Final Project Report

Fundamental Data Science Remed

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11 March 2024

Problem Analysis

Rainbow Six Siege (R6) is a popular tactical first-person shooter game developed by Ubisoft. In Rainbow Six Siege, players choose from various operators with unique abilities, weapons, and gadgets. Predicting operator selection using machine learning algorithms can enhance player experience, improve team composition, and provide insights into player preferences.

From this research, we can find the most favorable operator (character) from the game Rainbow Six Siege based on their Given map, objective location, round number, and the winning role.

Dataset and Processing

The data I used for this project is from Kaggle.com where there are the datasets of every game played in season 5 of Rainbow Six Siege called Operation Velvet Shell.

The dataset that is used: datadump_s5-000.csv

The variables consist of :
Dateid, platform, gamemode, mapname, matchid, roundnumber, objectivelocation, winrole, endroundreason, roundduration, clearancelevel, skillrank, role, team, haswon, operator, nbkills, isdead, primaryweapon, primaryweapontype, primarysight, primarygrip, primaryunderbarrel, primarybarrel, secondaryweapon, secondaryweapontype, secondarysight, secondarygrip, secondaryunderbarrel, secondarybarrel, secondarygadget.

	dateid	platform	gamemode	mapname	matchid	roundnumber	objectivelocation	winrole	endroundreason	roundduration	...	primarygrip	primaryunderbarrel	primarybarrel	secondaryweapon
0	20170212	PC	HOSTAGE	CLUB_HOUSE	1522380841	1	STRIP_CLUB	Defender	AttackersKilledHostage	124	...	Vertical	None	Compensator	5.7_USG
1	20170212	PC	HOSTAGE	CLUB_HOUSE	1522380841	4	CHURCH	Defender	AttackersEliminated	217	...	Vertical	Laser	Suppressor	P12
2	20170212	PC	HOSTAGE	CLUB_HOUSE	1522380841	3	CHURCH	Defender	AttackersEliminated	160	...	None	None	None	MK1_9mm
3	20170212	PC	HOSTAGE	CLUB_HOUSE	1522380841	4	CHURCH	Defender	AttackersEliminated	217	...	None	None	MuzzleBrake	PRB92
4	20170212	PC	HOSTAGE	CLUB_HOUSE	1522380841	6	BEDROOM	Attacker	DefendersEliminated	143	...	Vertical	Laser	Suppressor	P12
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3999995	20170221	PS4	HOSTAGE	BANK	1368316041	6	STAFF_ROOM	Defender	AttackersEliminated	158	...	Vertical	None	None	BEARING_9
3999996	20170221	PS4	HOSTAGE	BANK	1368316041	2	VAULT	Attacker	DefendersEliminated	170	...	Vertical	None	None	BEARING_9
3999997	20170221	PS4	HOSTAGE	BANK	1368316041	1	VAULT	Attacker	DefendersEliminated	142	...	Vertical	None	MuzzleBrake	M45_MEUSOC
3999998	20170221	PS4	HOSTAGE	BANK	1368316041	4	VAULT	Defender	AttackersEliminated	156	...	Vertical	None	Compensator	P9
3999999	20170221	PS4	HOSTAGE	BANK	1368316041	8	VAULT	Defender	AttackersEliminated	141	...	Angle	None	None	PMM

4000000 rows × 31 columns

secondaryweapontype	secondarysight	secondarygrip	secondaryunderbarrel	secondarybarrel	secondarygadget
Pistols	None	None	None	None	IMPACT_GRENADE
Pistols	None	None	Laser	Suppressor	DEPLOYABLE_SHIELD
Pistols	None	None	None	None	DEPLOYABLE_SHIELD
Pistols	None	None	None	None	IMPACT_GRENADE
Pistols	None	None	Laser	Suppressor	DEPLOYABLE_SHIELD
...	...	...	...	...	...
Submachine_Guns	RedDot	None	None	None	CLAYMORE
Submachine_Guns	RedDot	None	None	None	CLAYMORE
Pistols	None	None	Laser	Suppressor	SMOKE_GRENADE
Pistols	None	None	None	None	BREACH_CHARGE
Pistols	None	None	None	None	NITRO_CELL

After dropping some variables that are not important to the objective, the variable consists of :
Gamemode, mapname, roundnumber, objectivelocation, winrole, and operator

	gamemode	mapname	roundnumber	objectivelocation	winrole	operator
0	HOSTAGE	CLUB_HOUSE	1	STRIP_CLUB	Defender	SWAT-CASTLE
1	HOSTAGE	CLUB_HOUSE	4	CHURCH	Defender	GSG9-JAGER
2	HOSTAGE	CLUB_HOUSE	3	CHURCH	Defender	JTF2-FROST
3	HOSTAGE	CLUB_HOUSE	4	CHURCH	Defender	BOPE-CAVEIRA
4	HOSTAGE	CLUB_HOUSE	6	BEDROOM	Attacker	GSG9-JAGER

Dataset Variables
- gamemode
consist of: ['HOSTAGE', 'BOMB', 'SECURE_AREA']
- mapname
consist of: ['CLUB_HOUSE', 'PLANE', 'KANAL', 'HEREFORD_BASE', 'CONSULATE',
'YACHT', 'OREGON', 'BORDER', 'SKYSCRAPER', 'BANK', 'COASTLINE',
'BARTLETT_U.', 'HOUSE', 'KAFE_DOSTOYEVSKY', 'FAVELAS', 'CHALET']

- roundnumber
consist of: [1, 4, 3, 6, 2, 5, 7, 8, 9]
- objectivelocation
consist of: 'STRIP_CLUB', 'CHURCH', 'BEDROOM', 'CASH_ROOM',
'MEETING_ROOM-EXECUTIVE_OFFICE',
'CARGO_HOLD-LUGGAGE_HOLD',
'STAFF_SECTION-EXECUTIVE_BEDROOM',
'SERVER_ROOM-CONTROL_ROOM',
'COAST_GUARD_OFFICE-HOLDING_ROOM',
'KITCHEN-PROJECTOR_ROOM',
'ARMORY', 'MASTER_BEDROOM', 'ARCHIVES', 'GARAGE', 'COCKPIT',
'KITCHEN-DINING_HALL', 'KIDS_DORMS-DORMS_MAIN_HALL',
'REAR_STAGE-WATCH_TOWER', 'CASINO', 'MAPS_ROOM', 'ENGINE',
'LAUDRY_ROOM-SUPPLY_ROOM', 'KITCHEN-ENGINE_CONTROL',
'MAPS_ROOM-COCKPIT', 'MEETING_ROOM', 'LUGGAGE_HOLD',
'TELLERS',
'OFFICES', 'ARMORY_LOCKERS', 'WORKSHOP', '2F_TEA_ROOM',
'1F_BEDROOM', '1F_BBQ', '2F_WORK_OFFICE', 'LOCKERS',
'OPEN_AREA',
'ARSENAL_ROOM', 'KITCHEN', 'CEO_OFFICE', 'VAULT',
'2F_KARAOKE-2F_TEA_ROOM', '1F_BEDROOM-1F_BATHROOM',
'2F_EXHIBITION-2F_WORK_OFFICE',
'CONSUL_OFFICE-MEEETING_ROOM',
'GARAGE-CAFETERIA', 'LOBBY-PRESS_ROOM', '1F_KITCHEN',
'2F_GEISHA_ROOM', '2F_PENTHOUSE', '2F_BILLIARDS_ROOM',
'AKLARK_SUB_ROOM', 'CLASSROOM', 'LIBRARY',
"KID'S_BEDROOM",
'EXECUTIVE_BEDROOM', 'DINING_ROOM',
'FIREPLACE_HALL-MINING_ROOM',
'KITCHEN_PREP-BAKERY', 'BAR-COCKTAIL_LOUNGE',
"1F_AUNT'S_APARTMENT", '3F_PACKAGING_ROOM',
'1F_ARMORY_ROOM',
'LAUNDRY_ROOM', 'DORMS_MAIN_HALL', 'MAIN_OFFICE',
'ROWING_MUSEUM-TROPHY_ROOM', 'READING_ROOM-LIBRARY',
'KITCHEN-PIANO_ROOM', 'CLASSROOM-LIBRARY', 'MODEL_HALL',

'ADMINISTRATION_OFFICE', 'BRIEFING_ROOM-ARMORY',
'DINING_ROOM-KIDS_BEDROOM', 'TV_ROOM-KITCHEN',
...
'LIVING_ROOM-TRAINING_ROOM', "TELLER'S_OFFICE",
"2F_AUNT'S_BEDROOM-1F_AUNT'S_APARTMENT",
'3F_PACKAGING_ROOM-2F_METH_LAB', 'SUPPLY', 'STAFF_ROOM',
"1F_BIKER'S_APARTMENT", 'CUSTOMS_INSPECTIONS', 'CAFETERIA',
'2F_VIP_LOUNGE']

- winrole

consist of: ['Defender', 'Attacker']

- operator

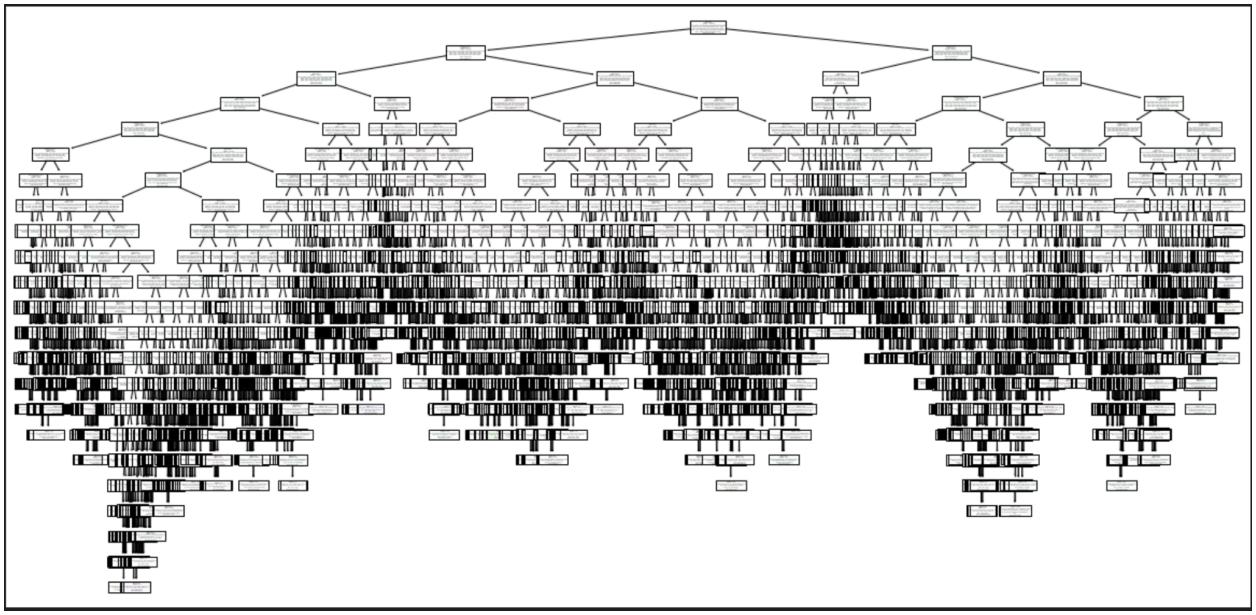
consist of: ['SWAT-CASTLE', 'GSG9-JAGER', 'JTF2-FROST', 'BOPE-CAVEIRA',
'G.E.O.-JACKAL', 'GIGN-TWITCH', 'SWAT-ASH', 'JTF2-BUCK',
'SPETSNAZ-FUZE', 'GSG9-IQ', 'NAVYSEAL-BLACKBEARD',
'SPETSNAZ-TACHANKA', 'GSG9-BANDIT', 'G.E.O.-MIRA',
'SAT-HIBANA',
'NAVYSEAL-VALKYRIE', 'SPETSNAZ-GLAZ', 'SAS-MUTE',
'SWAT-THERMITE',
'SWAT-PULSE', 'GIGN-DOC', 'SAT-ECHO', 'SAS-SLEDGE',
'GIGN-MONTAGNE', 'SWAT-RESERVE', 'SAS-SMOKE', 'GIGN-ROOK',
'GSG9-BLITZ', 'SPETSNAZ-KAPKAN', 'GSG9-RESERVE',
'BOPE-CAPITAO',
'SAS-THATCHER', 'GIGN-RESERVE', 'SAS-RESERVE',
'SPETSNAZ-RESERVE']

Machine Learning

The machine learning that is used in this project is Random Forest, Decision Tree, and K-Nearest Neighbor. I picked these algorithms because since my data is not numerical, those 3 work better in categorical data.

Visualization

Decision Tree

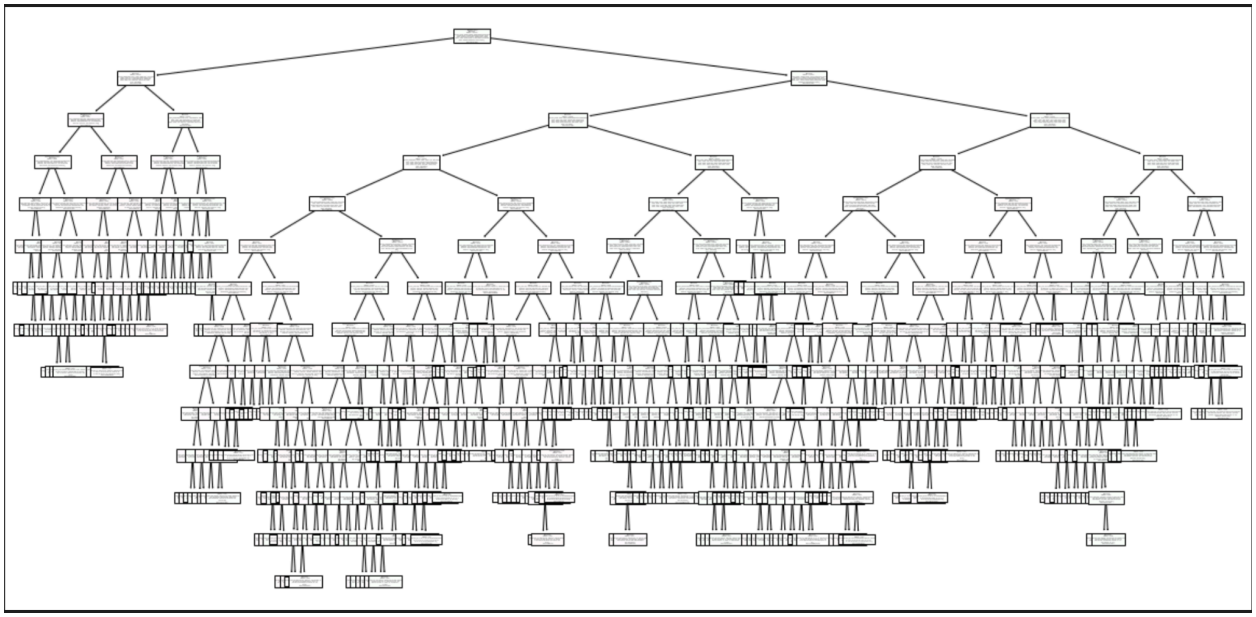


Accuracy: 0.0637675

Classification Report:

	precision	recall	f1-score	support
0	0.00	0.00	0.00	14150
1	0.04	0.00	0.01	32580
2	0.05	0.02	0.03	41029
3	0.04	0.01	0.01	35066
4	0.01	0.00	0.00	22512
5	0.01	0.00	0.00	12925
6	1.00	0.00	0.00	1298
7	0.04	0.00	0.00	28680
8	0.04	0.02	0.02	40648
9	0.06	0.04	0.05	38005
10	1.00	0.00	0.00	4527
11	0.00	0.00	0.00	12989
12	0.07	0.60	0.12	52913
13	1.00	0.00	0.00	3978
14	0.00	0.00	0.00	18768
15	0.04	0.00	0.00	26045
16	0.00	0.00	0.00	15286
17	0.03	0.00	0.00	31047
18	0.04	0.00	0.00	31069
19	1.00	0.00	0.00	2945
20	0.03	0.00	0.00	29528
21	0.00	0.00	0.00	21685
22	0.03	0.00	0.00	24309
23	1.00	0.00	0.00	9654
24	0.04	0.01	0.02	40412
25	0.06	0.07	0.06	37175
26	0.06	0.06	0.06	14388
27	0.09	0.00	0.00	18460
28	1.00	0.00	0.00	1260
29	1.00	0.00	0.00	3629
30	0.06	0.19	0.09	48950
31	0.02	0.00	0.00	19232
32	0.00	0.00	0.00	24537
33	1.00	0.00	0.00	1508
34	0.06	0.05	0.06	38813
accuracy			0.06	800000
macro avg	0.25	0.03	0.02	800000
weighted avg	0.07	0.06	0.03	800000

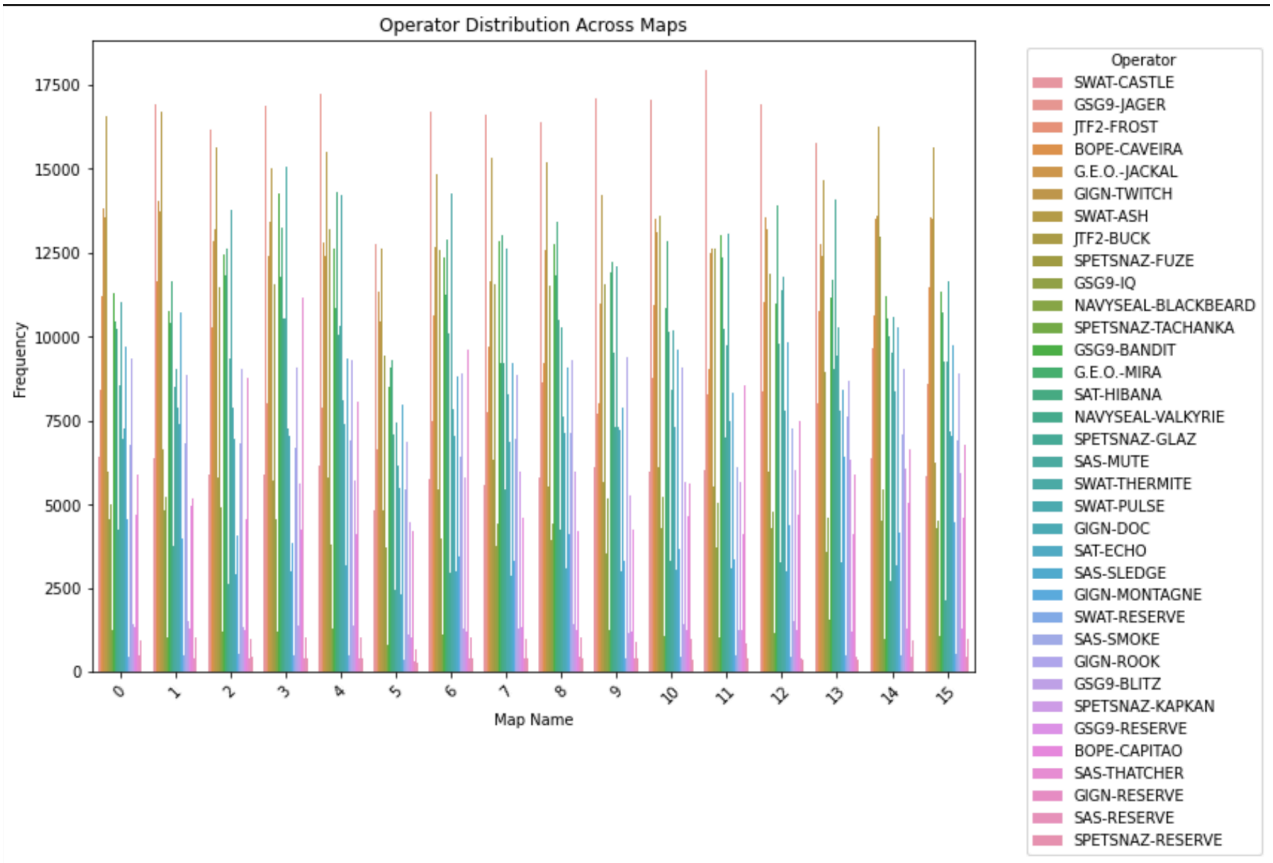
Random Forest



Accuracy: 0.06712

	precision	recall	f1-score	support
BOPE-CAPITAO	0.00	0.00	0.00	14150
BOPE-CAVEIRA	0.03	0.00	0.00	32580
G.E.O.-JACKAL	0.05	0.00	0.00	41029
G.E.O.-MIRA	0.00	0.00	0.00	35066
GIGN-DOC	0.00	0.00	0.00	22512
GIGN-MONTAGNE	0.00	0.00	0.00	12925
GIGN-RESERVE	0.00	0.00	0.00	1298
GIGN-ROOK	0.00	0.00	0.00	28680
GIGN-TWITCH	0.04	0.00	0.00	40648
GSG9-BANDIT	0.07	0.05	0.06	38005
GSG9-BLITZ	0.00	0.00	0.00	4527
GSG9-IQ	0.00	0.00	0.00	12989
GSG9-JAGER	0.07	0.64	0.12	52913
GSG9-RESERVE	0.00	0.00	0.00	3978
JTF2-BUCK	0.00	0.00	0.00	18768
JTF2-FROST	0.00	0.00	0.00	26045
NAVYSEAL-BLACKBEARD	0.00	0.00	0.00	15286
NAVYSEAL-VALKYRIE	0.00	0.00	0.00	31047
SAS-MUTE	0.05	0.00	0.00	31069
SAS-RESERVE	0.00	0.00	0.00	2945
SAS-SLEDGE	0.00	0.00	0.00	29528
SAS-SMOKE	0.00	0.00	0.00	21685
SAS-THATCHER	0.00	0.00	0.00	24309
SAT-ECHO	0.00	0.00	0.00	9654
SAT-HIBANA	0.00	0.00	0.00	40412
SPETSNAZ-FUZE	0.06	0.05	0.05	37175
SPETSNAZ-GLAZ	0.06	0.06	0.06	14388
SPETSNAZ-KAPKAN	0.00	0.00	0.00	18460
SPETSNAZ-RESERVE	0.00	0.00	0.00	1260
SPETSNAZ-TACHANKA	0.00	0.00	0.00	3629
SWAT-ASH	0.06	0.26	0.10	48950
SWAT-CASTLE	0.00	0.00	0.00	19232
SWAT-PULSE	0.00	0.00	0.00	24537
SWAT-RESERVE	0.00	0.00	0.00	1508
SWAT-THERMITE	0.06	0.05	0.06	38813
accuracy			0.07	800000
macro avg	0.02	0.03	0.01	800000
weighted avg	0.03	0.07	0.02	800000

KNN


Operator Distribution Across Maps
Frequency
Map Name
0
2500
5000
7500
10000
12500
15000
17500
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Operator
SWAT-CASTLE
GSG9-JAGER
JTF2-FROST
BOPE-CAVEIRA
G.E.O.-JACKAL
GIGN-TWITCH
SWAT-ASH
JTF2-BUCK
SPETSNAZ-FUZE
GSG9-IQ
NAVYSEAL-BLACKBEARD
SPETSNAZ-TACHANKA
GSG9-BANDIT
G.E.O.-MIRA
SAT-HIBANA
NAVYSEAL-VALKYRIE
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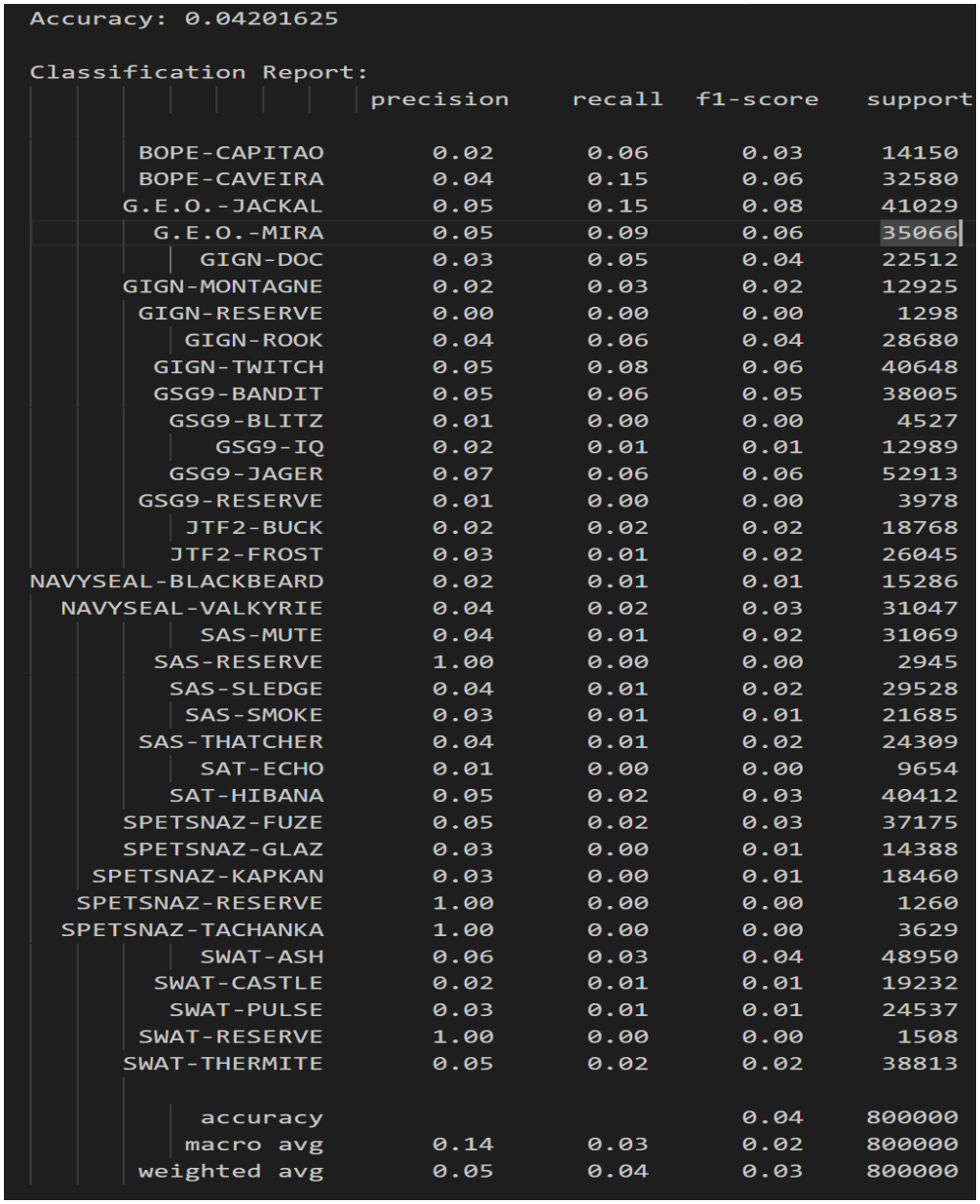
SAS-MUTE
SWAT-THERMITE
SWAT-PULSE
GIGN-DOC
SAT-ECHO
SAS-SLEDGE
GIGN-MONTAGNE
SWAT-RESERVE
SAS-SMOKE
GIGN-ROOK
GSG9-BLITZ
SPETSNAZ-KAPKAN
GSG9-RESERVE
BOPE-CAPITAO
SAS-THATCHER
GIGN-RESERVE
SAS-RESERVE
SPETSNAZ-RESERVE



```
Accuracy: 0.04201625

Classification Report:
                    precision    recall  f1-score   support

        BOPE-CAPITAO       0.02      0.06      0.03     14150
        BOPE-CAVEIRA       0.04      0.15      0.06     32580
      G.E.O.-JACKAL        0.05      0.15      0.08     41029
        G.E.O.-MIRA        0.05      0.09      0.06     35066
          GIGN-DOC         0.03      0.05      0.04     22512
      GIGN-MONTAGNE        0.02      0.03      0.02     12925
        GIGN-RESERVE       0.00      0.00      0.00      1298
          GIGN-ROOK        0.04      0.06      0.04     28680
        GIGN-TWITCH        0.05      0.08      0.06     40648
        GSG9-BANDIT        0.05      0.06      0.05     38005
          GSG9-BLITZ       0.01      0.00      0.00      4527
            GSG9-IQ        0.02      0.01      0.01     12989
        GSG9-JAGER         0.07      0.06      0.06     52913
       GSG9-RESERVE        0.01      0.00      0.00      3978
          JTF2-BUCK        0.02      0.02      0.02     18768
         JTF2-FROST        0.03      0.01      0.02     26045
NAVYSEAL-BLACKBEARD        0.02      0.01      0.01     15286
  NAVYSEAL-VALKYRIE        0.04      0.02      0.03     31047
          SAS-MUTE         0.04      0.01      0.02     31069
        SAS-RESERVE        1.00      0.00      0.00      2945
        SAS-SLEDGE         0.04      0.01      0.02     29528
         SAS-SMOKE         0.03      0.01      0.01     21685
       SAS-THATCHER        0.04      0.01      0.02     24309
          SAT-ECHO         0.01      0.00      0.00      9654
        SAT-HIBANA         0.05      0.02      0.03     40412
      SPETSNAZ-FUZE        0.05      0.02      0.03     37175
      SPETSNAZ-GLAZ        0.03      0.00      0.01     14388
    SPETSNAZ-KAPKAN        0.03      0.00      0.01     18460
   SPETSNAZ-RESERVE        1.00      0.00      0.00      1260
  SPETSNAZ-TACHANKA        1.00      0.00      0.00      3629
          SWAT-ASH         0.06      0.03      0.04     48950
        SWAT-CASTLE        0.02      0.01      0.01     19232
         SWAT-PULSE        0.03      0.01      0.01     24537
       SWAT-RESERVE        1.00      0.00      0.00      1508
      SWAT-THERMITE        0.05      0.02      0.02     38813

           accuracy                             0.04    800000
          macro avg        0.14      0.03      0.02    800000
       weighted avg        0.05      0.04      0.03    800000
```

References:

https://www.kaggle.com/datasets/maxcobra/rainbow-six-siege-s5-ranked-dataset