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AI and Nanotechnology for Healthcare: A survey

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ABSTRACT (10 PT)

AI is today's wave of technology, and it caters to various problems. One of them is Nanotechnology. Nanotechnology is another thread of technology. The use of nanotechnology is well known, including in the health sector, cosmetic industry, and agriculture. The role of AI in healthcare is broad, from detecting lung disease to skin analysis. This study aims to explore healthcare possibilities by integrating AI and nanotechnology. The method of applying nanotechnology in the health sector uses a Nanomedicine Microscope. Nanomedicine is the medical application of nanotechnology used to diagnose, monitor, and control biological systems. Therefore, the author uses the Nanomedicine Microscope as the object in this study because the wonders of nanotechnology in various operations are also well established. The novelty in this paper focuses on AI and Nanotechnology together as possibilities for healthcare. AI and nanotechnology are two critical technologies. The ultimate goal is to integrate the uses and possibilities of these two technologies and do wonders in the healthcare domain. This study will benefit those working in AI and medicine. Nanotechnology integrating AI technology into the medical industry enables many conveniences, including task automation and analyzing large amounts of patient data for better, faster, and more affordable healthcare.

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1. INTRODUCTION

Artificial intelligence (AI) is defined as the intelligence of machines instead of the intelligence of humans or other living species[1]. AI has shown its potential in various fields, including online shopping, marketing, intelligent cars, social media, surveillance, and customer service [2]. Healthcare is an emerging field where medical professionals use it extensively to solve medical problems such as diseases diagnosis [3], end-to-end drug discovery, improving communication between doctor and patient[4], transcribing medical documents such as prescription, and remotely treating patients [5]. With the emergence of Nanotechnology, the power of AI has increased tremendously, especially in the field of healthcare [6]. Nanotechnology or nanoscience refers to the research and development of applied science at the atomic or molecular level (i.e., molecular engineering, manufacturing)[7]. Integration of AI and nanotechnology can open ways for various technological developments and a large variety of disciplines[8]. This paper aims to explore possibilities for healthcare by integrating AI and nanotechnology[9]. The following section discusses how the healthcare system has made significant improvements by integrating AI and nanotechnology[10]. Nanotechnology is the creation of functional materials, devices, and systems through the manipulation of matter at a length scale of 1–100 nm"[11]. DNA Manipulation and Gene Therapy, drug delivery, and nanofibers are areas where nanotechnology has delivered results[12][13].

2. METHOD

a. Using Nanotechnology to Predict Personalized Drug Potency

Personalized drug discovery is the need of the hour as we can see multiple cases where acute situations can be tackled only when this objective is adequately addressed [14].

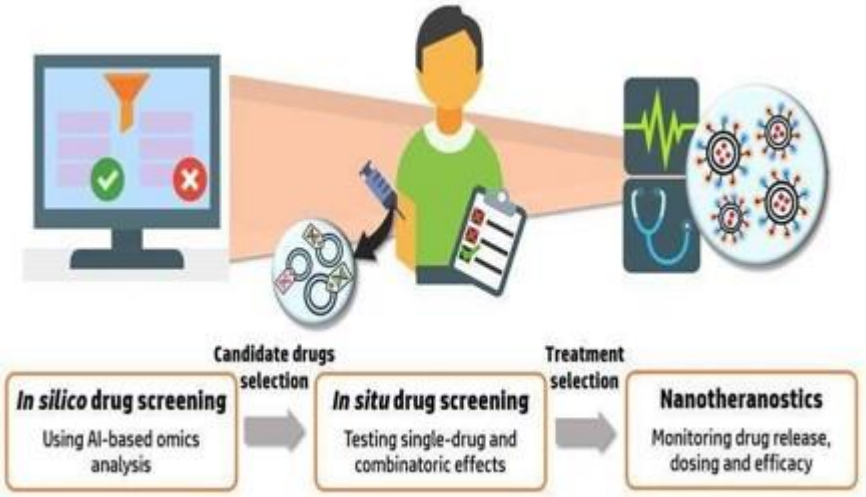

Figure 1. Exploiting AI and nanomedicine for tailoring a patient-specific treatment regime

b. Microscopy

Although a significant advance has been made in microscopy, getting high-quality signals from these devices[15]. The main reason is that these images possess tips to possess sample complex interactions [16], vary, and are difficult to decipher. This is where AI can be beneficial in dealing with signal-related issues[17].

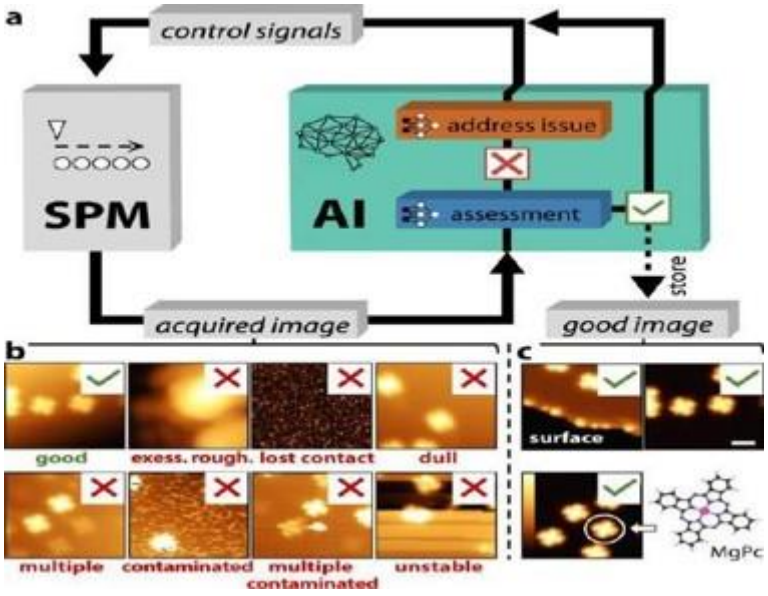

Figure 2. Schematic of Deeps, a machine learning (ML)-based AI system for autonomous scanning probe microscopy operation

c. Computation in Nanotherapeutics - Targeting and Personalized Dosing

Integrating the power of AI and nanotechnology is giving rise to various solutions in the medical domain[18][19]. Finding out precision cancer medicine, improving vascular hypertension, tumor diagnosis, etc., are the use cases and potential of this combination[20].

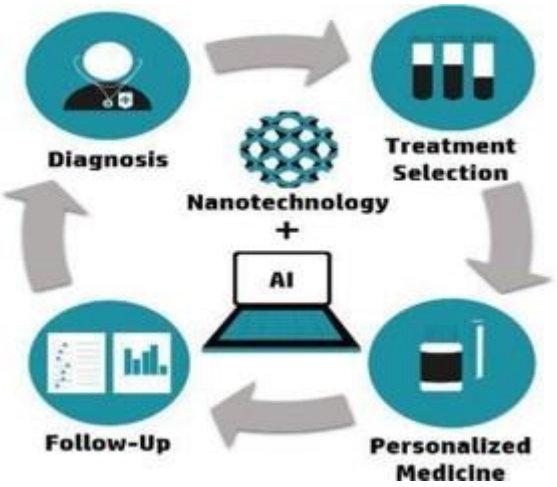

Figure 3. AI and nanotechnology integration

d. Deciding when to use Nanomedicine Microscopy

Medical experts can decide the need for nanomedicine microscopy based on their experience and practice[21][22]. AI can be helpful to assist them in terms of making accurate decisions where experience can join hands with added experience into machines[23]. This concept has been derived in Biomedical imaging and is relatively stable now[24][25].

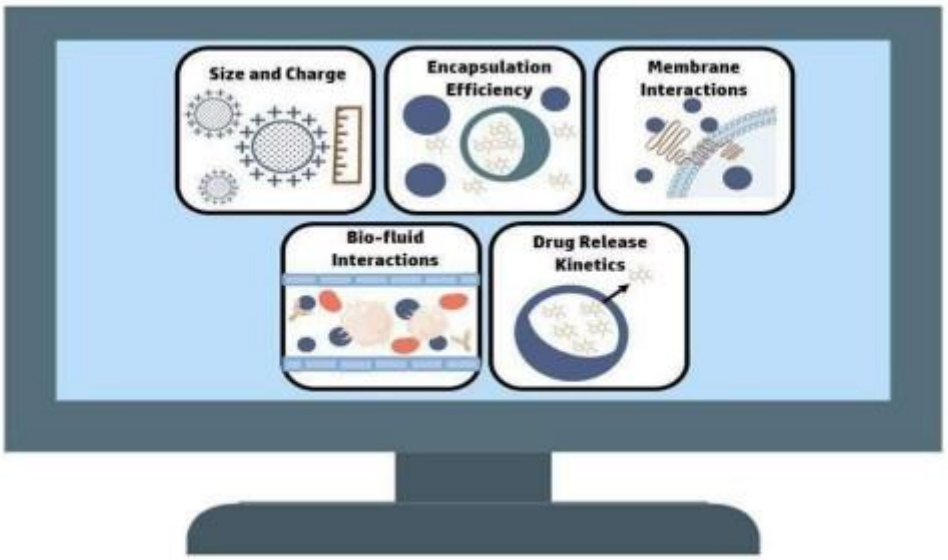

Figure 4. Computational methods contribute to various aspects of nanoparticle design

3. CONCLUSION

AI and nanotechnology are two critical technologies[26]. The ultimate goal is to integrate the uses and possibilities of these two technologies and work wonders in the healthcare domain[27]. The world is focused on medical possibilities and has understood the importance of health after COVID-19. It is time to write time to put effort at this crossroads. This research will benefit those working in AI and medicine[28][29]. Future research is expected to find personalized medicine is the current need because we can see many cases where acute situations can be handled only if these goals are adequately handled[30]. Integrating the power of AI and nanotechnology gives rise to various solutions in the medical domain[31].

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