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Innovation Centre for Education

Data-Driven Drugs Discovery & Development

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Presentation Outline



Today's Topics >



Introduction >

Drugs Development & Discovery >

Data Science in Drugs Classification >

Challenges for Drugs Development >

Benefits of Drugs Discovery >

Need & Real Life Impact of Drug
Development >



Introduction

- Data science revolutionizes medication discovery and development.
- The reliance on vast datasets from genomics, proteomics, and clinical trials.
- Accelerates drug candidate identification and personalized treatment.
- Addresses challenges and ethical considerations associated with data-driven approaches.
- Highlights the transformative impact on healthcare outcomes.
- Discovers the potential of data-driven methodologies in advancing medical research and treatment delivery.



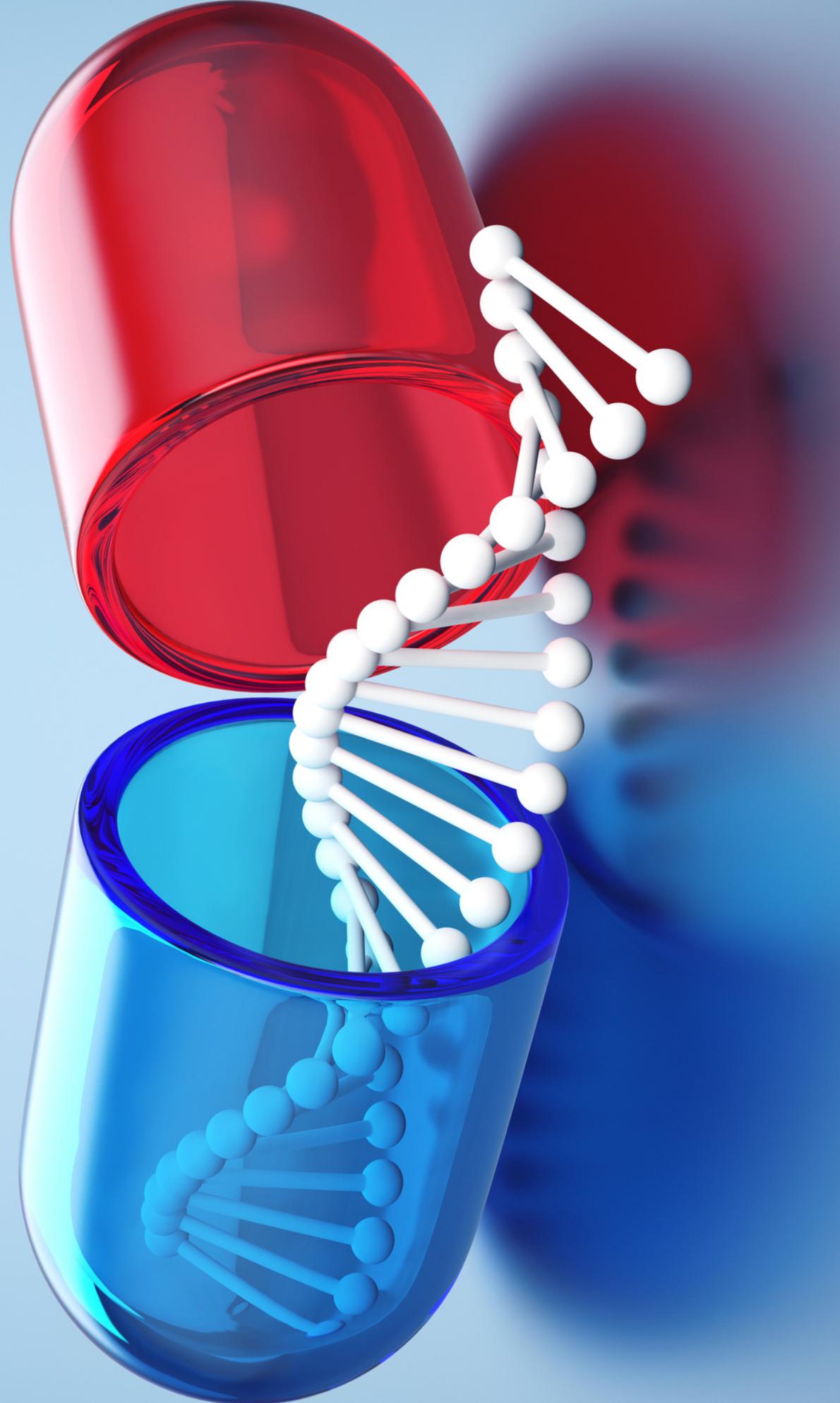
Drugs Discovery & Development

- **Process Overview:** Drug discovery and development involves identifying, testing, and refining pharmaceutical compounds to create effective medications.
- **Stages:** It progresses through discovery, preclinical testing, clinical trials, regulatory approval, and post-marketing surveillance phases.
- **Role of Data:** Data guides decision-making, experimental design, and outcome prediction throughout the process.



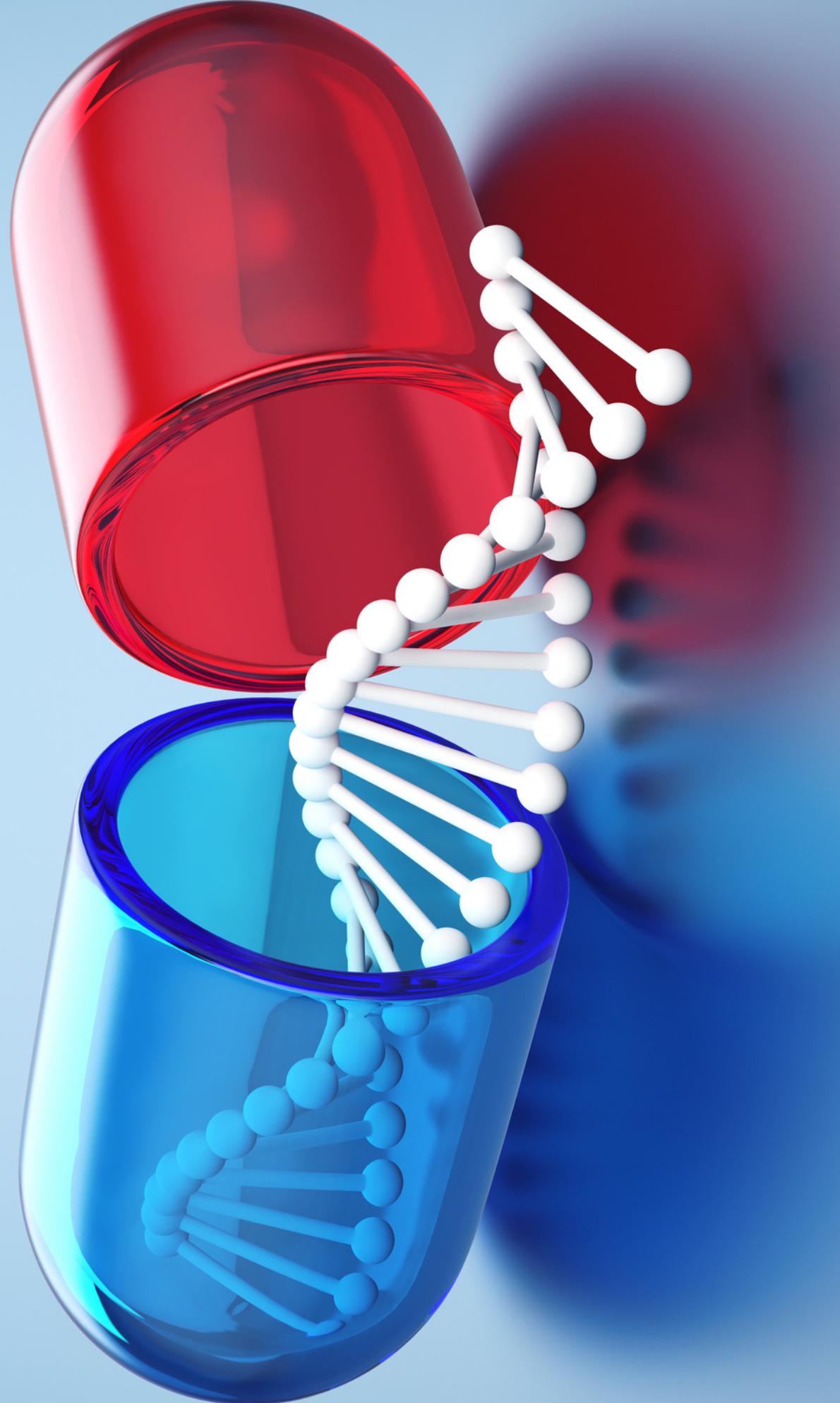
Drugs Discovery & Development

- **Data-Driven Approaches:** Utilizing machine learning, bioinformatics, and big data analytics expedites discovery, personalizes treatments, and enhances patient outcomes.
- **Benefits:** Data-driven methodologies streamline processes, reduce costs, and increase success rates in bringing new medications to market.
- **Impact:** Ultimately, these advancements benefit patients globally by facilitating the development of innovative and effective treatments.



DataScience in Drugs Classification

- **Role of Data Science:** Data science aids in classifying drugs by analyzing their therapeutic properties, mechanisms of action, and safety profiles.
- **Methods:** Utilizes advanced algorithms and models like machine learning and clustering to categorize drugs based on chemical structures and biological targets.
- **Predictive Modeling:** Builds models to anticipate drug efficacy, toxicity, and interactions with biological systems.



DataScience in Drugs Classification

- **Target Identification:** Identifies potential drug targets within the body through analysis of biological data such as genomics and proteomics.
- **Drug Repurposing:** Analyzes large datasets to explore existing drugs for new therapeutic uses, accelerating drug development.
- **Personalized Medicine:** Integrates patient data to tailor treatments to individual genetic makeup and disease characteristics, optimizing efficacy and minimizing adverse effects.



Challenges for Drug Discovery

- **Complex Biological Systems:** Understanding intricate molecular interactions and identifying suitable drug targets within complex biological systems.
- **Target Validation:** Validating potential drug targets for efficacy and safety.
- **Drug Resistance:** Combatting the emergence of resistance in pathogens and cancer cells.





Challenges for Drug Discovery

- **Cost and Time Intensiveness:** High financial investment and lengthy timelines for research, development, and regulatory approval.
- **Data Integration and Analysis:** Overcoming challenges in integrating and analyzing diverse datasets.
- **Ethical and Regulatory Hurdles:** Navigating stringent regulatory requirements and ethical considerations throughout the drug development process.





Benefits for Drugs Discovery & Development

- **Accelerated Discovery:** Data-driven methods expedite the identification of new drug candidates.
- **Enhanced Target Identification:** Precise identification of potential drug targets within biological systems.
- **Optimized Treatment:** Personalized medicine improves treatment efficacy and minimizes adverse effects.



Benefits for Drugs Discovery & Development

- **Improved Predictive Modeling:** More accurate prediction of drug efficacy and safety.
- **Cost and Time Savings:** Streamlined processes reduce research and development timelines and costs.
- **Facilitated Repurposing:** Data analytics identify new therapeutic uses for existing drugs, saving resources.



Need of Drug Discovery & Development

- **Addressing Disease Burden:** Drug discovery meets the demand for effective treatments, combating diseases like cancer, diabetes, and infectious diseases.
- **Responding to Emerging Health Threats:** Innovations are crucial in addressing emerging health challenges like antimicrobial resistance and pandemics.
- **Fulfilling Unmet Medical Needs:** Many diseases lack adequate treatments, necessitating research for new therapeutic options.



Need of Drug Discovery & Development

- **Advancing Personalized Medicine:** Tailored treatments based on individual characteristics require ongoing research and development efforts.
- **Promoting Healthcare Equity:** Drug discovery contributes to reducing health disparities by improving access to effective medications.
- **Driving Economic Growth:** The pharmaceutical industry fosters innovation, creates jobs, and stimulates economic development through drug discovery and development.



Real Life Applications

- **Precision Medicine:** Tailoring treatments based on individual patient characteristics, improving efficacy and minimizing adverse effects.
- **Drug Repurposing:** Identifying new therapeutic uses for existing medications, accelerating treatment development for various diseases.
- **Target Identification:** Pinpointing molecular targets implicated in disease pathways, leading to more effective targeted therapies.



Real Life Applications

- **Clinical Trial Optimization:** Enhancing trial design and execution, predicting treatment responses, and accelerating drug development.
- **Drug Safety Monitoring:** Analyzing real-world data to detect and assess potential safety concerns, ensuring patient safety throughout the drug lifecycle.
- **Disease Modeling:** Integrating clinical, genetic, and environmental data to predict disease progression and outcomes, facilitating early intervention and personalized treatment strategies.



How our model helps?

- Our model uses advanced **machine learning** to **analyze biological** and **clinical data**, for pinpointing potential drug targets.
- It **predicts the biological activity** of chemical compounds, aiding **lead optimization** and **screening** while assessing adverse effects.
- It tailors treatments using **genomic data**, identifying **biomarkers** and optimizing regimens for individual patients.



How our model helps?

- By merging computational insights with experimental data, it **speeds up therapeutic discovery**.
- It's a cornerstone in data-driven drug discovery, **decoding complex datasets, optimizing treatments, and personalizing strategies**.
- With **sophisticated methodologies**, it is **revolutionizing pharmaceutical research, & driving innovation worldwide**.



Words to Live By →



"Wherever the art of Medicine is loved,
there is also a love of Humanity".

H I P P O C R A T E S

thank
you