# How AI is reshaping pharmaceutical R&D

The complex industry/academia/government research framework involved in discovering and developing new therapeutic products makes drug discovery an extremely laborious and costly exercise.

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Developing a single new therapeutic involves an average cost of $2.6bn, with 97% of all drug discovery programmes failing. Consequently, more than 60% of known diseases remain untreatable. Life sciences companies, meanwhile, are making rapid strides in the fields of gene and cell therapies, omics technologies, and smart molecules approaches, creating an urgent need for advanced, cost- and time-effective technologies that can parse large databases of information to help develop novel therapies.

“Pharmaceutical companies are increasingly recognising the value of deploying artificial intelligence (AI)-based platforms that can leverage data regarding gene mutations, protein targets, signaling pathways, disease events, and clinical trials to find hidden drug-disease correlations,” says Cecilia van Cauwenberghe, associate fellow and TechVision senior industry analyst at Frost & Sullivan. "This technology will enable scientists to derive structured and unstructured data from multiple sources as never before. Strategic collaborations with AI-driven companies can help large pharmaceutical companies establish a robust, AI-based pipeline as part of their portfolios and address new therapeutic areas."

AI-driven tools are encouraging companies to develop therapies for severely underserved areas and are also paving the way for precision medicine through a stratified therapeutics discovery and development approach. Collaborations among database holders, AI developers, and drug manufacturers will facilitate the early development of multiple therapeutics, even those focused on treating rare and chronic diseases.

AI-based technology companies are also empowered to make the most of scientific results and learning systems synergy to ensure a successful clinical translation of therapeutic, diagnostic, and theranostic developments.

Some of the key applications of AI technologies in pharmaceuticals include:

- ## Drug development:

  Aids in disease modelling, drug design and development, lead identification, and drug repurposing.

- **Candidates' validation:** Helps design and run pre-clinical trials, in silico/in vitro/in vivo studies, and investigational new drug (IND) process.
- **Clinical trials:** Supports all processes, from designing the trial to patient identification through data collection, analysis, and report generation.
- **Regulatory approval:** Facilitates the approval of application and process, labelling, and safety updates.
- **Precision medicine:** Accelerates the development of preventive and personalised care, treatment surveillance, and omics adaptive models.

"Overall, there is a profound and growing scientific understanding of many metabolic and signalling pathways, especially at molecular and genomic levels, which encourages the use of sophisticated technologies to develop ground-breaking therapies," says Van Cauwenberghe. "As the underlying causes of many diseases remain vague and imprecise, AI-based approaches have emerged as the ideal mechanisms for finding novel treatments."