**Business Context**

**Pharmaceutical companies invest millions of dollars in clinical trials to test drug efficacy. However, some drugs do not work for all patients due to individual differences in biology, metabolism, and pre-existing conditions.**

**Traditional clinical trials take years to conclude, with high costs and risks.**

**Machine learning models can help predict drug response early, saving time and resources.**

**Personalized medicine ensures that patients receive the right drug at the right dose.**

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**Drug Response Classification (0 = No response, 1 = Positive response)**

Drug response classification refers to how a patient’s body **reacts to a particular drug**. This is a key concept in **pharmaceutical research** and **clinical trials**, where researchers analyze whether a drug is **effective or not** based on biological responses.

**Interpretation of Classification Labels:**

1. **0 = No Response**
   * The drug **did not have a significant effect** on the patient.
   * The patient’s condition **remained unchanged** after taking the drug.
   * The biomarkers (e.g., blood pressure, glucose level, heart rate) **did not improve**.
   * Possible reasons:
     + The drug is not suitable for the patient.
     + The dosage is ineffective.
     + The patient's metabolism is resistant to the drug.
2. **1 = Positive Response**
   * The drug **had a beneficial effect** on the patient.
   * The patient’s condition **improved after taking the drug**.
   * Biomarkers such as blood pressure, glucose levels, and enzyme activity **show significant improvement**.
   * Possible reasons:
     + The drug is effective for this patient.
     + The dosage is appropriate.
     + The patient’s metabolism responds well to the drug.

**Why is This Classification Important?**

* **Pharmaceutical Industry:** Used to test new drugs and evaluate their effectiveness before FDA approval.
* **Personalized Medicine:** Helps doctors prescribe drugs based on individual patient responses.
* **Machine Learning in Healthcare:** Enables predictive models to **forecast patient responses** based on medical data.

