



Smart Assistive Device for Nutrition Monitoring and Control of Chronic Dialysis Patients

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Perspective

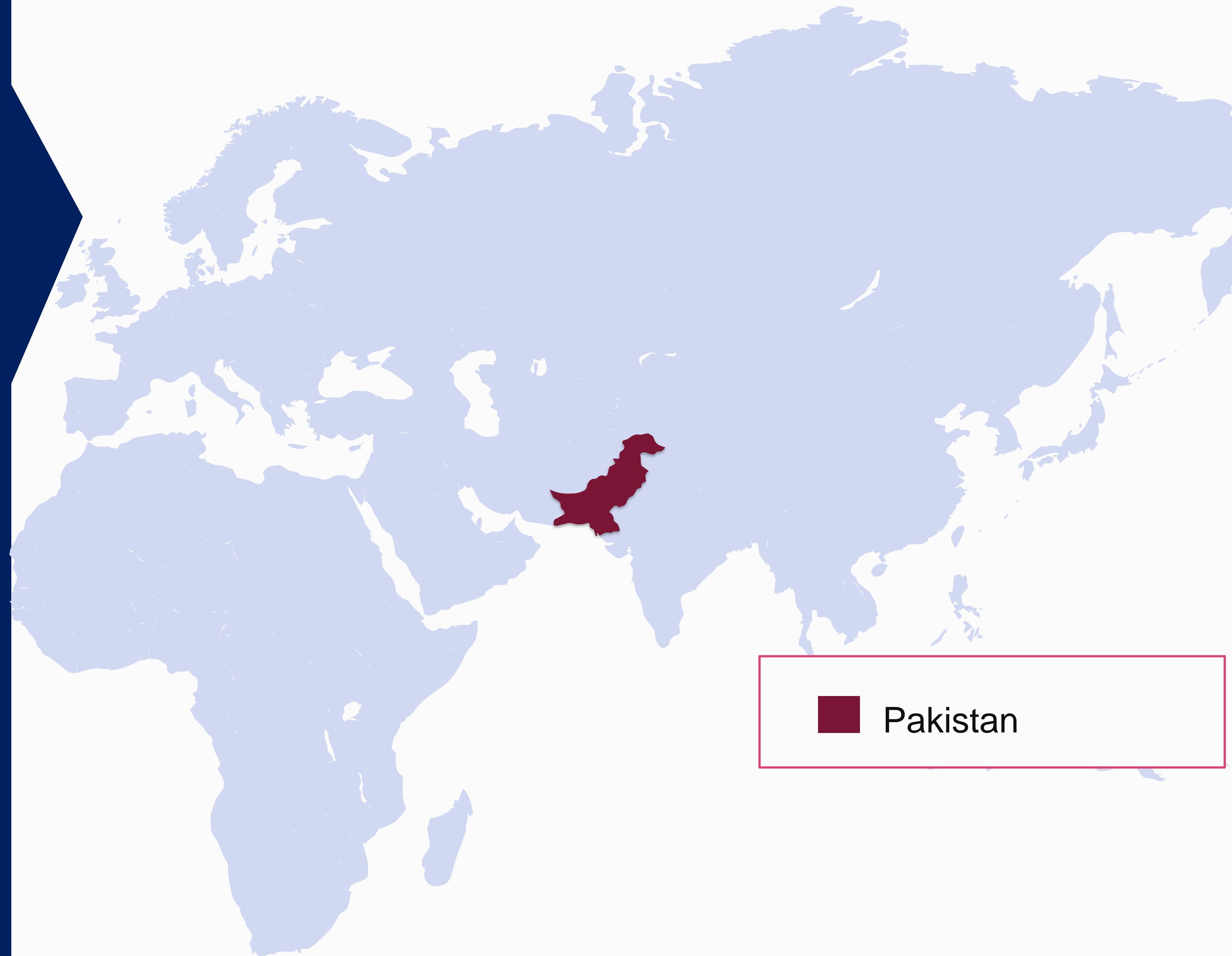
Pakistan ranks 8th highest in chronic kidney diseases in the world.*

CDK effects approximately 300 million people worldwide

10th leading cause of death resulting in 600,000 deaths per year

18.4% increase since 2005 third largest increase of any major cause of death.**

In Pakistan the dialysis patients are more than 20,000 per year



* Shaukat Khanum Memorial Cancer Hospital & Research Centre (2017)

** <https://www.kidney.org/kidneydisease/global-facts-about-kidney-disease>

Problems faced by dialysis patients:



Inconvenience

Painful
Expensive



Lack of facilities



Food and fluid restriction

Problems of Dialysis patients:



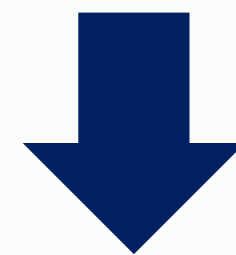
sodium



**High Blood Pressure
/Hypertension**



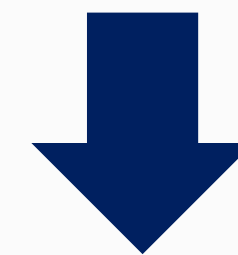
Phosphate



**Low calcium
level**



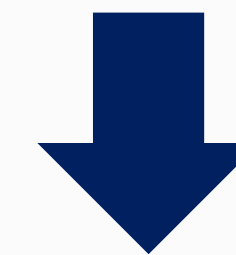
Potassium



**Heart Attacks/
Waste
accumulation**



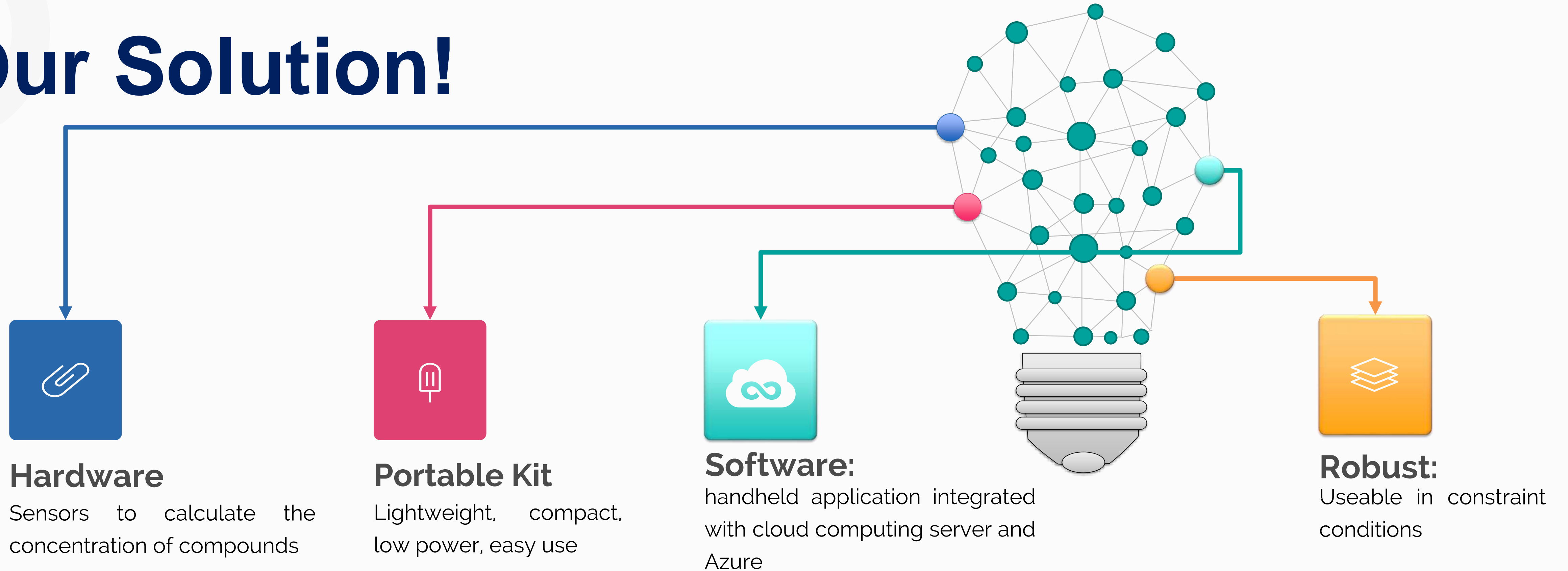
Protein



**Dehydration/
Hormone
imbalance**

Concentration over critical level may lead to DEATH!!

Our Solution!



01

Concentration
monitoring

02

On Demand
analysis

03

Weekly
Report

04

Provides
alerts



Principle Used



Schematics



Working



Mobile application



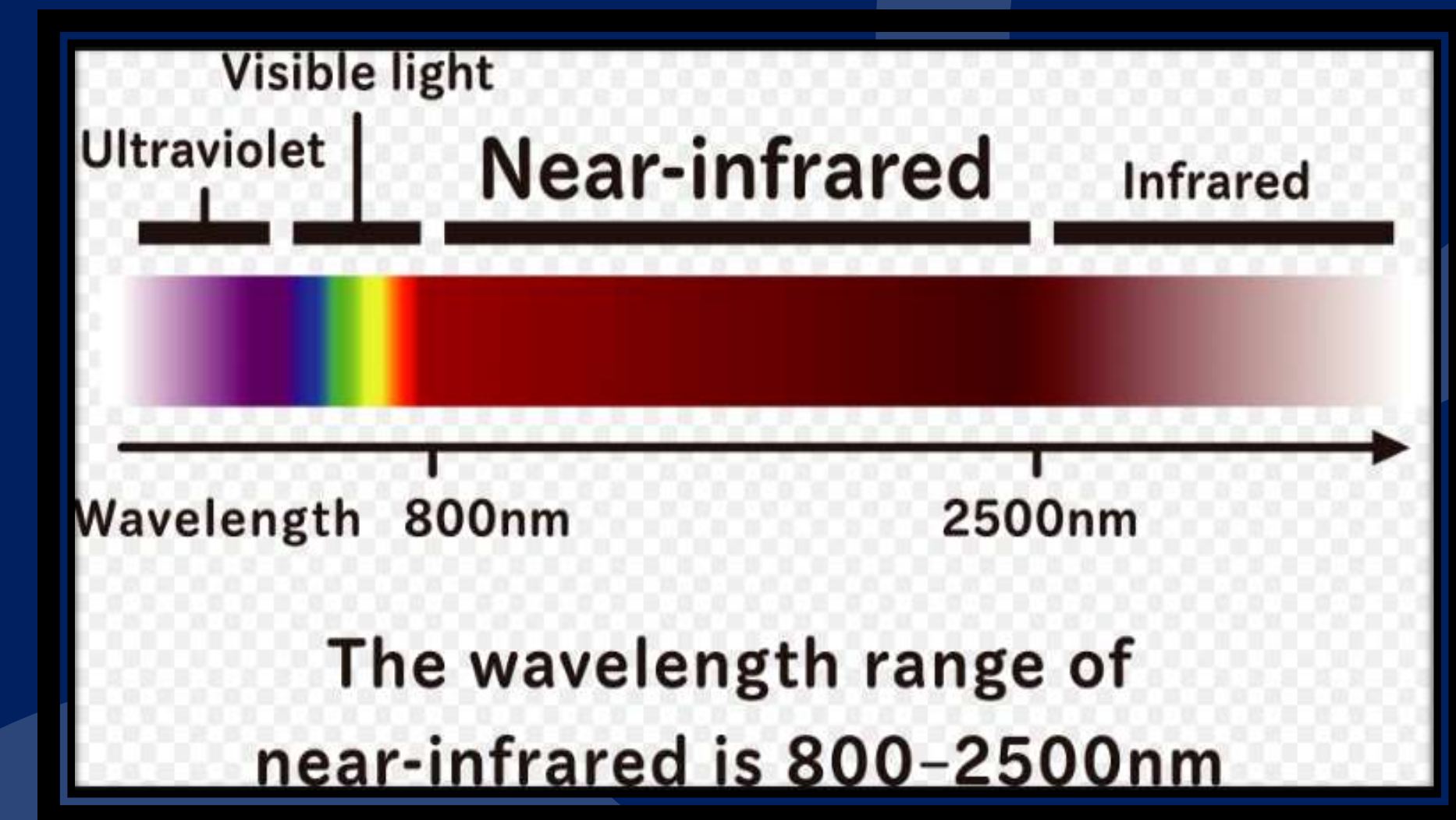
Comparison

Innovation



Principle Used: NIR-Visible Spectroscopy

- Spectroscopy is a method that uses the a region of the electromagnetic to determine characteristic molecular changes in the composition and concentration.
- Visible region lies from 380nm to 740nm
- Near-infrared (NIR) spectrum (from 780 nm to 2500 nm)
- Spectroscopy is based on collecting reflectance or absorption spectra of the compound with a spectrometer.



Components

LED's

- 595nm (sodium)
- 760nm (potassium)
- 840nm (phosphate)
- 850nm (phosphate)
- 890nm (phosphate)

Photodiode

- 200 – 1100nm FDS010
- Active Area 1mm, 0.04 inches

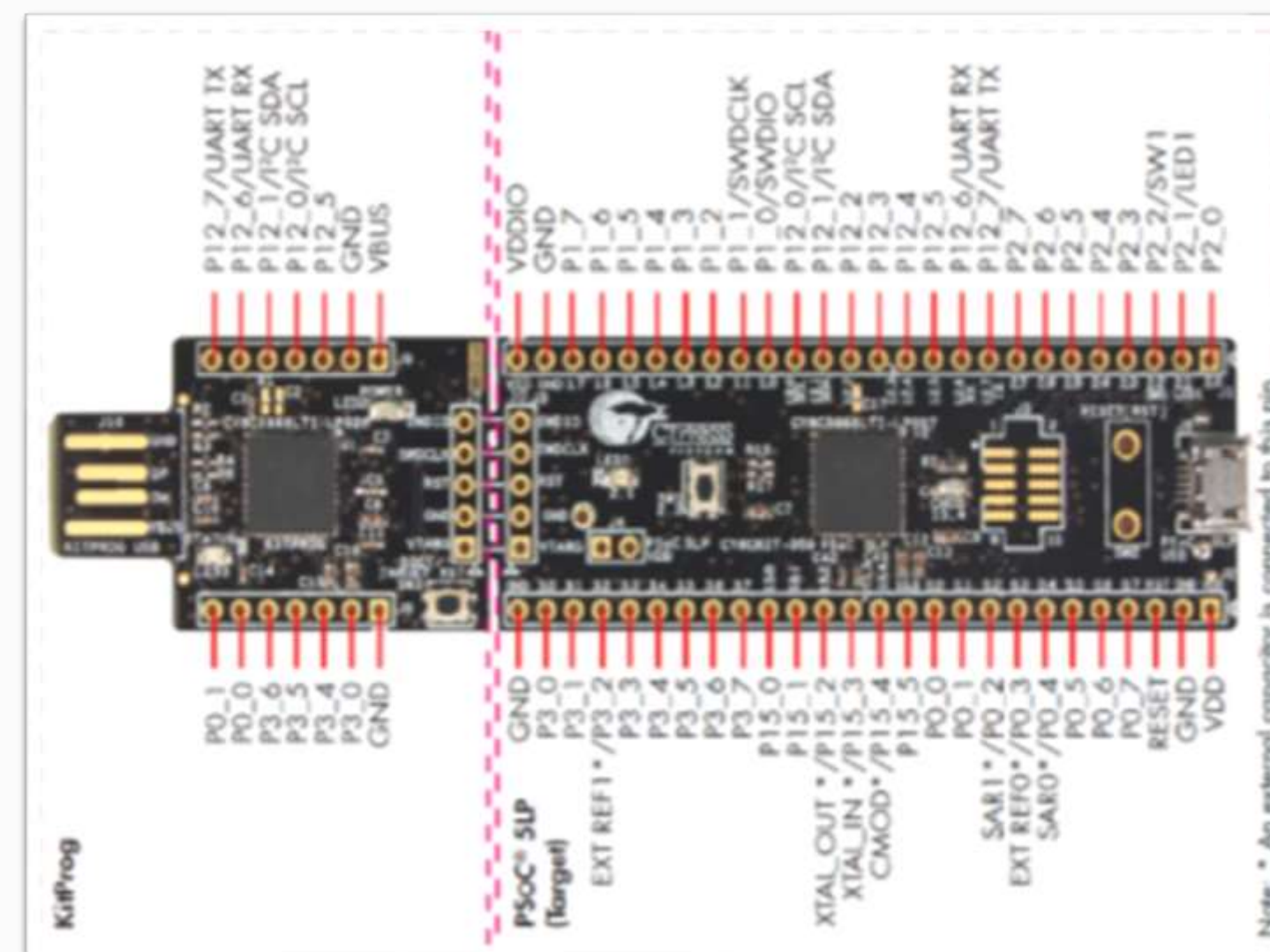


Components

PSOC 5lp

HC-05

- 32 bit ARM Cortex M3
- RAM - 64 KB
- Flash - 256 KB
- Bluetooth Mobile HC-05





Principle Used



Designs



Working



Mobile application

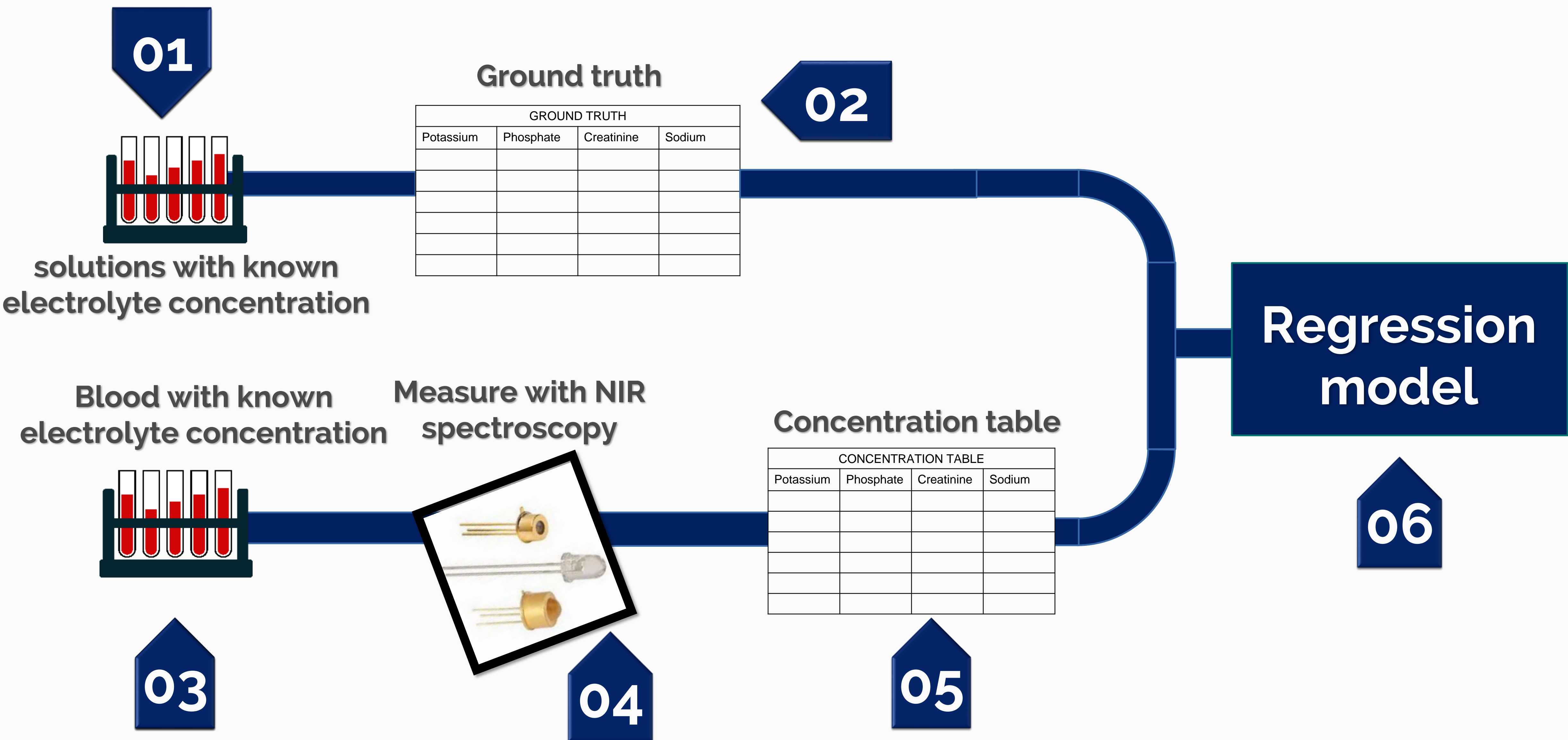


Comparison

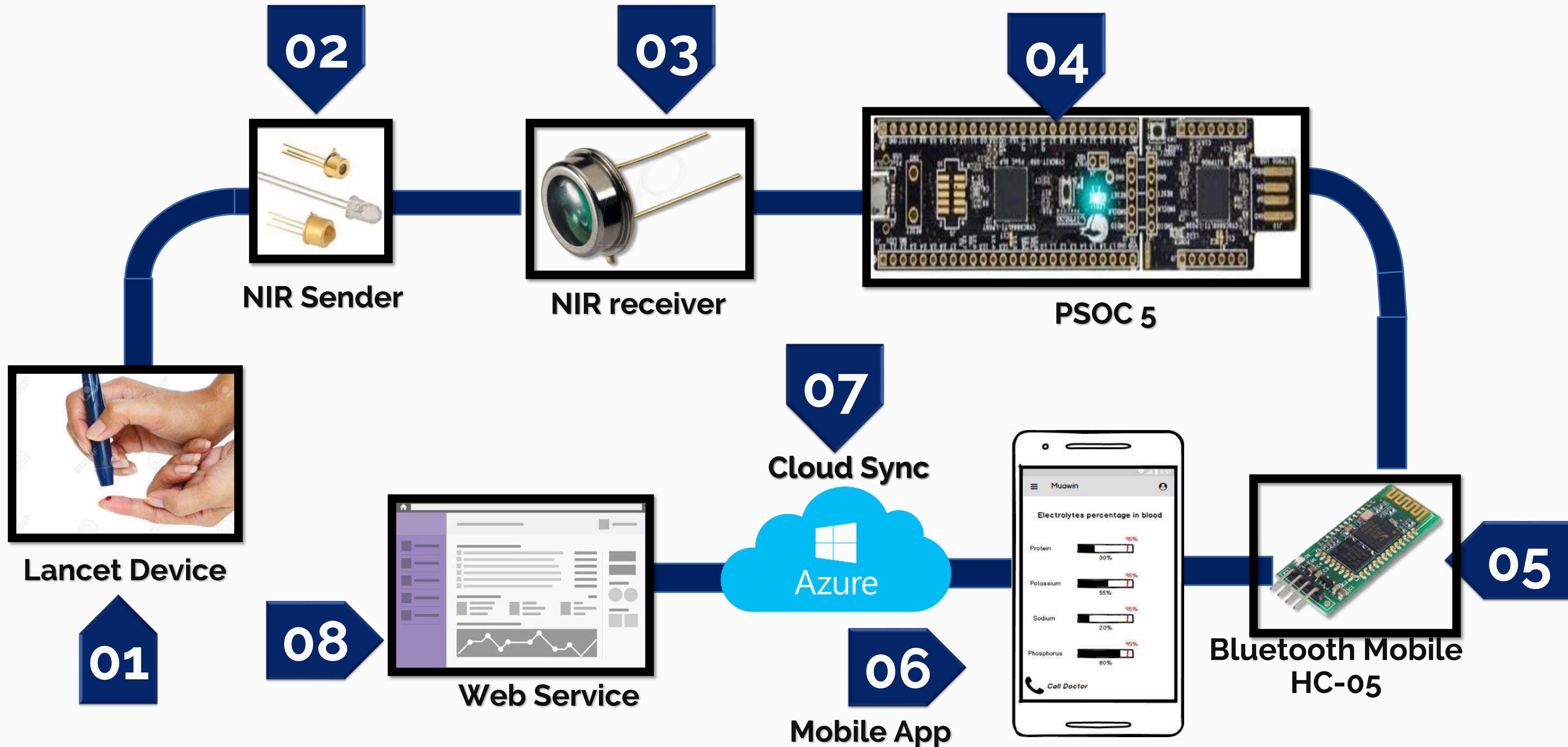
Designs



Data Collection Phase



How it Works:





Principle Used



Schematics



Working

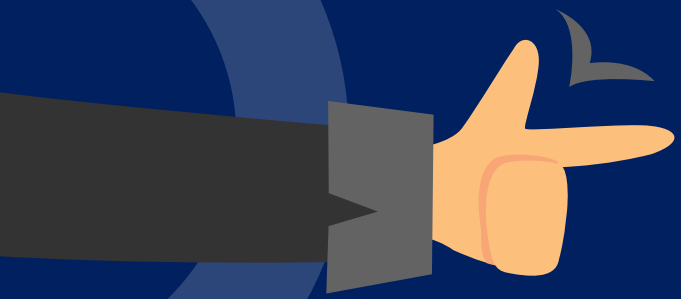


Mobile application

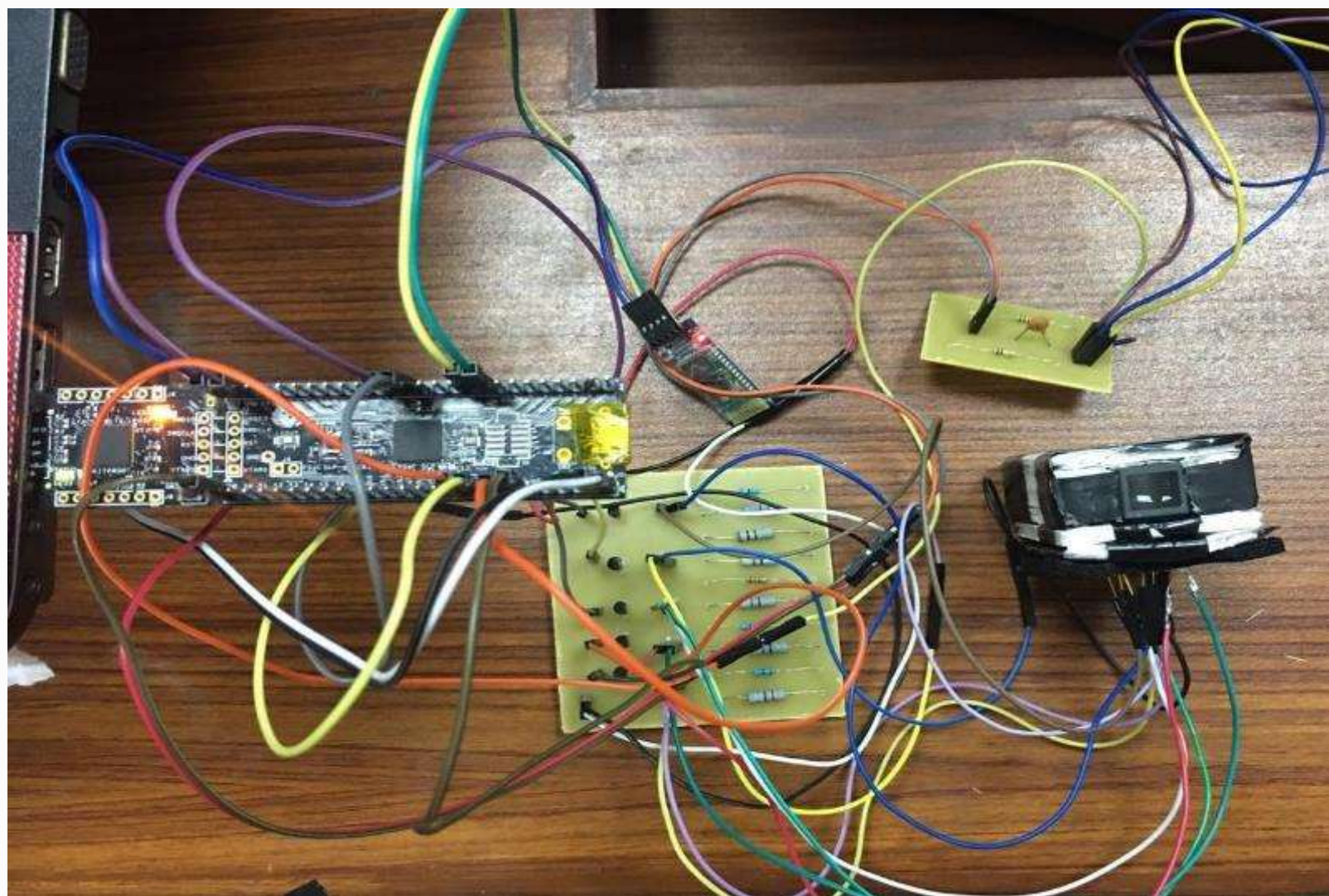
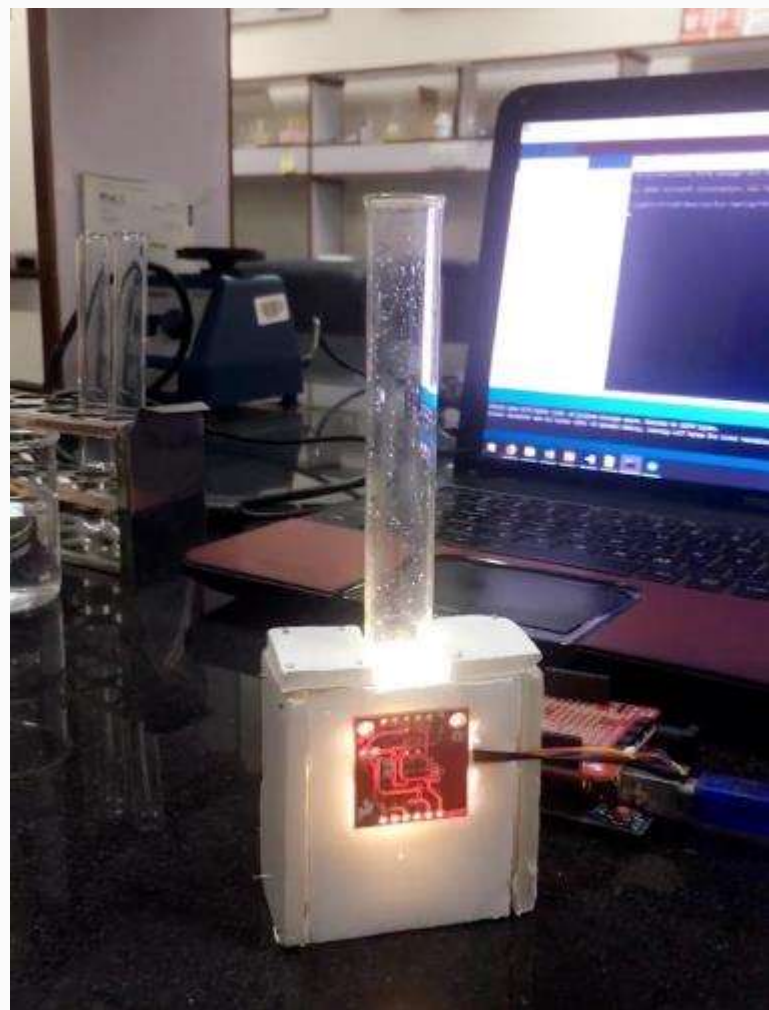


Comparison

Mobile App

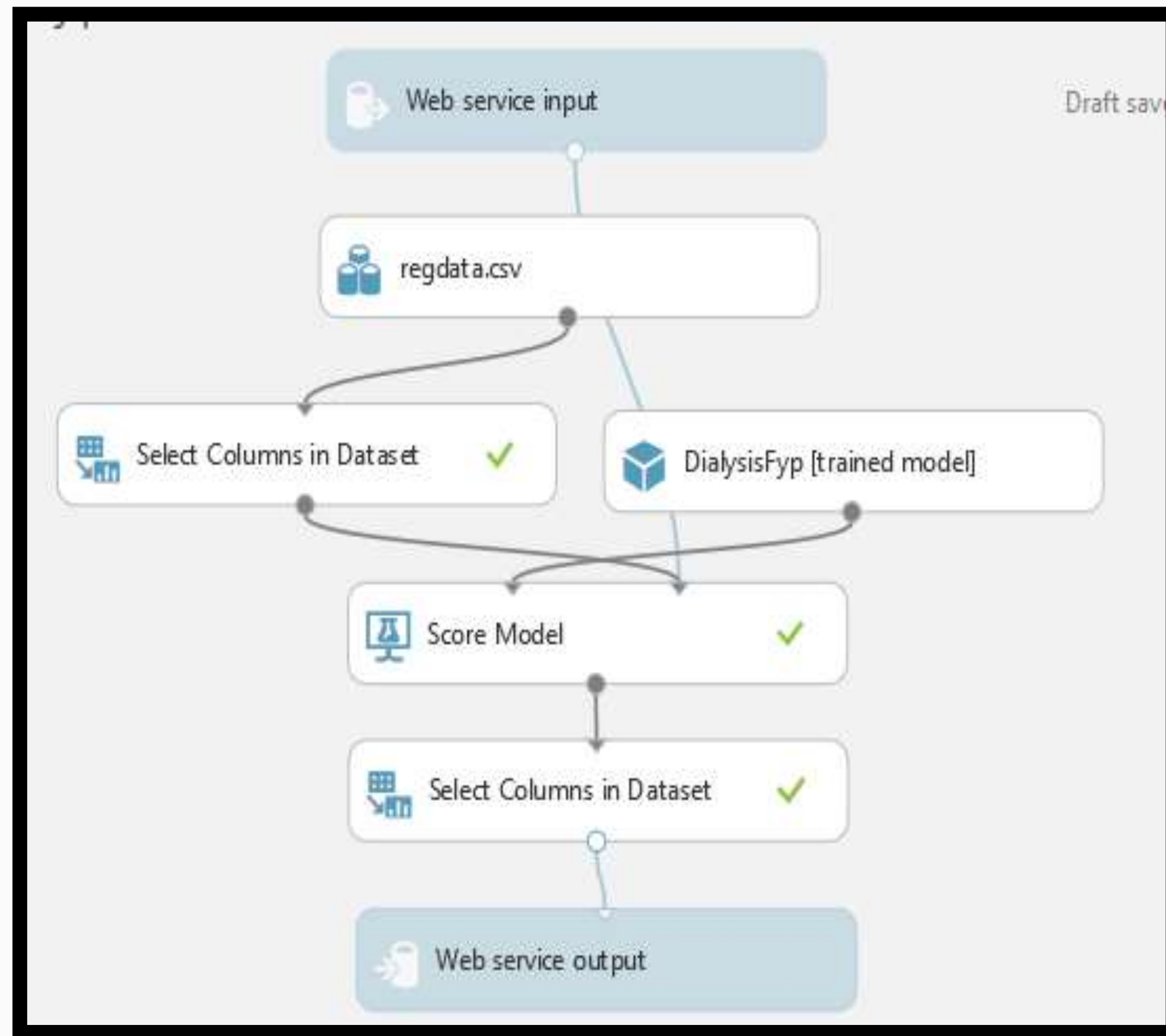


Experimentation Setup

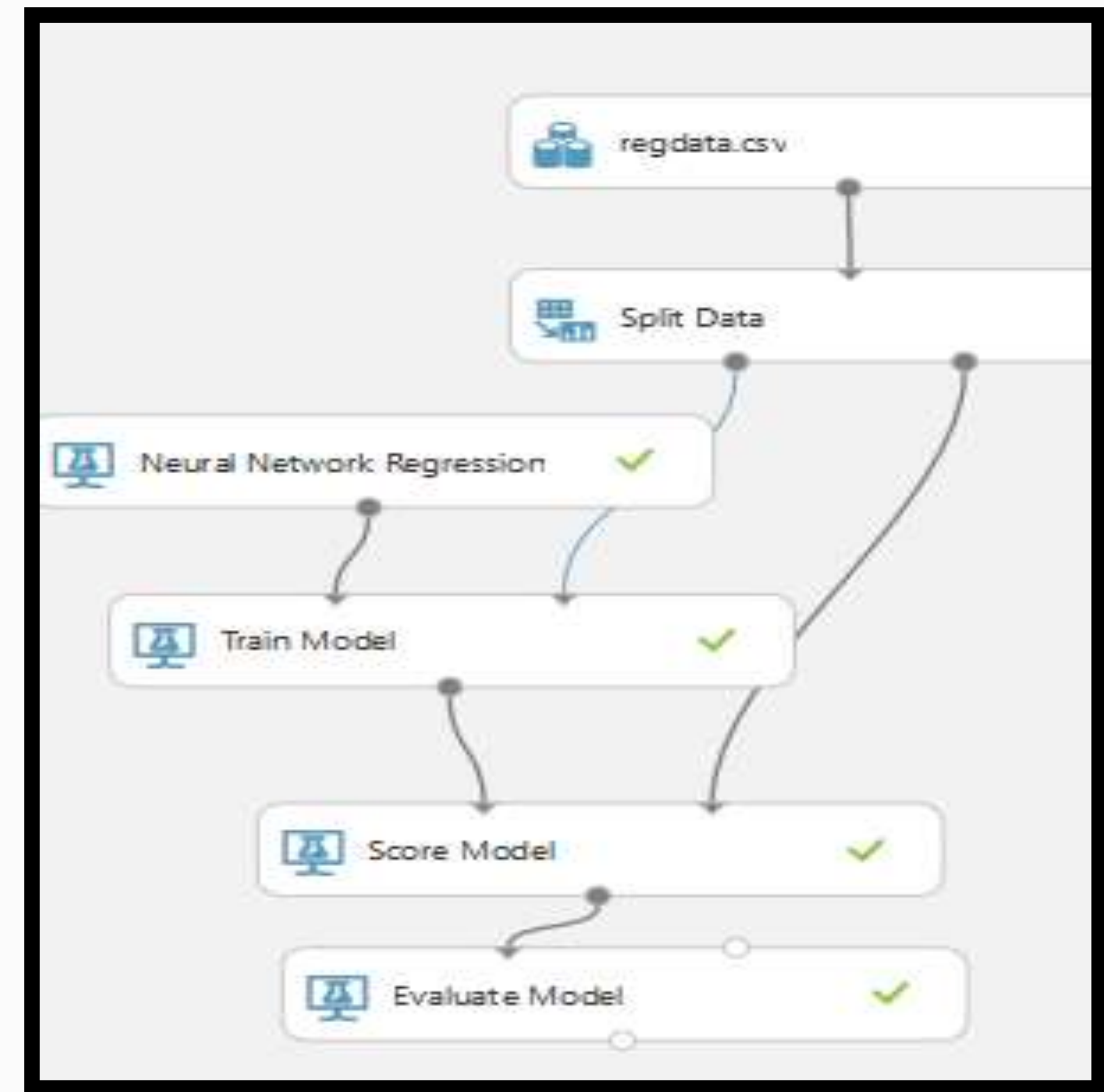


conc	mV												
0.2	2403		0.8	4.29E+09		0.2	4.29E+09		0.9	2464		0.7	4.29E+09
0.3	1306		0.8	2452		0.7	4.29E+09		0.7	2499		0.4	2391
0.5	9		0.8	2476		0.6	4.29E+09		0.6	2500		0.3	20
0.5	2428		0.8	2470		0.5	2428		0.4	2403		0.3	2396
0.2	4.29E+09		0.2	2359		0.4	795		0.3	591		0.4	2385
0.2	2362		0.3	2397		0.6	2523		0.6	2513		0.3	2402
0.5	2434		0.7	2500		0.8	2470		0.3	2408		0.2	2353
0.9	2472		0.5	4.29E+09		0.4	4.29E+09		0.2	2351		0.9	4.29E+09
0.2	2356		0.8	2459		0.8	2460		0.6	4.29E+09		0.9	2459
0.8	2464		0.9	2478		0.9	2469		0.6	2520		0.2	52
0.6	1151		0.5	2425		0.6	2515		0.4	2399		0.4	4.29E+09
0.4	2401		0.8	2471		0.7	2509		0.4	2398		0.3	4.29E+09
0.2	2375		0.7	2505		0.5	4.29E+09		0.6	2526		0.9	4.29E+09
0.7	2494		0.5	2422		0.6	2522		0.4	2404		0.9	4.29E+09
0.3	2407		0.2	2357		0.7	2501		0.4	2397		0.9	658
0.3	2404		0.7	2507		0.4	2403		0.6	2513		0.6	2484
0.9	2449		0.2	2355		0.6	2522		0.5	2434		0.2	2405
0.5	2422		0.7	2503		0.3	2398		0.5	4.29E+09		0.5	2433
0.8	2473		0.7	2497		0.3	2406		0.7	2501		0.4	2385
			0.4	4.29E+09		0.9	2446		0.8	107		0.2	463

Regression Model

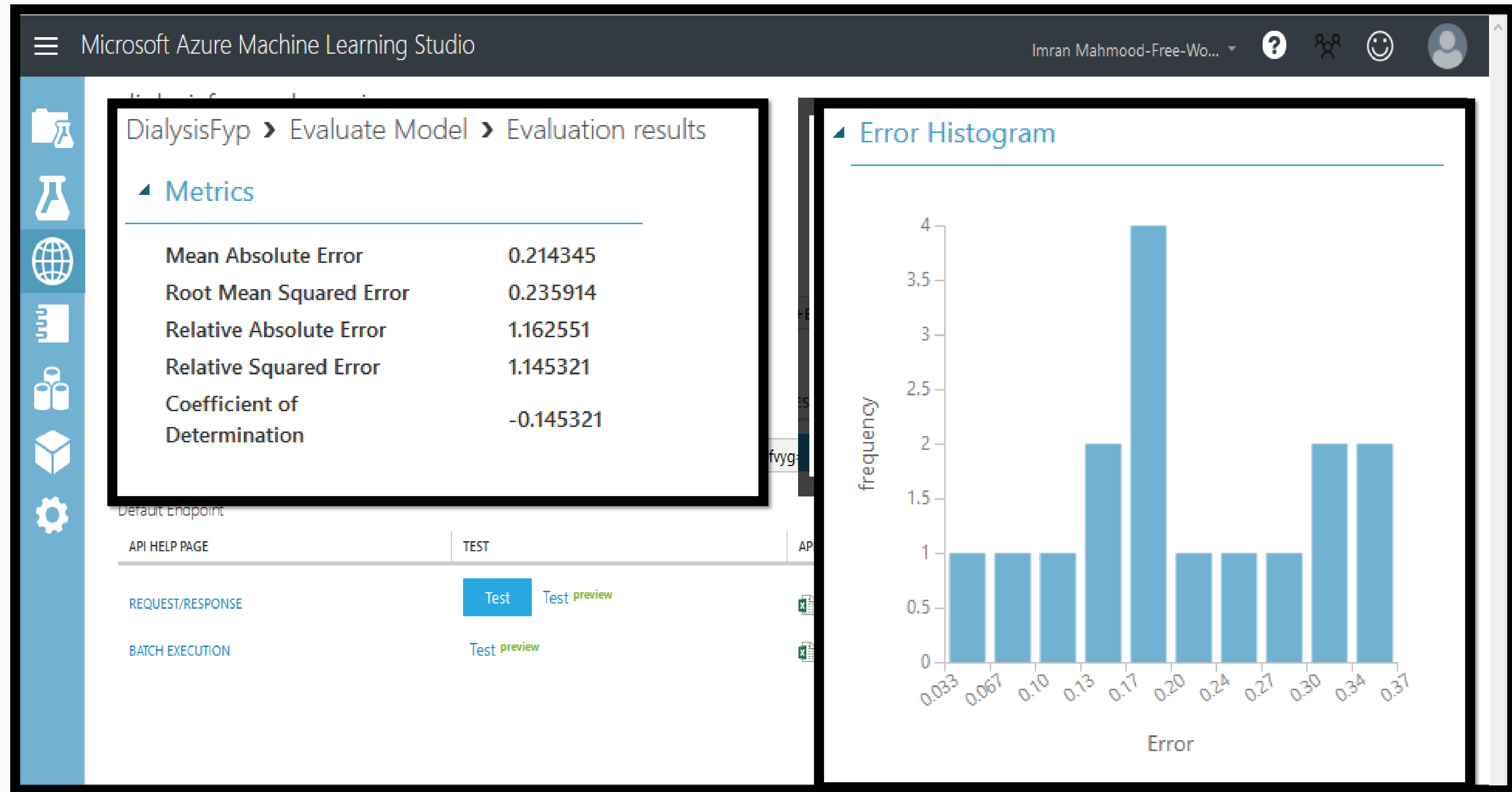


Prediction model

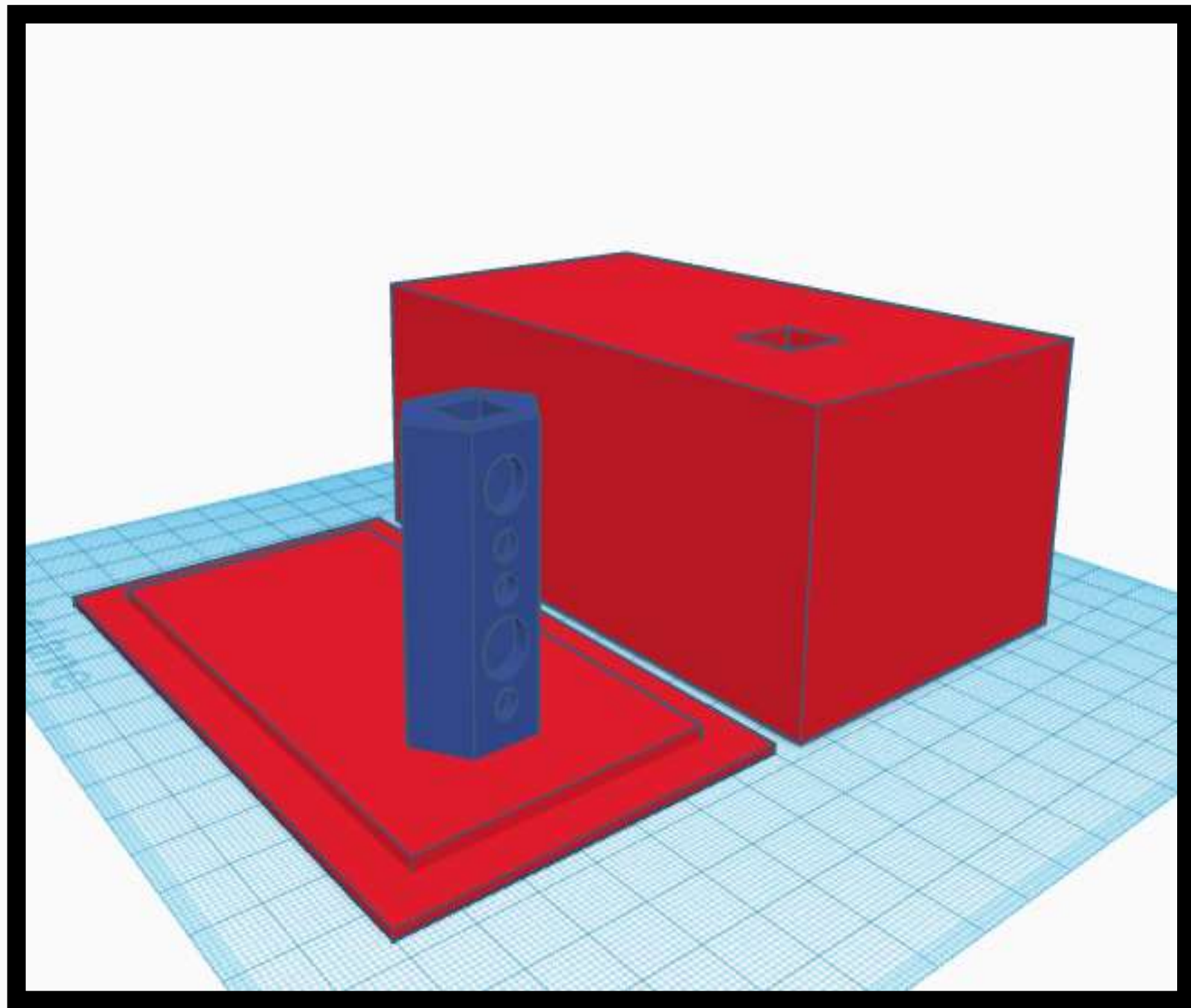


Training model

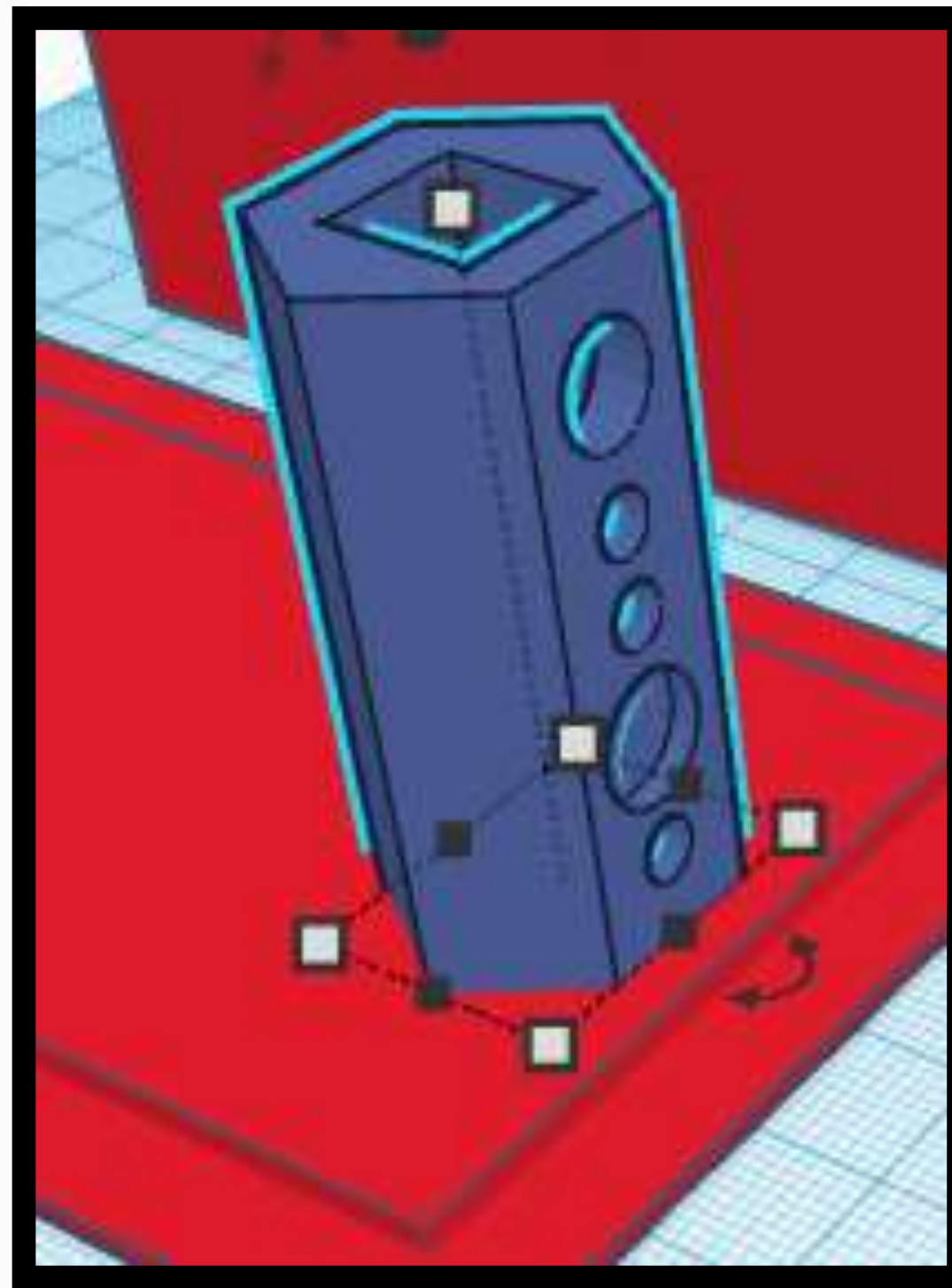
Regression Model:



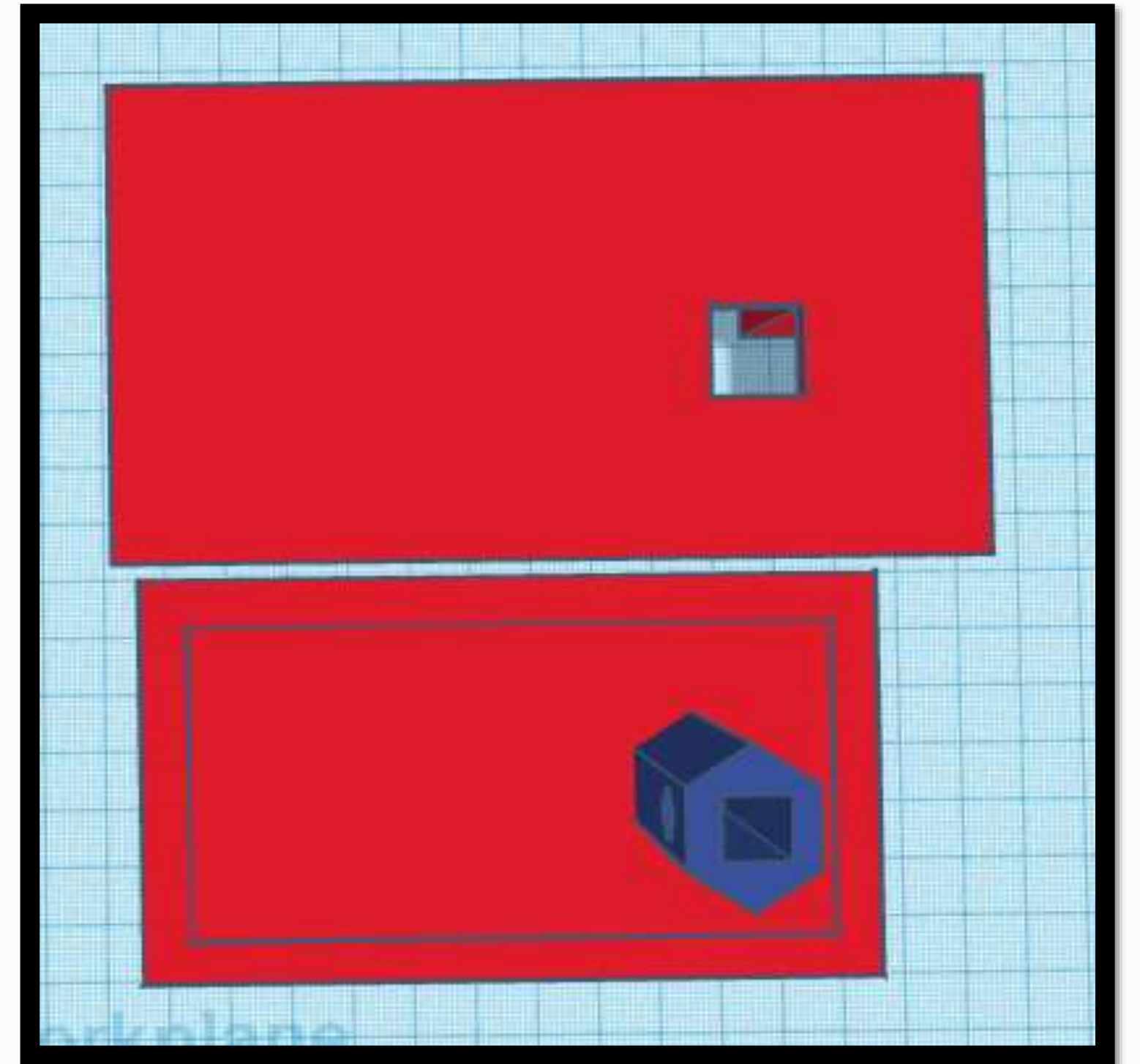
3D Printing Design



Side View



Holder



Top View



Principle Used



Schematics



Working



Mobile application



Comparison

Mobile App



Muawin Mobile Application

01

Real time
concentration

02

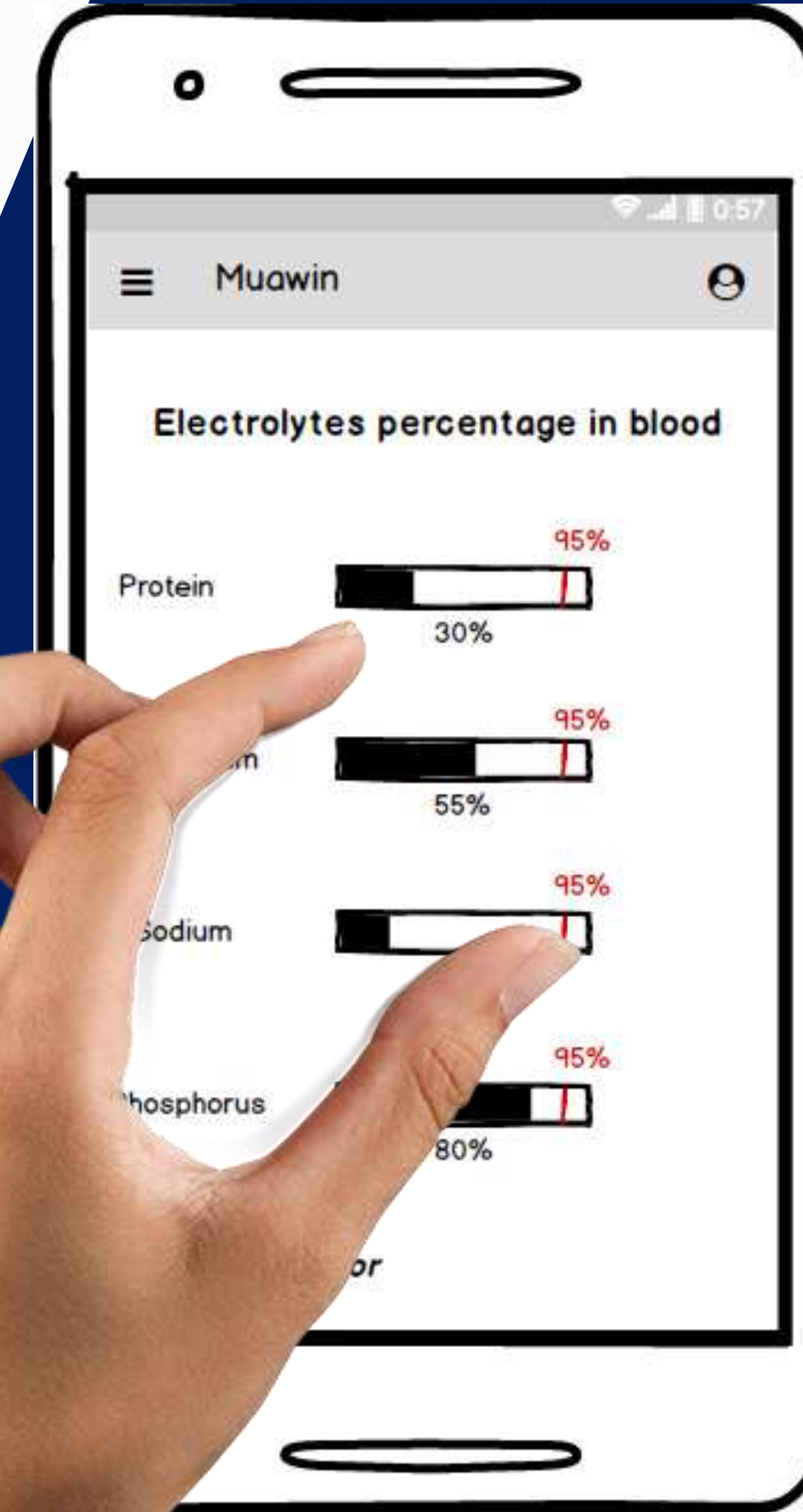
Weekly
Report

03

Pie charts
and Bar
graphs

04

Provides
alerts





Principle Used



Schematics



Working



Mobile application



Comparison

Comparisons



Comparison with existing products

1



**Electrolyte
Analyzer (\$2,000)**

Can only be used by experts



Muawin

User friendly; Provides
automated analysis

Comparison with existing products

2



Abaxis (\$15,000)

PiccoloXpress

Expensive; Displays concentrations of electrolytes etc. only



Muawin

Displays concentrations

Comparison with existing products

3



KidneyDiet App

It tracks potassium, phosphorus, protein, sodium and fluid levels in various foods



Muawin

Tracks the concentration level in blood.

Comparison with existing products

4



Renal Trkrr app

Paid; Provides information regarding food items



Muawin

Free

Comparison with existing products

5



Kidney Diet Food List

Suggest kidney friendly meal plan
for Kidney Diet



Muawin

Free; Regulated diet plan according
to measured concentrations

Muawin Feasibility



Target Market



Industry Analysis



Customer Surveys



Partnership



Cost Breakdown

Muawin – Who is it for?



**Dialysis Patients
(At home)**



**Dialysis Patients
(Travelling)**



Children



Nephrologist

Thank you!
Questions?

