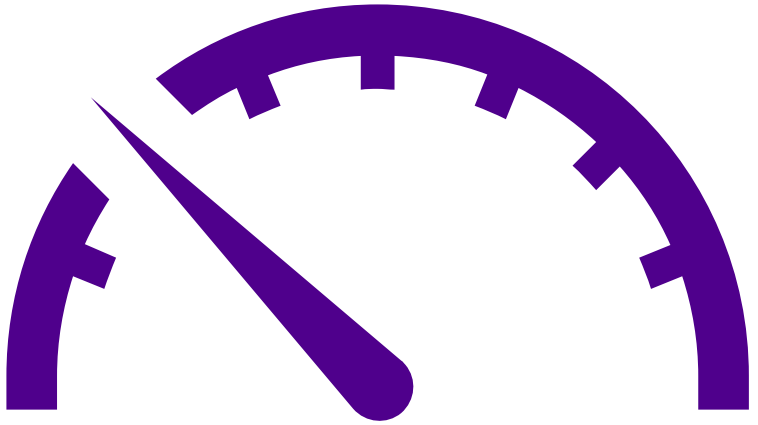
Dynamic Channel Bonding with Machine Learning

STC Team 2

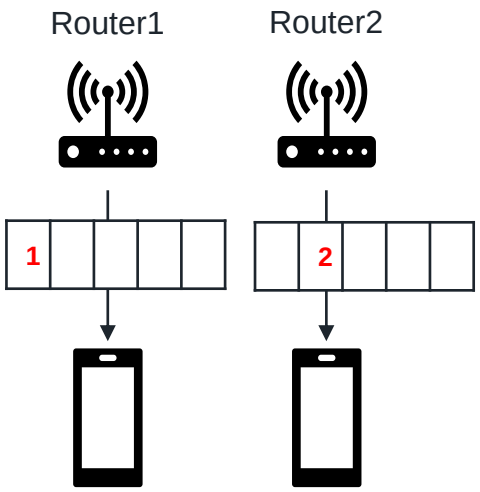
M Alfaifi – A Aloshan – A Algunayah – M Abid – K Sahari

Introduction



Promised internet speed vs. Actual internet speed

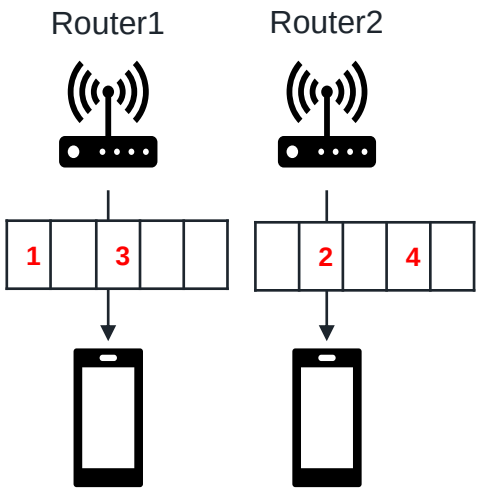
Problem Background



Before 802.11n standard each router will transmit with a single channel. E.g. R1 will use CH1 and R2 will use CH2

No interference

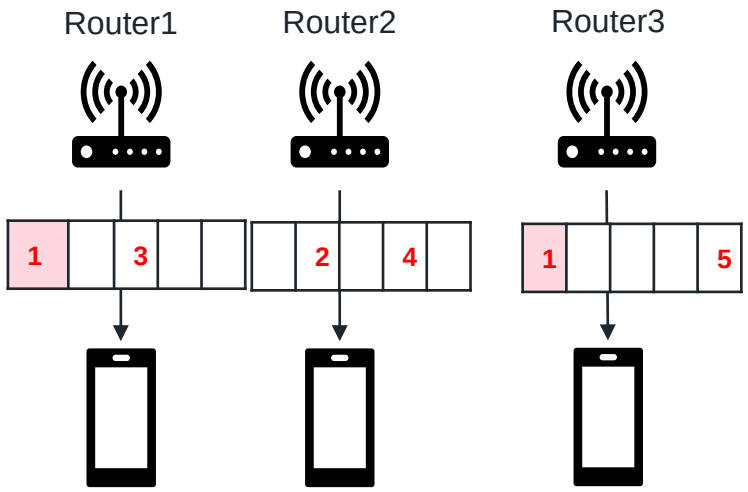
Router1 throughput is okay [**20** Mbps]



802.11n standard enable each router to bond with more than channel

No interference

Router1 throughput Increases [**60** Mbps]



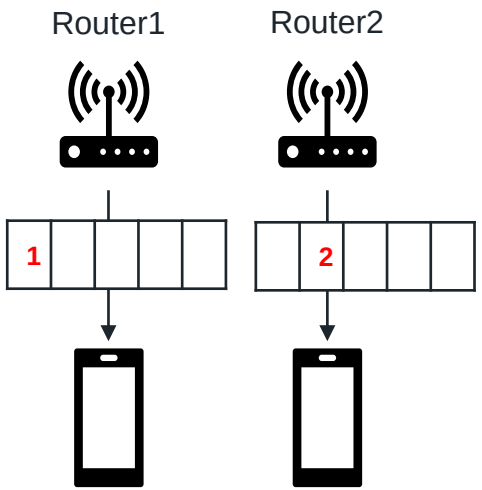
Power must be distributed over the larger channel. And Which creates interference and contention since two access points near each other must share a channel

No interference

Router1 throughput Dramatically decreases to [**5** Mbps]

Problem Background

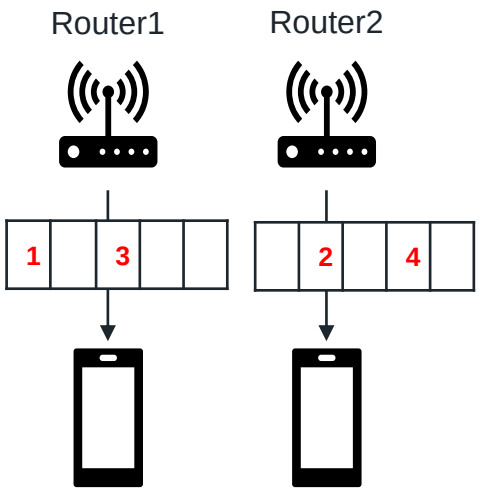
Before



Each router will transmit with a single channel. E.g. R1 will use CH1 and R2 will use CH2

Router1 throughput is okay [**20** Mbps]

Now

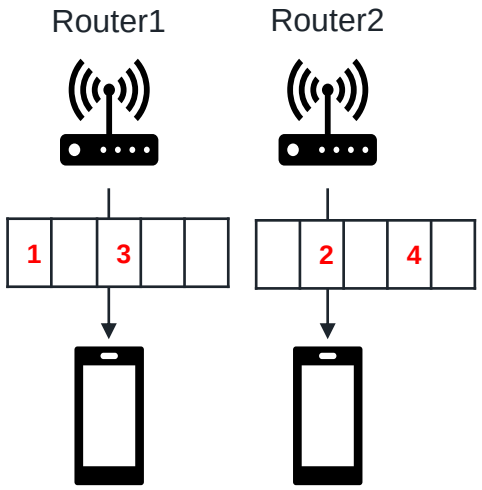


802.11n standard enable each router to bond with more than channel

Router1 throughput Increases [**60** Mbps]

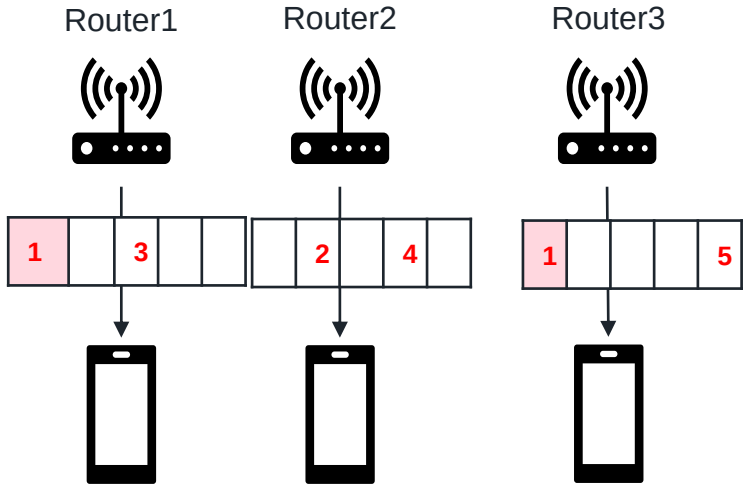
Problem Background

Now



802.11n standard enable each router to bond with more than channel

Router1 throughput Increases [**60 Mbps**]



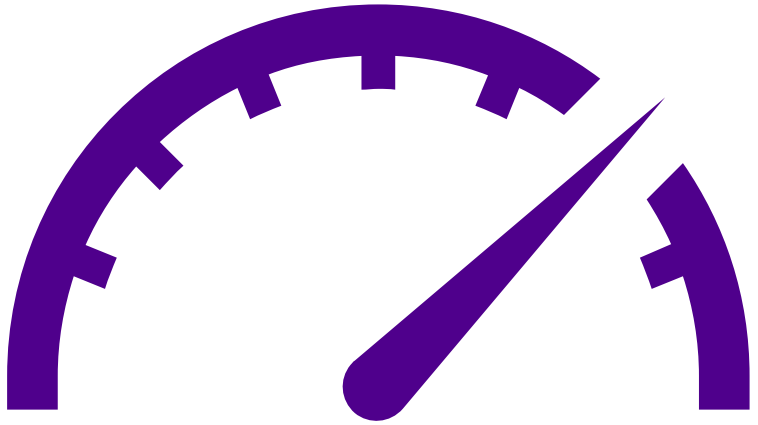
Power must be distributed over the larger channel. And Which creates interference and contention since two access points near each other must share a channel

Interference

Contention

Router1 throughput [**5** Mbps]

Goals and objectives

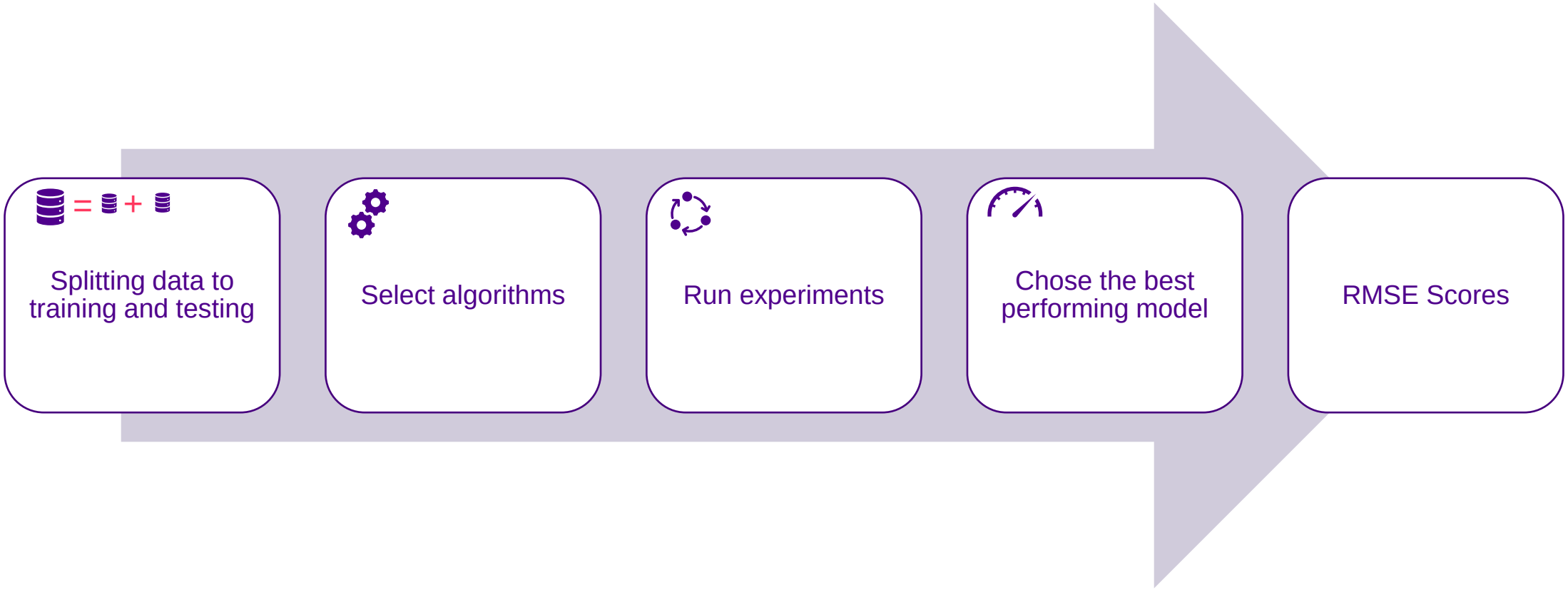


Predict the throughput and enhance customer experience

Dynamic Channel Bonding in WLANs

improve the planning phase and optimize the performance by utilizing ML

ML Model


Splitting data to training and testing
Select algorithms
Run experiments
Chose the best performing model
RMSE Scores

Data

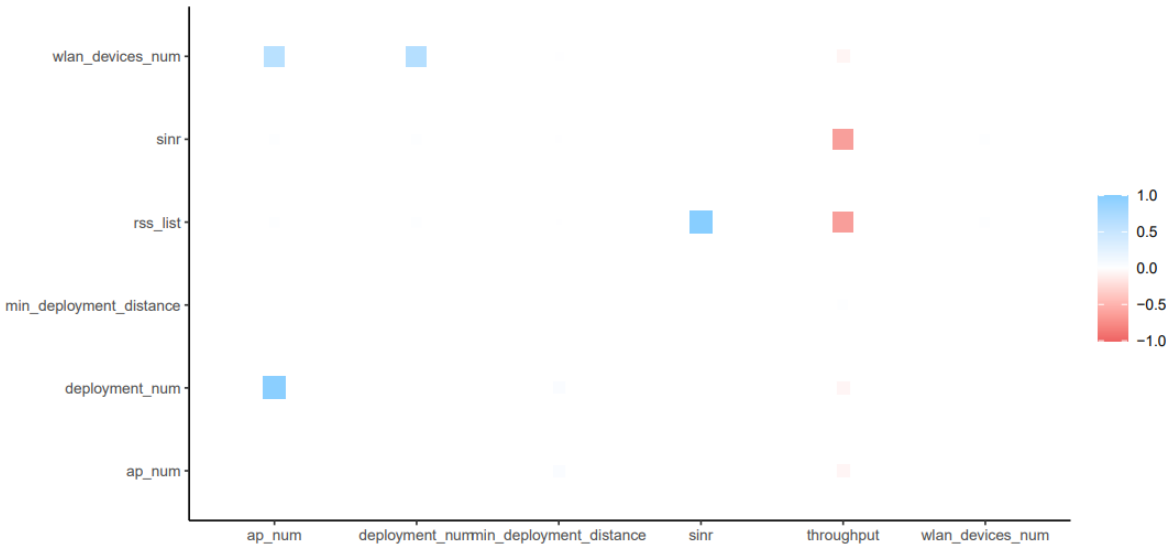
The data consists of two parts:
input and output for multiple deployments

- 2 scenarios for the deployments
  - Scenario 1: 12 APs [3x4]
  - Scenario 2: 8 APs [2x4]
- 100 Deployments for each scenario

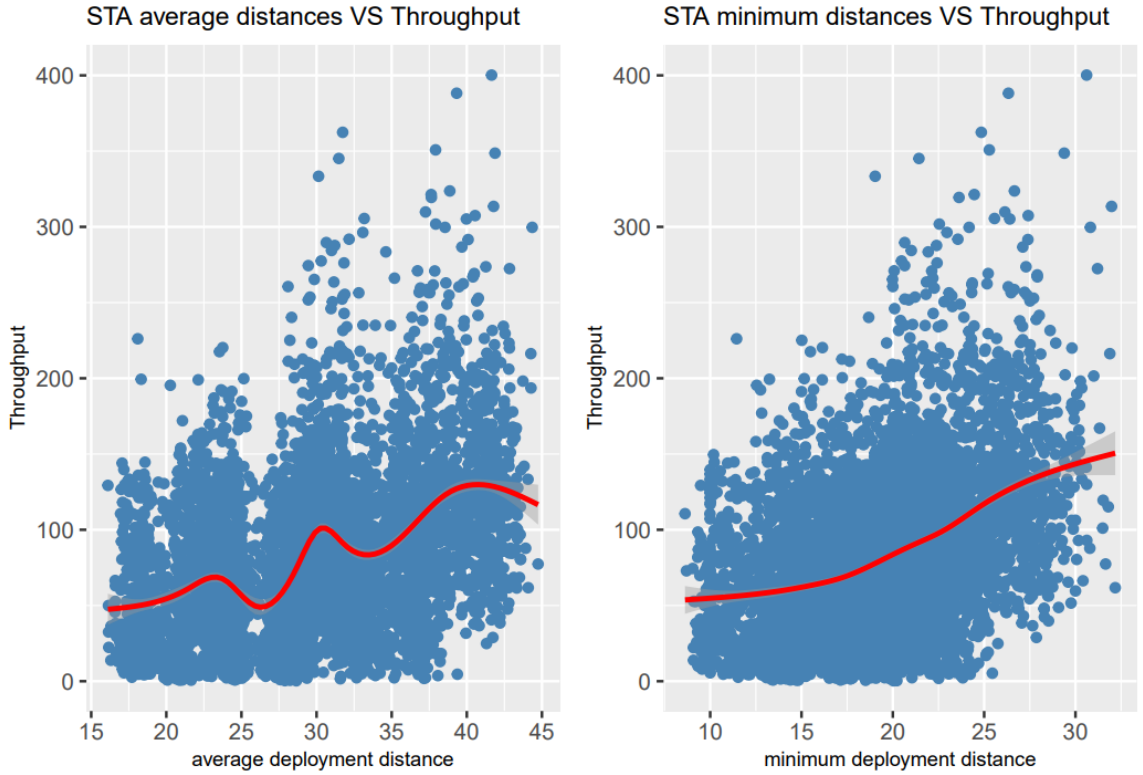
Name	data
Number of rows	78078
Number of columns	29
Column type frequency:	
character	5
numeric	24

skim_variable	n_missing	complete_rate	min	max	empty	n_unique	whitespace
deployment	0	1	20	20	0	600	0
node_code	0	1	4	7	0	252	0
node_type	0	1	1	1	0	2	0
wlan_code	0	1	1	1	0	12	0
ap_num_12	0	1	1	1	0	2	0

Descriptive statistics



As power from AP decreases throughput decreases

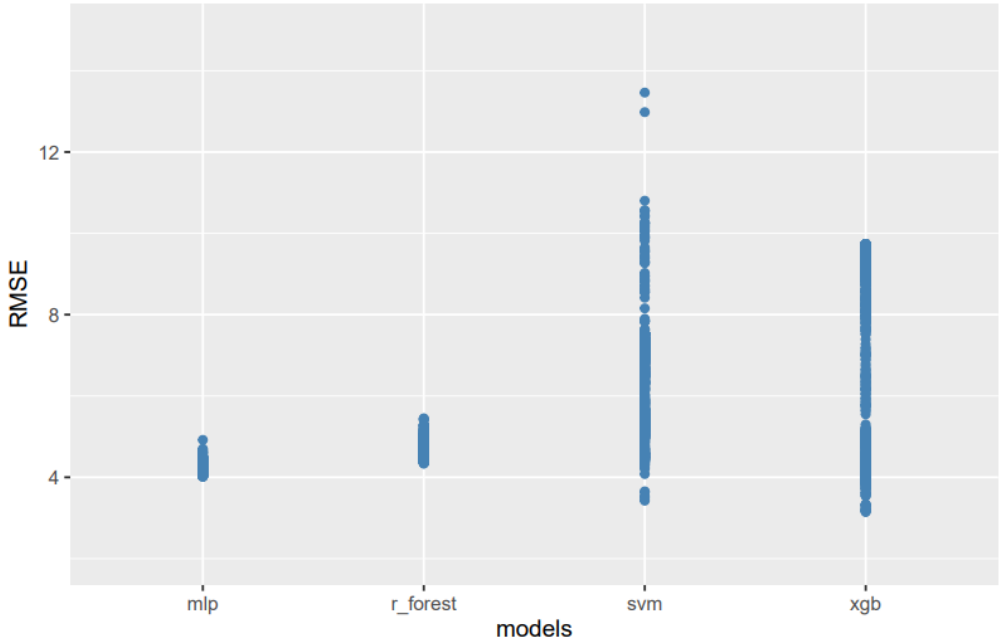


As devices get relatively far apart, the throughput has an upward trend

Experiments

Search for the best model

Xgboost(xgb)	Deep Learning multilayer percptron (MLP)	Randomforest(r_forest)	Support vector machines(svm)

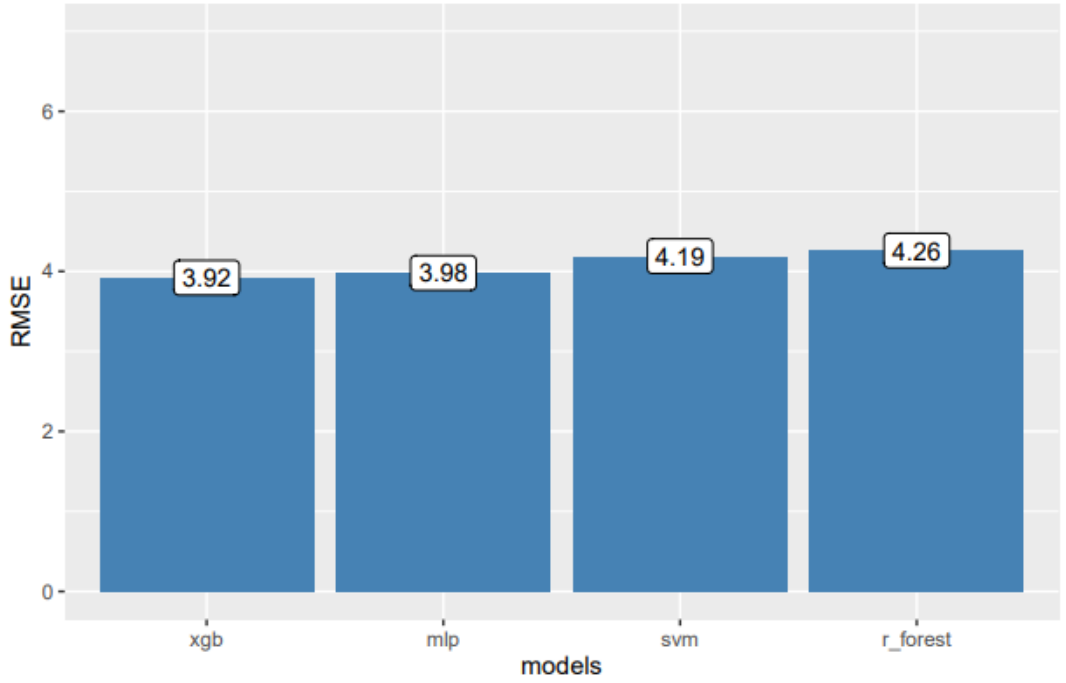


The best performing model is **xgboost**

Validation Data

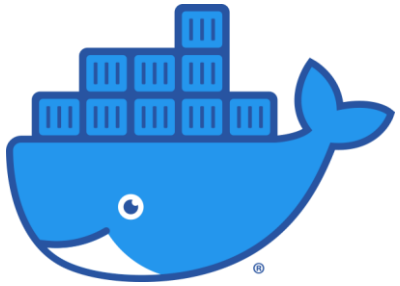
Search for the best model

- Xgboost(xgb)
- Deep Learning multilayer percptron (MLP)
- Randomforest(r_forest)
- Support vector machines(svm)

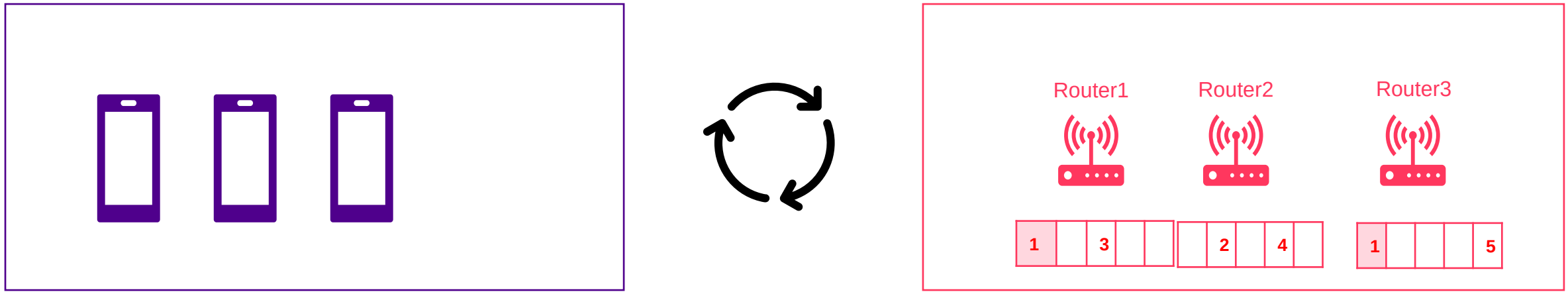


The best performing model among the best models is also **xgboost**

Easily and reproduceable solution



Possible solution



Main Unit

XGBoost

“If you look at history, innovation doesn’t come just from giving people incentives; it comes from creating environments where their ideas can connect.”