapy,

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diagnostics, and vaccine development.

## Applications

- **Immunotherapy and vaccine development:** Identification and prioritization of validated tumor antigens for CAR-T, TCR, TIL therapies, and peptide-based vaccines.
- **Diagnostics and liquid biopsy:** Development of highly specific biomarkers and blood-based assays using HLA-presented peptides.
- **Precision oncology and biomarkers:** Patient stratification, treatment selection, and monitoring based on tumor-specific antigen profiles.

## Advantages

- **End-to-end platform:** Integrates antigen discovery with direct validation of HLA-presented peptides.
- **Expanded target space:** Captures canonical, non-canonical, and microbial-derived tumor antigens.
- **Clinical relevance:** Focuses on antigens actually presented on tumor cells, improving translational potential.
- **Versatility and scalability:** Applicable across tumor types and compatible with existing workflows.

## Intellectual Property

NYU has filed patent applications covering the integrated computational and immunopeptidomic platform and its applications in cancer diagnostics and therapeutics. Importantly, NYU has developed intellectual property across the full workflow, including target discovery, pMHC-focused library design, binder screening, and CAR engineering, enabling a fully integrated platform from discovery to therapeutic development.