

Nanobioinformatics and its application

Shashank Rana

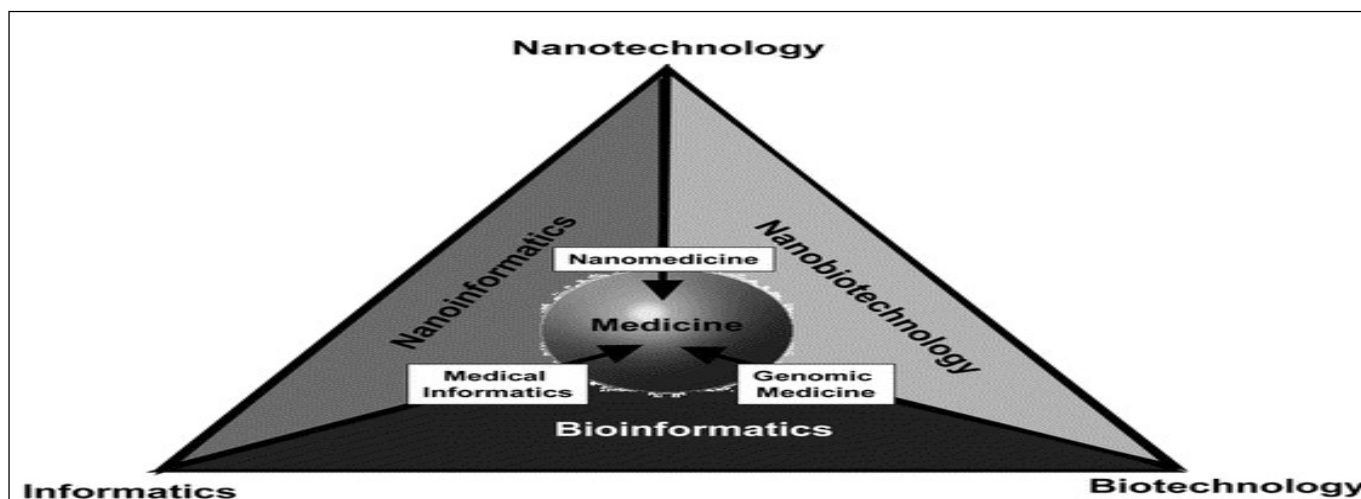
Department of Microbiology, Chaudhary Charan Singh University Campus, Meerut (U.P.) India

(Email : shashank.bioinfo@gmail.com)

Nanoinformatics is the application of informatics to nanotechnology. Nanoinformatics is a newly emerging informatics area, working at the intersection between informatics (computer science and information technologies), nanotechnology, medicine and established areas such as biology, chemistry and physics. The first large official meeting in the field was held in Virginia in 2007, with support from the US National Science Foundation (NSF). Nano bioinformatics, or bionanoinformatics, is proposed as a new informatics discipline by some specialists and science groups in BioMedical Informatics. Nanobioinformatics cover the fields of nanotechnology (e.g., nanobiological particle, Nanomedicine) and Bioinformatics (e.g., genomics and proteomics) and deal with problem related to the approach of understanding the complex biological system and disease network in medicine, the analysis of high throughput genomics data, Nanobiology and computer added drug design etc. applications. Nanoinformatics has newly appear to address the need of computing applications at the nano level. The prefix nano is from the Greek word meaning dwarf. Nanoinformatics can accelerate the introduction of nano-related research and applications into

clinical practice, leading to an area that could be called “translational nanoinformatics.” Nanoinformatics aims to represent and work with information at the nano level. Nanoinformatics adds areas such as advanced quantum physics and chemistry, including nanotoxicity, with new models of imaging and pharmacodynamics, which go beyond traditional research and curricula in Biomedical information (BMI). Future professionals with expertise in nanoinformatics may have an important role to play as information brokers, connecting people with diverse backgrounds and expertise who would, otherwise, have a difficult time understanding each other. In such futuristic academic programmes for nanoinformatics/nanomedicine, informatics methods and tools could play a central role for students and professionals by helping understand and manage the new concepts needed, without having to become quantum physicists or chemists.

Application: Nanoinformatics has applications for improving workflows in fundamental research, manufacturing and environmental health, allowing the use of high-throughput data-driven methods to analyze broad sets of experimental results. Nanoinformatics is especially useful in nanoparticle-based cancer diagnostics and



Source-(<https://www.nature.com/articles/pr201088/figures/1>)

Fig. 1: A pictorial representation of nanoinformatics with nanobiotechnology and bioinformatics

therapeutics. They are very diverse in nature due to the combinatorially large numbers of chemical and physical modifications that can be made to them, which can cause drastic changes in their functional properties. Nanoinformatics can enable structure–activity relationship modelling for nanoparticle-based drugs. Nanoinformatics and biomolecular nanomodeling provide a route for effective cancer treatment. Nanoinformatics deconstructs experimental studies using data, metadata, controlled vocabularies and ontologies to populate databases so that trends, regularities and theories will be uncovered for use

as predictive computational tools. At present, nanoinformatics is an extension of bioinformatics due to the great opportunities for nanotechnology in medical applications, as well as to the importance of regulatory approvals to product commercialization. In these cases, the models target, their purposes, may be physico-chemical, estimating a property based on structure (quantitative structure–property relationship, QSPR); or biological, predicting biological activity based on molecular structure (quantitative structure–activity relationship, QSAR).

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