Technology Bucket: Life Sciences
Company Name: Private(Sun Pharmaceuticals Industries Ltd.)
Team Leader Name: Ariba Akber

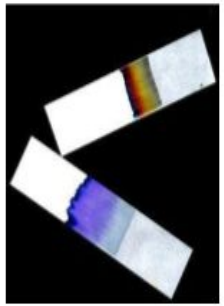
Category: Software
Problem Code: DD1
College Code: U-0108

Problem Statement: Software to compare Chromatography output and match the reference standard output using Image recognition/ AI techniques.

Basic Idea:

1. The chromatography performed in pharma industry is human read, which is highly susceptible to human errors and time consuming.
2. To automate this procedure of reading chromatographic results using **Computer Vision, Machine Learning, Android user Interface and Django for building API .**
3. Digitally colors are represented, by a combination of 256 levels of red, green, and blue, giving computer vision flexibility to distinguish 16, 777, 216 different colors, and their saturation.
4. The lab result will be put into our computer vision model using an android app running on client side. The model will give the output which then can be displayed on the app, and then analysed with the human entered chromatography results.
5. The **Machine Learning engine** will further improve the result, by giving the lab asst. Certain predictions, to help improve the performance and minimise the processing time.
6. The final result will be presented to user in graphical or tabular form as per choice, based on the comparisons on the human entered values and image vision outputs.

Solution Overview



Chromatographic Slide

sixth Vision Mobile App

Tech Stack

- Application: Android platform. Java , XML.
- Django for building API in backend.(python).
- openCV for Image Processing and computer Vision.(Python).
- Amazon Web Services as a backend for hosting.
- JSON as a format to send data packets.
- SQL database to store result.
- PyTorch, for Machine Learning.(python).

Image

Mobile

Server

Apply Gaussian blur to remove noise.

Canny Edge Detection

Get The Largest Area Contour

Region of Interest

1) Convert image to -"hsv"
2) Define boundaries for all 8 colours in array, [min_range,max_range].
3) Create an image-like mask.
4) Apply bitwise_and with the mask to get the detected color pixels.

Apply Feature Extraction for each detected colour/ contour and get the height, etc. of each.

(Repeat for all 8 colours and eliminate Unused.)

Rf = D1/D2

Rf : Retention Factor
D1 : Distance the Solute moves.
D2 : Distance the solvent move

Apply Rf = D1/D2 (or other calculations based on results)

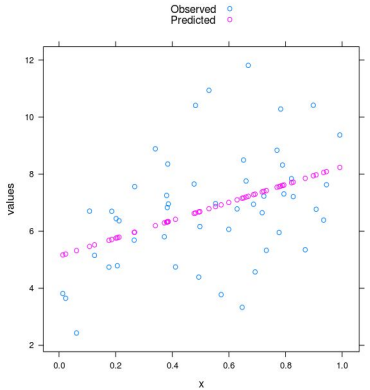
(Sent it to Client)

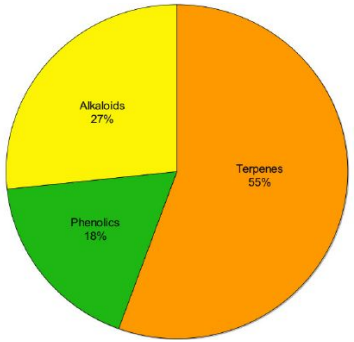
What more out Software Provides :

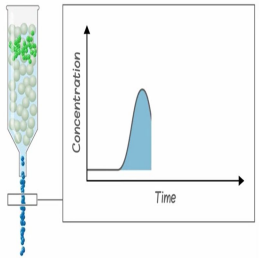
$$Rf = \frac{\text{distance spot moved}}{\text{distance solvent moved}}$$

We have only considered calculating only retention factor, but this can be extended to find other parameters, which is needed to calculate, and thus where our sixthVision app comes handy.

This can be extended for giving results in live video recording while the chromatographic process is going on.
Hence, analysing the results in a more intuitive way.







Why HSV form used:

HSV is based on the **H**ue shift, **S**aturation and **V**alue. Unlike the RGB color system, which has to do with "implementation details" regarding the way RGB displays color, HSV has to do with the "actual color" components. This is very useful here, as color components are spread across various densities.

Extending it for video:

This software can be extended to deal with live recording of the chromatography process and hence generate results in realtime. This will save a lot of time.

What more with the API:

The API built on Django can be easily extended, and used at more places to give more accurate chromatographic results.

Use case

- Pharma industry.
- Decrease cost of producing medicine.
- Increases quality medicine.
- Decreased time to complete one test, thus having direct impact on medicine cost.
- Helping to bring health care to masses at low cost.
- Aligning the vision with Modi Care of providing healthcare to masses
- Drug testing, dairy produce, forensics, food industry.
- Improved quality of industry produce which depend upon chromatography.
- Boosting the Make in India campaign.

Show Stoppers

- Providing cost-effective and efficient solution to improve efficiency and performance of the lab assistant/ technician.
- User friendly easy to use android app to get precise and accurate results.
- **Django** API to provide real time results.
- Robust OpenCV based image vision engine to find saturation of each component.
- With increase the usage the Machine Learning model gets more and more trained, hence giving more accurate predictions.
- All data stored in Database for further access.