BÖLÜM 10

İlaç Taşıyıcı Sistemlerin Gelişiminde Yapay Zeka Uygulamaları

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Giriş

Genel olarak ilaç taşıyıcı sistemler, herhangi bir hastalığın tedavisinde kullanılan etken maddeleri yardımcı materyaller ve sistemler aracılığı ile vücuda taşıyan teknolojileri ifade eden geniş bir araştırma alanıdır. Bu teknolojiler; çözelti, tablet, kapsül, merhem, emülsiyon gibi klasik sistemlerden mikro sistemlere ve benzersiz yapısal, kimyasal, mekanik, manyetik, elektriksel ve biyolojik özellikler sergileyen nano ölçekli boyuta sahip yapılara uzanan geniş bir yelpaze sunmaktadır. Ayrıca oral kullanım ya da aşı teknolojileri gibi uygulama yollarını ve tüm vücudu etkileyen etkin maddeleri sistemik olarak vermek yerine, lokal uygulamayı da kapsamaktadır. Kaliteli, etkili ve güvenli bir terapötik etkinlik elde edebilmek için kullanılabilecek sistem ve yaklaşımların çeşitliliği günümüzde teknolojik ilerlemelerle paralel olarak inanılmaz bir hızla büyümektedir. Bir ilaç molekülünün etkinliği ve güvenliliği onun saf halinden benzersiz bir taşıyıcı sistemine dönüştürerek büyük ölçüde geliştirilebilir ve doğru tasarlanmış bir ilaç taşıyıcı sistem ile biyoyararlanımda artış, yan etki ve toksisitede azalma, hasta uyuncunda artış ya da tamamen yeni tıbbi tedavileri mümkün kılma gibi avantajlar elde edilebilir.

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aşamaları etkin maddeye, yardımcı maddelere, ortam ve işlem koşullarına bağlı karmaşık bir süreçtir. Ayrıca nano ilaç taşıyıcı sistemlerin kimyasal bileşimi, yükleme etkinliği, boyut ve dağılımı, şekli, yüzey modifikasyonları gibi fizikokimyasal özelliklerinin tayini için kapsamlı analiz tekniklerinin uygulanması gereklidir. Bu nedenle nano ilaç taşıyıcı sistemlerin çok bileşenli yapısı amaçlanan fizikokimyasal özellikler, biyolojik davranışlar ve farmakolojik profillerle tutarlı bir ürün elde etmek için dikkatli tasarım ve mühendislik gerektirmektedir. Yapay zekâ uygulamalarının karmaşık ve yapılandırılmamış verilerle başa çıkmadaki avantajı göz önünde bulundurulduğunda ilaç taşıyıcı sistemlerin geliştirilmesinde nanoteknolojik uygulamalarla bir arada ele alınması süreci kolaylaştırmak için çok uygundur. Yapay zekâ, makine öğrenimi ve derin öğrenme gibi yaklaşımların nanoteknoloji ile entegrasyonu potansiyel olarak önceden tanımlanmış işlevselliklere sahip yüksek verim ile formüle edilmiş ilaçların rasyonel tasarımını ve gelişimini hızlandırabilir (40, 41).

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