"How to Bring the Right Drug to the Right Patient in the Right Way"
Prof. Andreas Bender – Oncode Accelerator Summit 2024

Modern drug discovery faces a critical challenge: matching the right drug to the right patient efficiently, safely, and in a personalized way. This report is an attempt to analyze key ideas from Prof. Andreas Bender's talk at the Oncode Accelerator Summit 2024, offering insights into how machine learning (ML) and AI models can support safer, targeted drug delivery and the limitations they currently face.

Key Takeaways from the talk :

Traditional Models Are Not Enough

Linear ML models (like logistic regression) often oversimplify the complex biological systems that govern drug interactions. These models struggle to predict real-world outcomes like side effects, efficacy, and contraindications, especially when multiple patient variables are involved.

Data Scarcity Limits Accuracy

Drug-related datasets are often:

- Incomplete (missing patient history)

- Noisy (inconsistent medical coding)

- Poorly labeled (e.g., side effects with unclear cause)

This makes supervised learning challenging; to train a good model, we need good data.

Importance of Keeping the human side in mind (patient-tailored solutions)

Instead of training one-size-fits-all models, we'll need to segment patients into subgroups based on:

- Age

- Gender

- Metabolic or genomic profiles

- Comorbidities

This enables more personalized predictions and avoids bias toward dominant demographics.

Multimodal Data Integration

Modern AI systems must learn to handle multi-omics data:

- Genomics

- Proteomics

- Clinical symptoms

- Medication history

Neural networks are promising in handling this complexity, especially deep learning and graph-based methods.

How does Pharmedic come in?

As a digital health platform working on adverse drug reaction (ADR) prediction and treatment personalization, Pharmedic can leverage these insights to:

- Move toward stratified algorithms: grouping patients before prediction

- Integrate data from multiple sources: prescriptions, history, lab results

- Improve data collection methods: ensure clean labeling and consistent inputs.

- Use explainable models when appropriate (e.g., decision trees + SHAP)

In conclusion, we are allowed to say that the promise of AI in drug discovery and personalization is real, but achieving its full potential requires several key foundations. These include access to high-quality, well-stratified data that reflects diverse patient profiles; the integration of multimodal inputs such as genomics, clinical history, and pharmacological data; and a strong awareness of clinical safety, bias, and fairness throughout model development. Equally important is the incorporation of human-in-the-loop feedback to ensure models are interpretable and aligned with real-world clinical decisions.