Drug Target Identification

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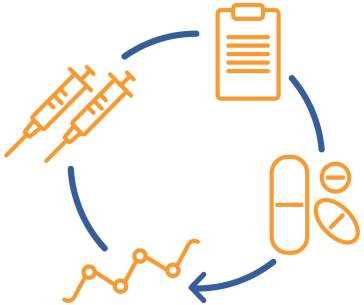
Problem Statement

Drug discovery and development pipeline is resource-intensive and time-consuming, which make them a major obstacle for rapid drug development.

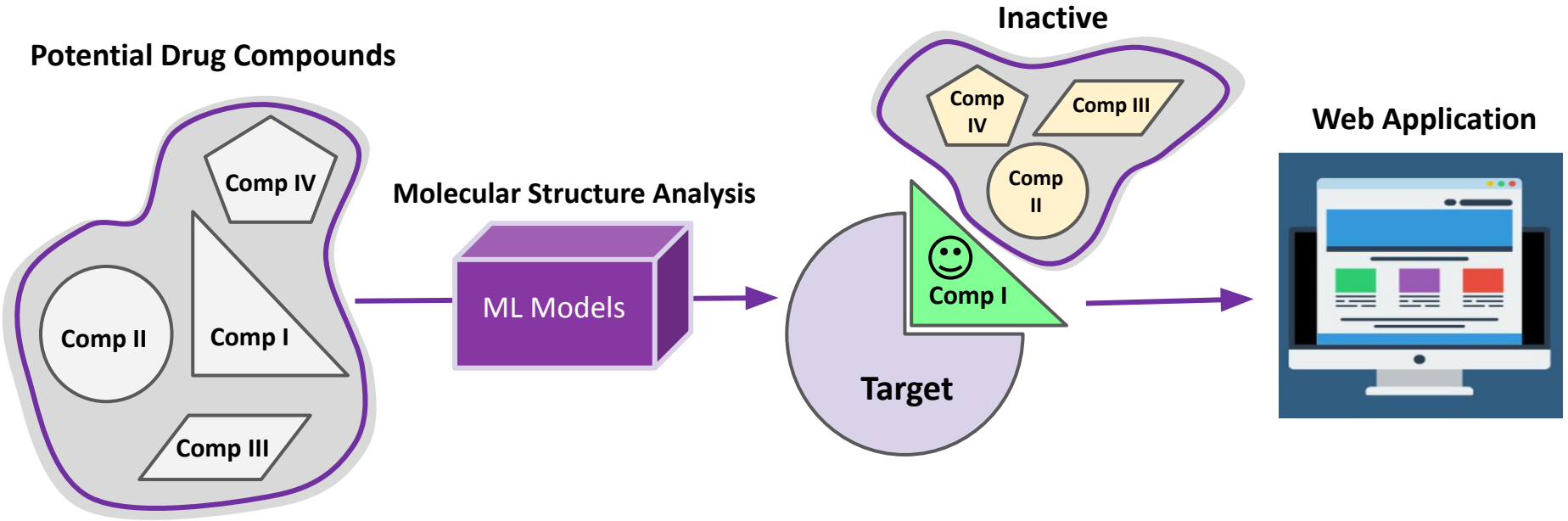


Current challenge is to develop discovery pipelines that can identify promising drug compounds early.

A reliable method that can identify the potential drug compound with respect to its successful clinical translatability is needed.

Objectives

- Create a prototype for identifying potential drug compounds.
- How we did it?



Pipeline

Literature Review

Targets Search

Google Scholar

PubMed.gov

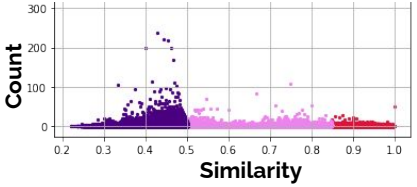
nature

Data Preparation

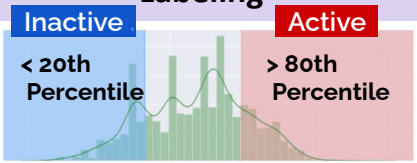
Data Acquisition

ChEMBL

Data Cleaning



Labeling



Data

PaDEL-Descriptor

Modeling

Binary Classifiers

Multi-labeled Classifiers

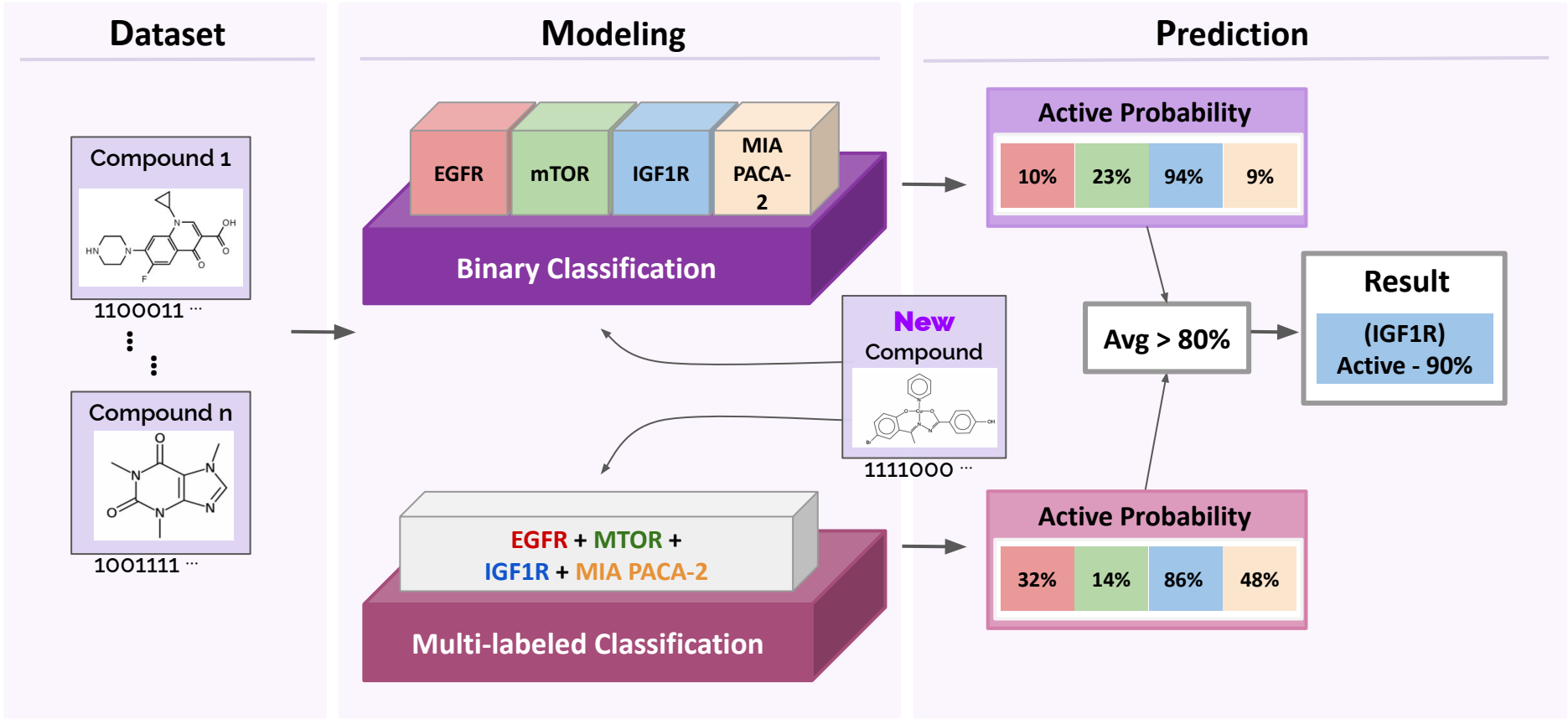
Deployment

Web Application

django

aws

Modeling


Dataset
Compound 1
1100011 ···
Compound n
1001111 ···
Modeling
EGFR
mTOR
IGF1R
MIA PACA-2
Binary Classification
New Compound
1111000 ···
EGFR + MTOR +
IGF1R + MIA PACA-2
Multi-labeled Classification
Prediction
Active Probability
10%
23%
94%
9%
Avg > 80%
Result
(IGF1R)
Active - 90%
Active Probability
32%
14%
86%
48%

Web Application Demo

Appendix

Preprocessing

Cleaning

- Filtered data by
  - standard_type = ‘IC50’
  - standard_unit = [‘nM’, ’uM’, ’pM’]
  - target_organism = ‘Homo Sapiens’
- Dropped data points with missing standard_value or canonical_smiles.
- Converted the standard values to have the same standard unit (nM).

Labeling

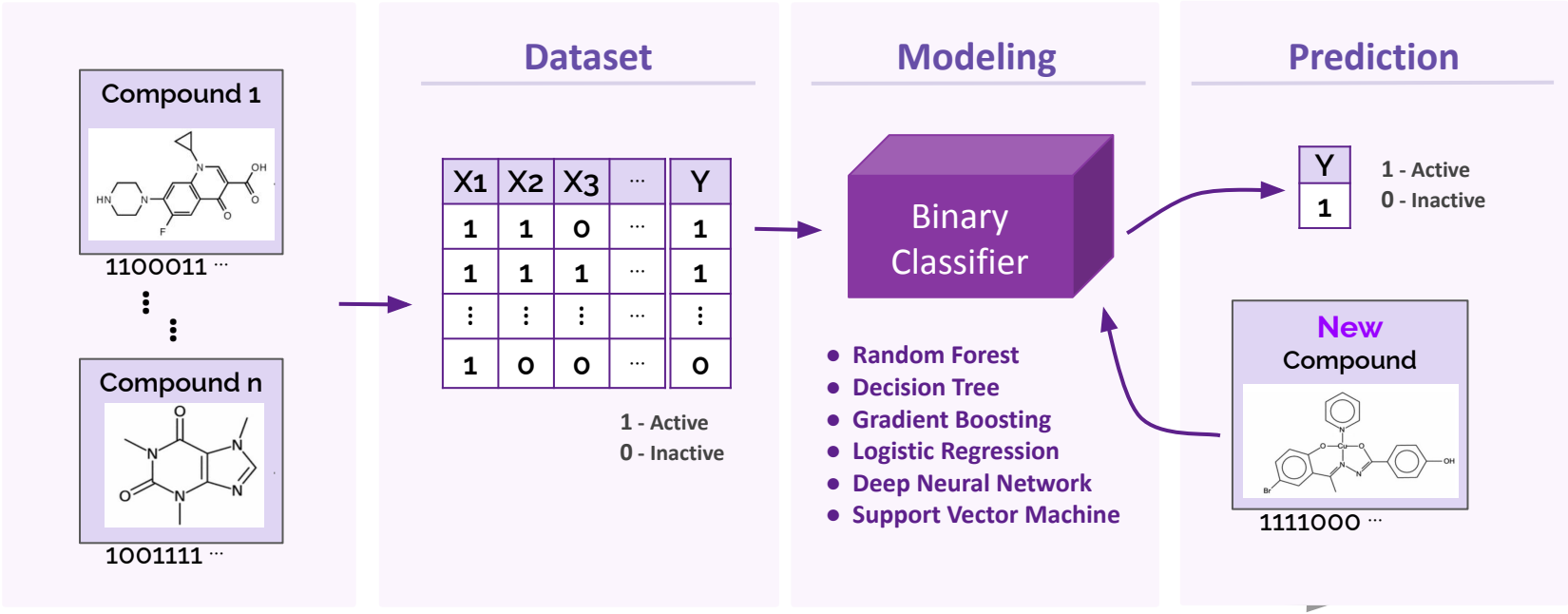
- Standardized IC50 to pIC50 to avoid skewed distribution.
- Checked the standard values at different percentiles to determine the cutoff values for labeling.

Transformation

- Used PaDEL descriptor to transform the SMILE notations into rule-based Pubchem Fingerprints.

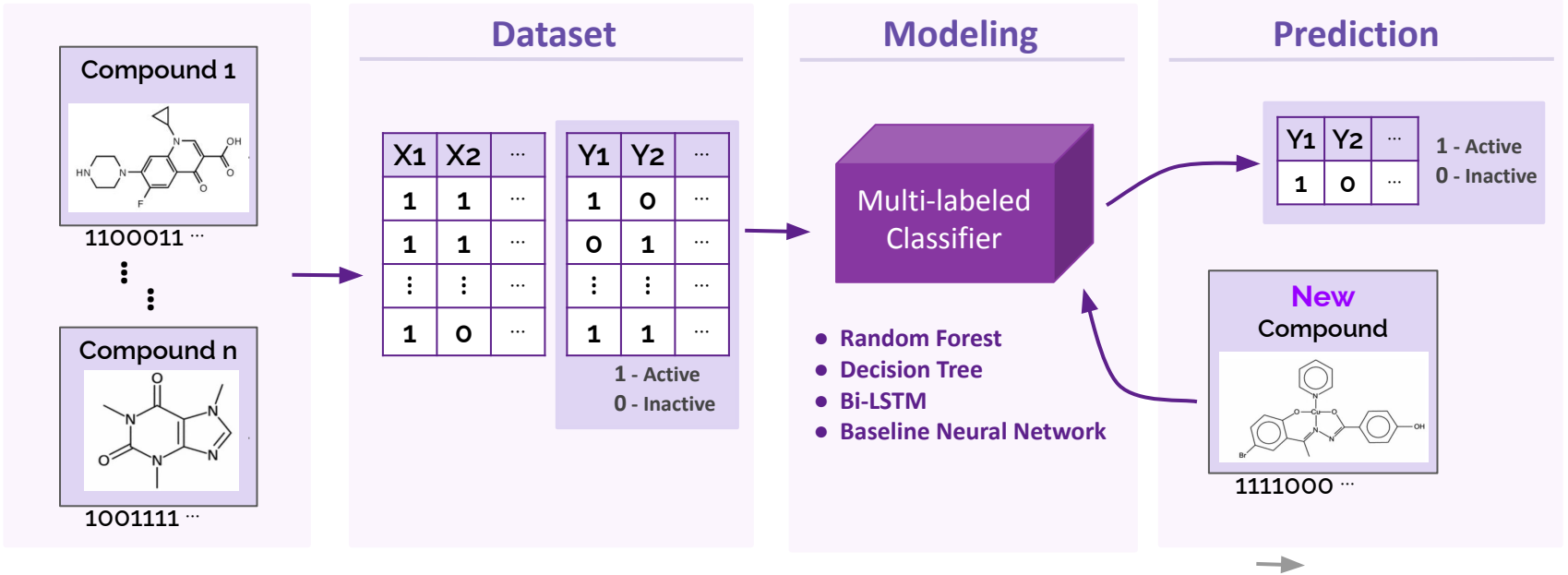
Modeling - Binary Classifiers

- Build models on each selected target to identify the bioactivity of candidate compounds.

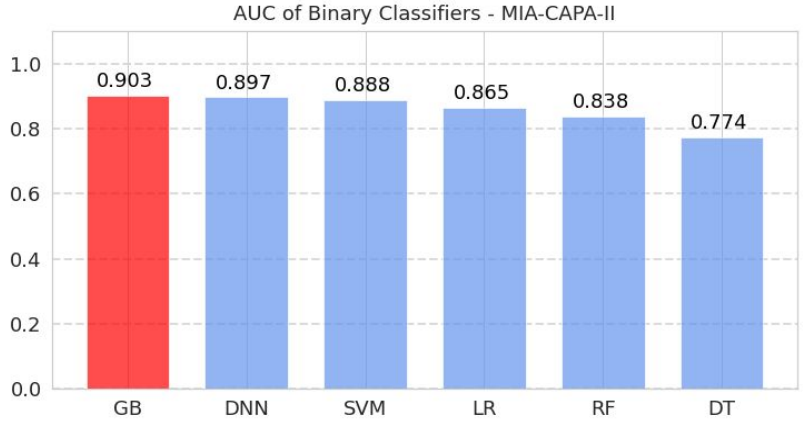


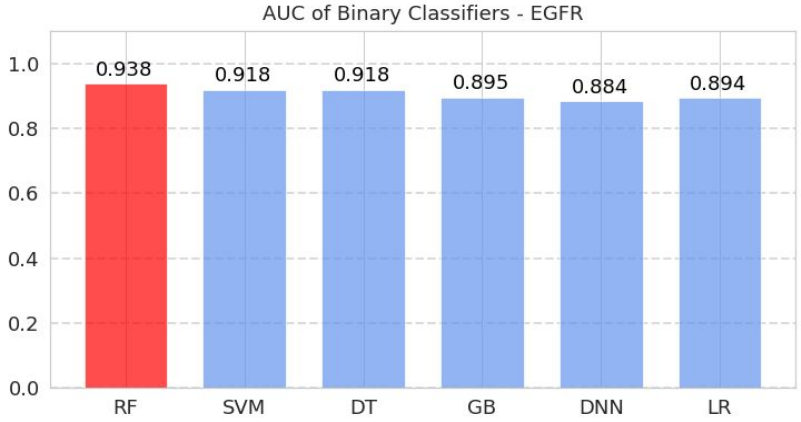
Modeling - Multi-labeled Classifiers

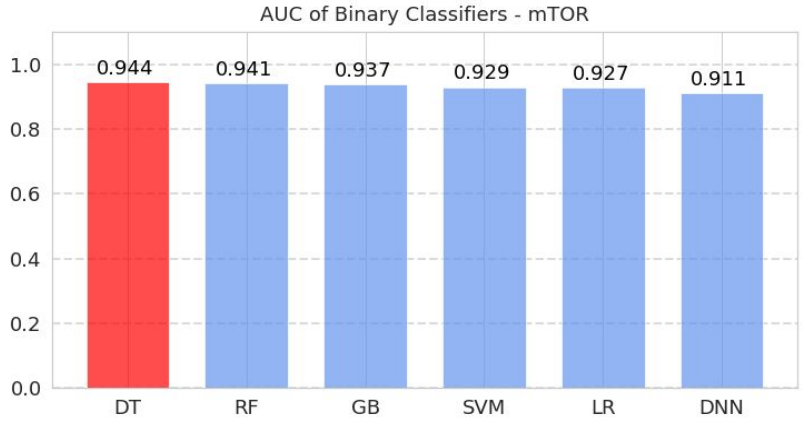
- Build models on all selected target to identify the bioactivity of candidate compounds.

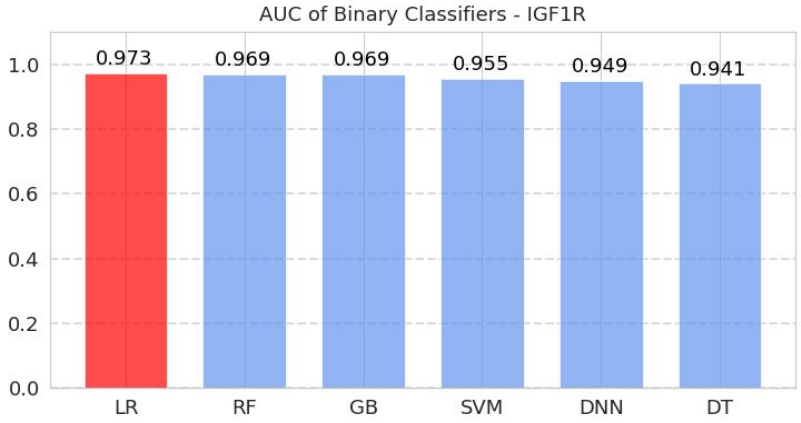


Modeling - Results









Modeling - Results