

FIG.1A

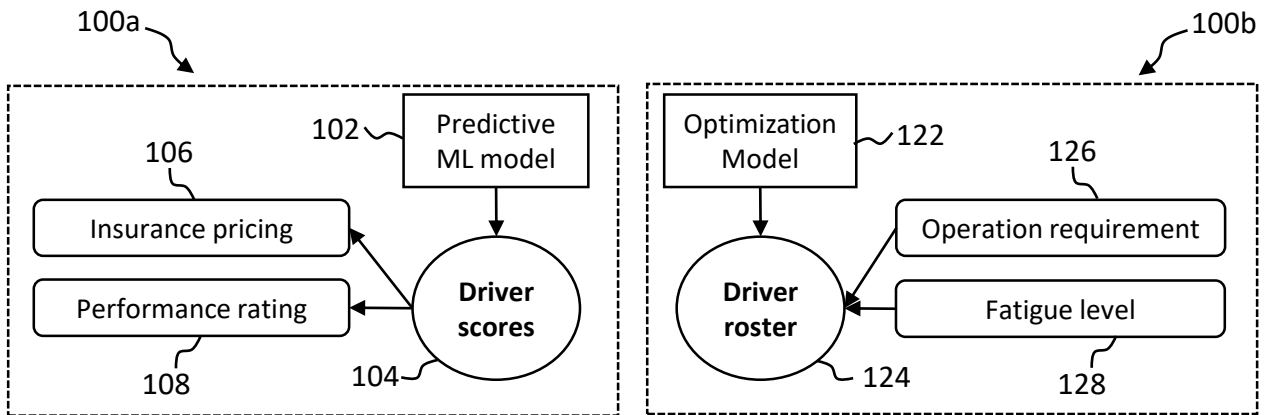


FIG.1B

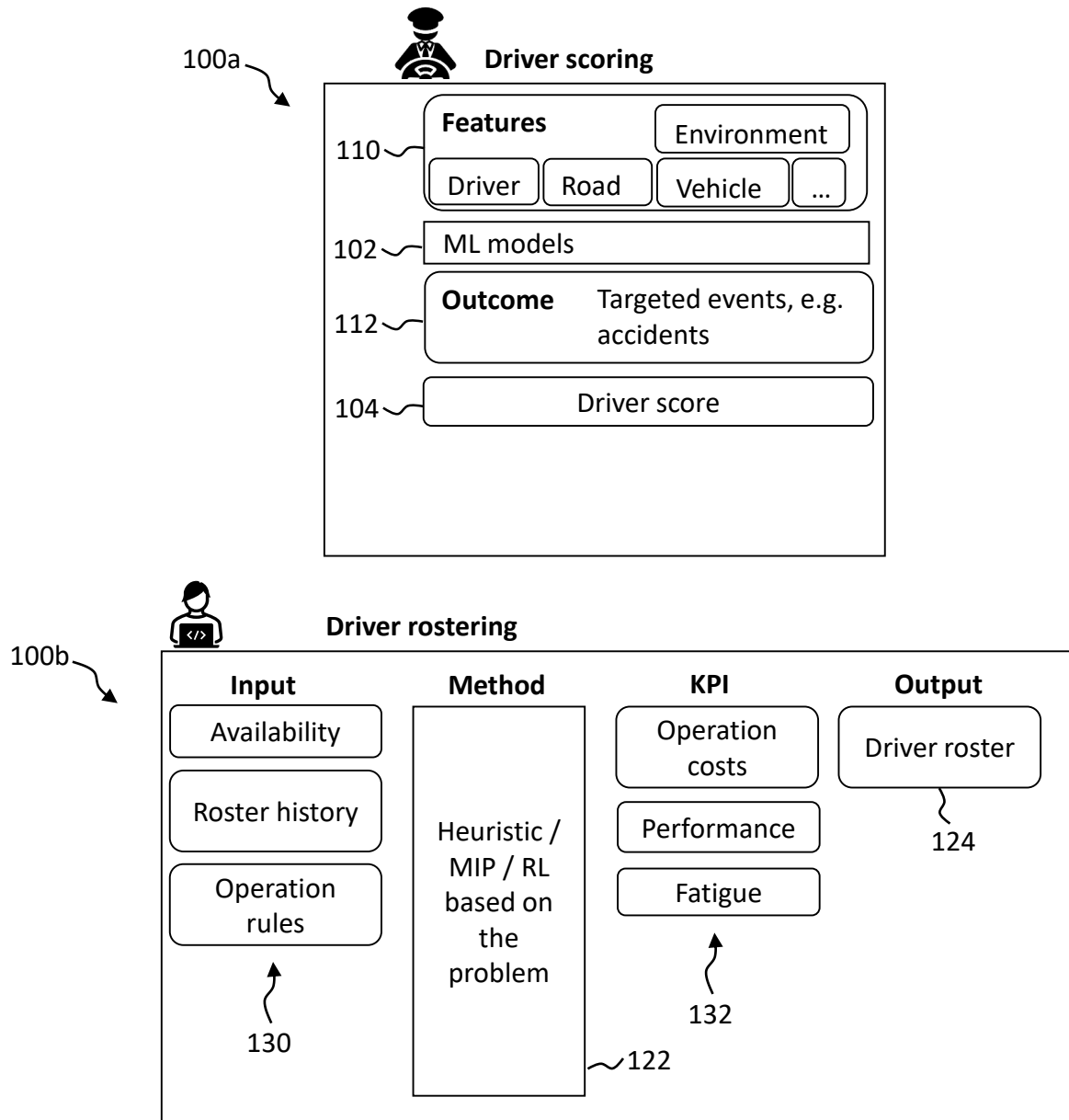


FIG.2

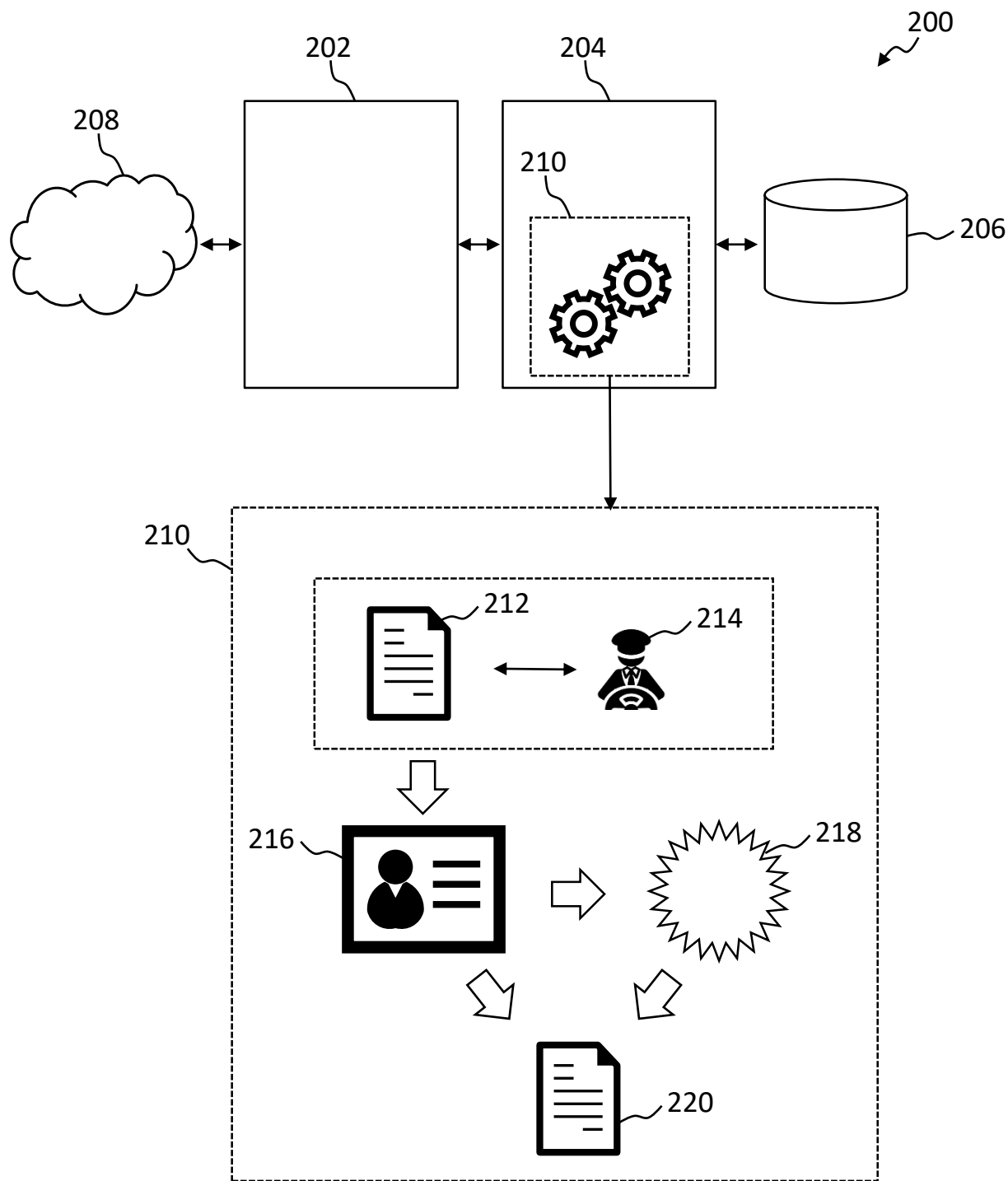


FIG.3

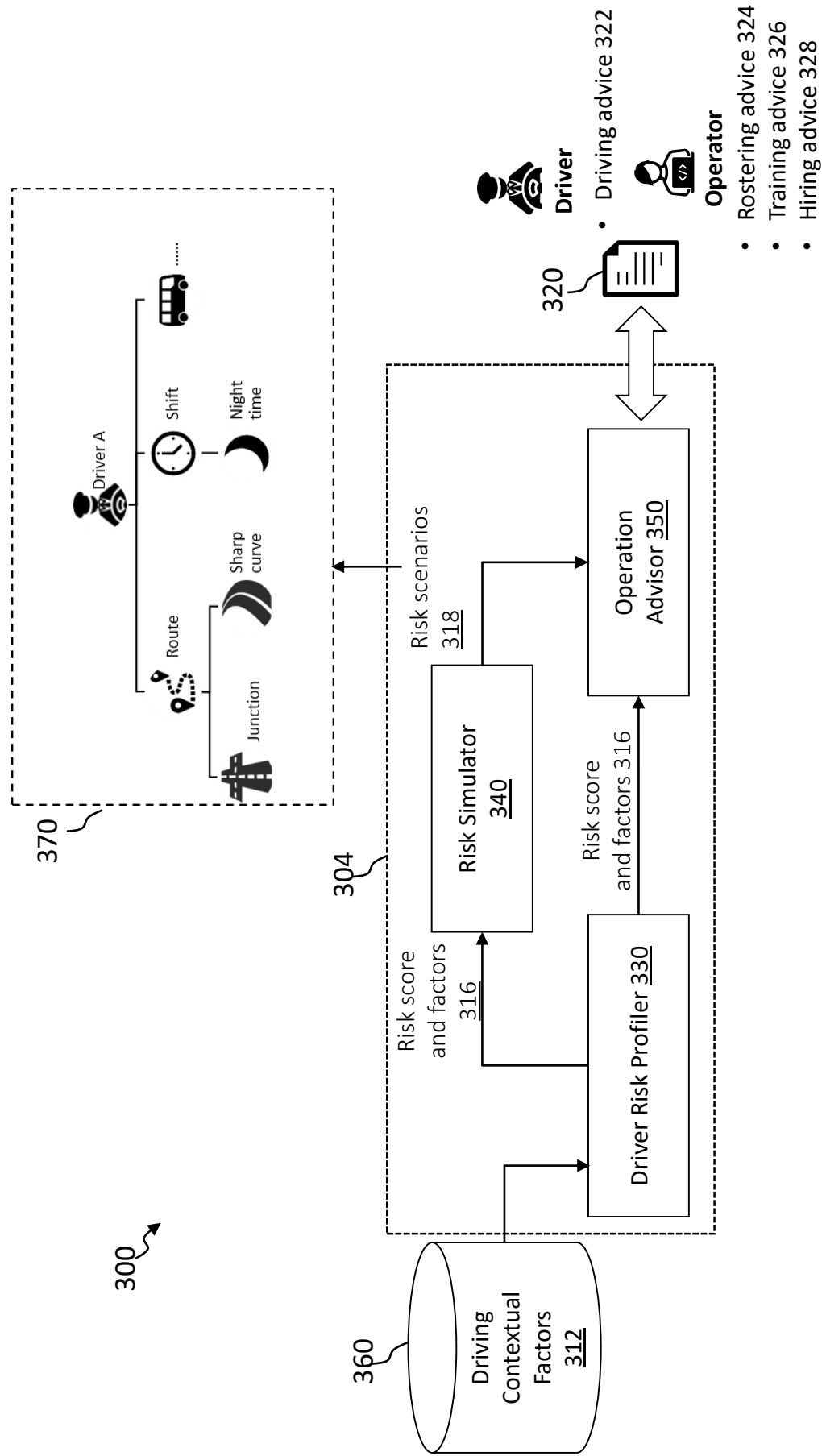


FIG.4

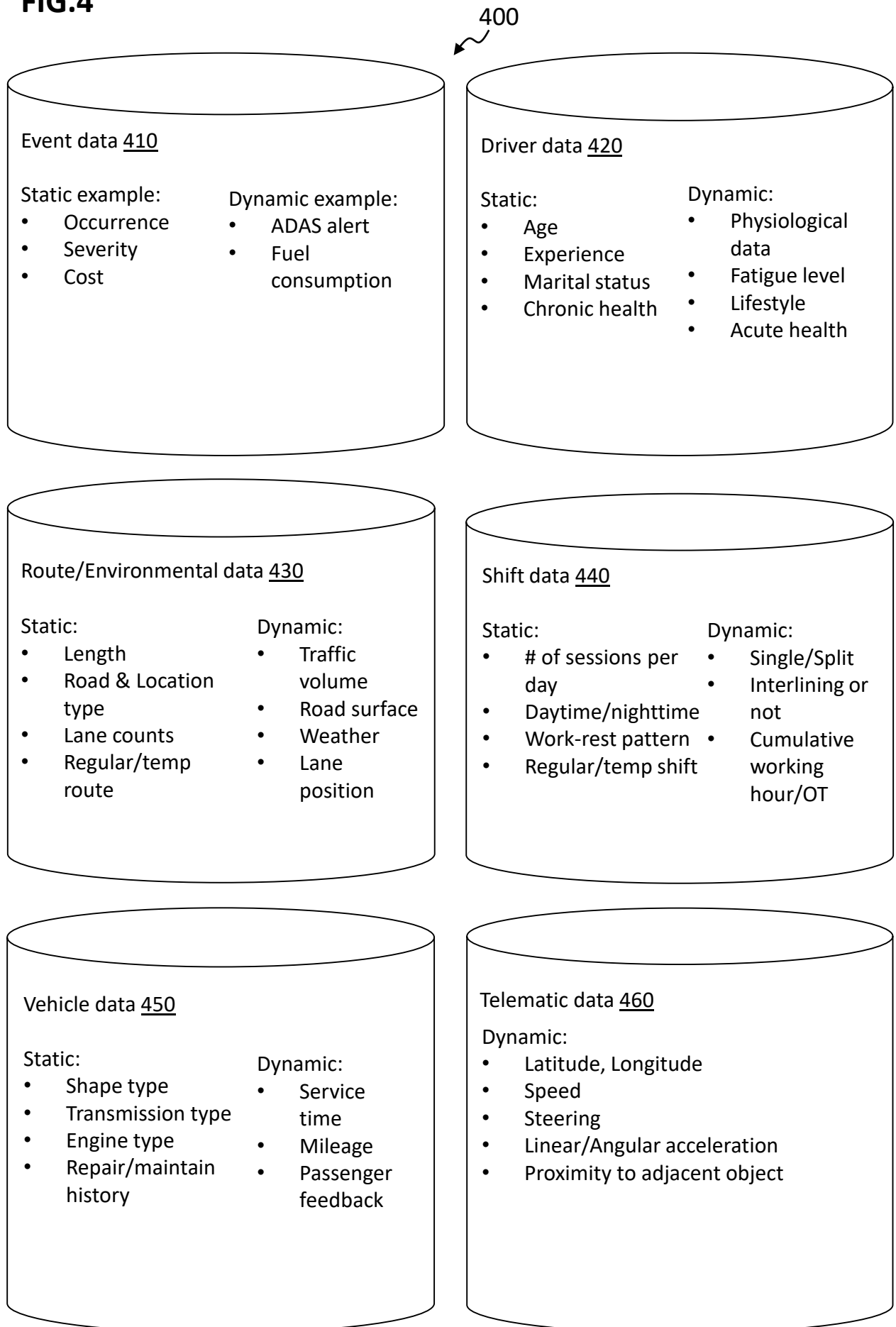


FIG.5

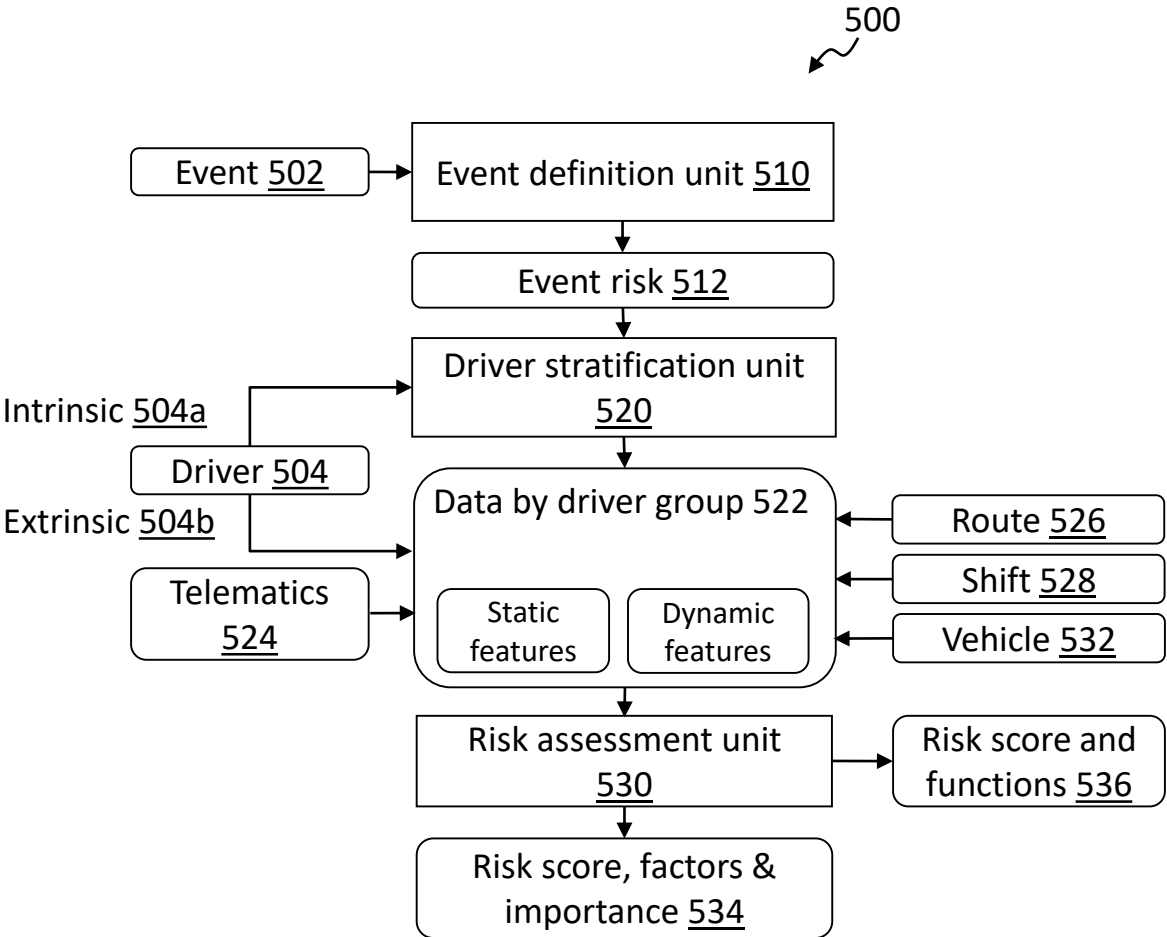


FIG.6A

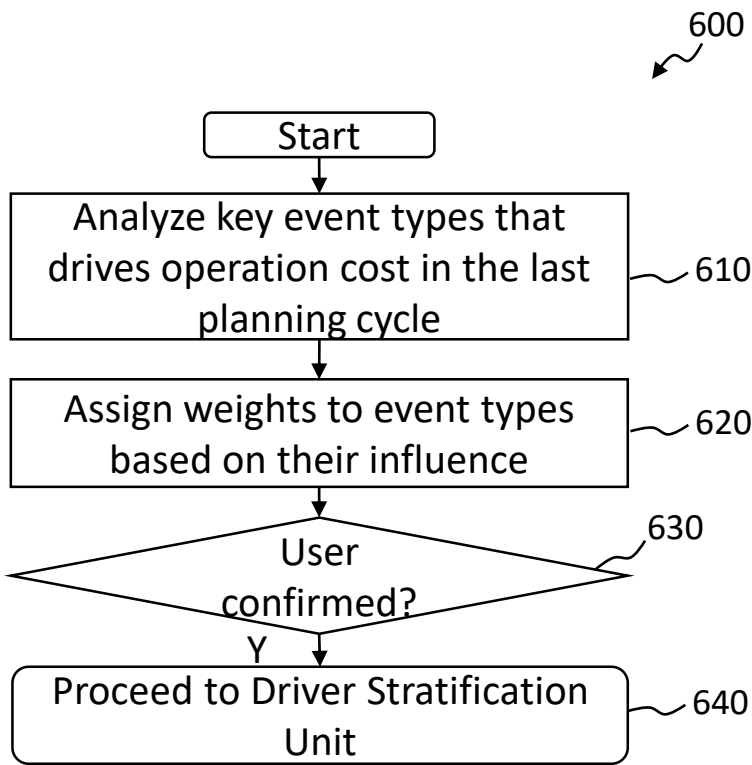


FIG.6B

650

652 Event type	654 Severity-weighted?	656 Weight
Accident or near-miss	Yes	0.8
Vehicle breakdown	N/A	0.1
Fuel consumption	N/A	0.1
.....		

FIG.7A

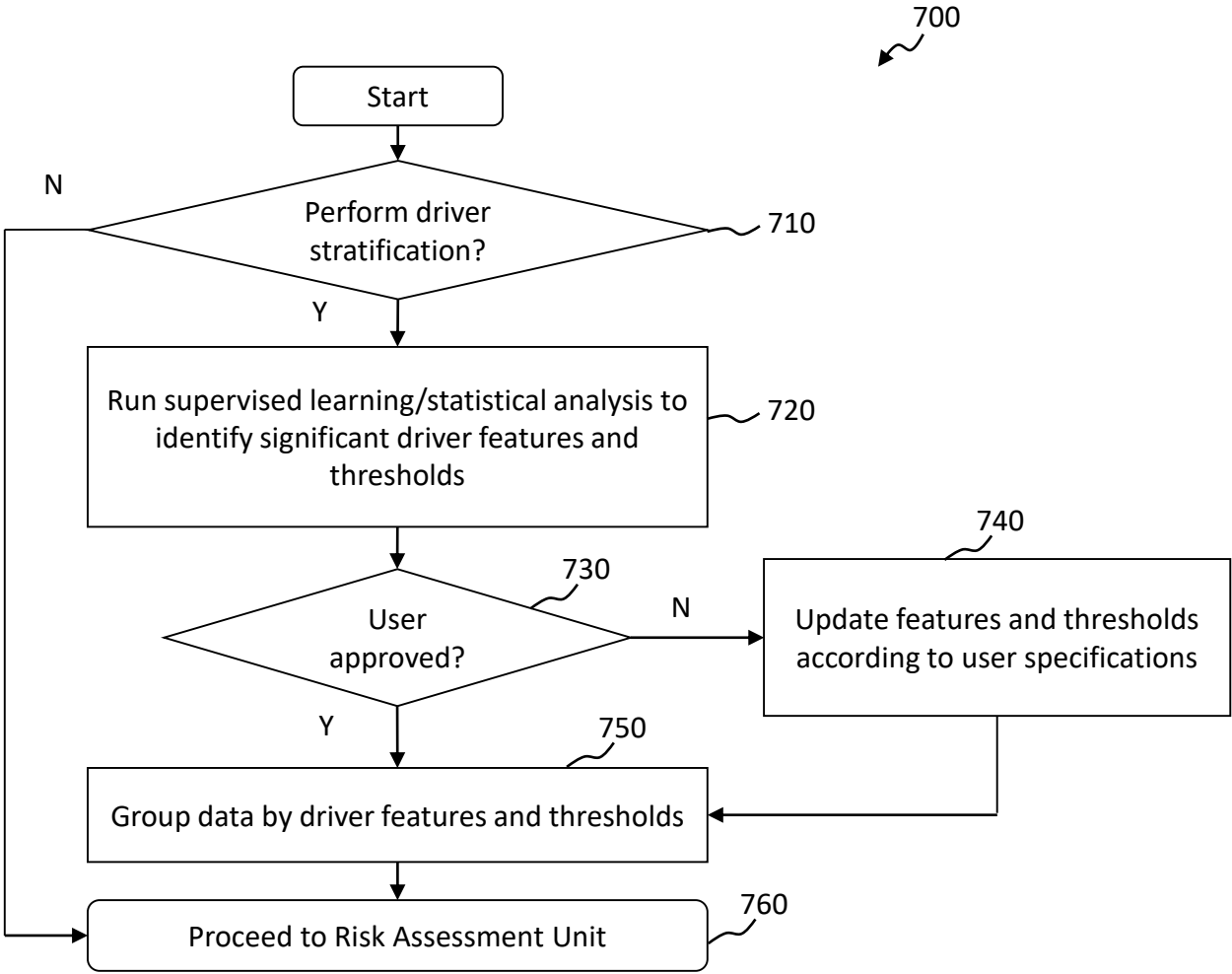


FIG.7B

		704	706-1	706-2	702
708	History	0	>0		
	Age				
712-1	≤45	Model 1: younger drivers w/o accident history N=21,000		Model 4: younger drivers with accident history N=2,000	
712-2	(45, 65]	Model 2: mid-age drivers w/o accident history N=42,000		Model 5: mid-age drivers with accident history N=1,000	
712-3	>65	Model 3: older drivers w/o accident history N=31,000		Model 6: older drivers with accident history N=3,000	

FIG.7C

714	708	704	716	718	722	724
Driver id	Driver age	Accident history	Time	Event occurrence	Other factors (excl. those used in DSU)	Model
AB	40	0	i	...	...	1
AB	40	0	i+1	...	...	1
...						1
RA	38	0	i	...	...	1
RA	38	0	i+1	...	...	1
...						1

Driver id	Driver age	Accident history	Time	Event occurrence	Other factors (excl. those used in DSU)	Model
ZK	51	0	i	...	...	2
ZK	51	0	i+1	...	...	2
...						2
BD	56	0	i	...	...	2
BD	56	0	i+1	...	...	2
...						2

FIG.7D

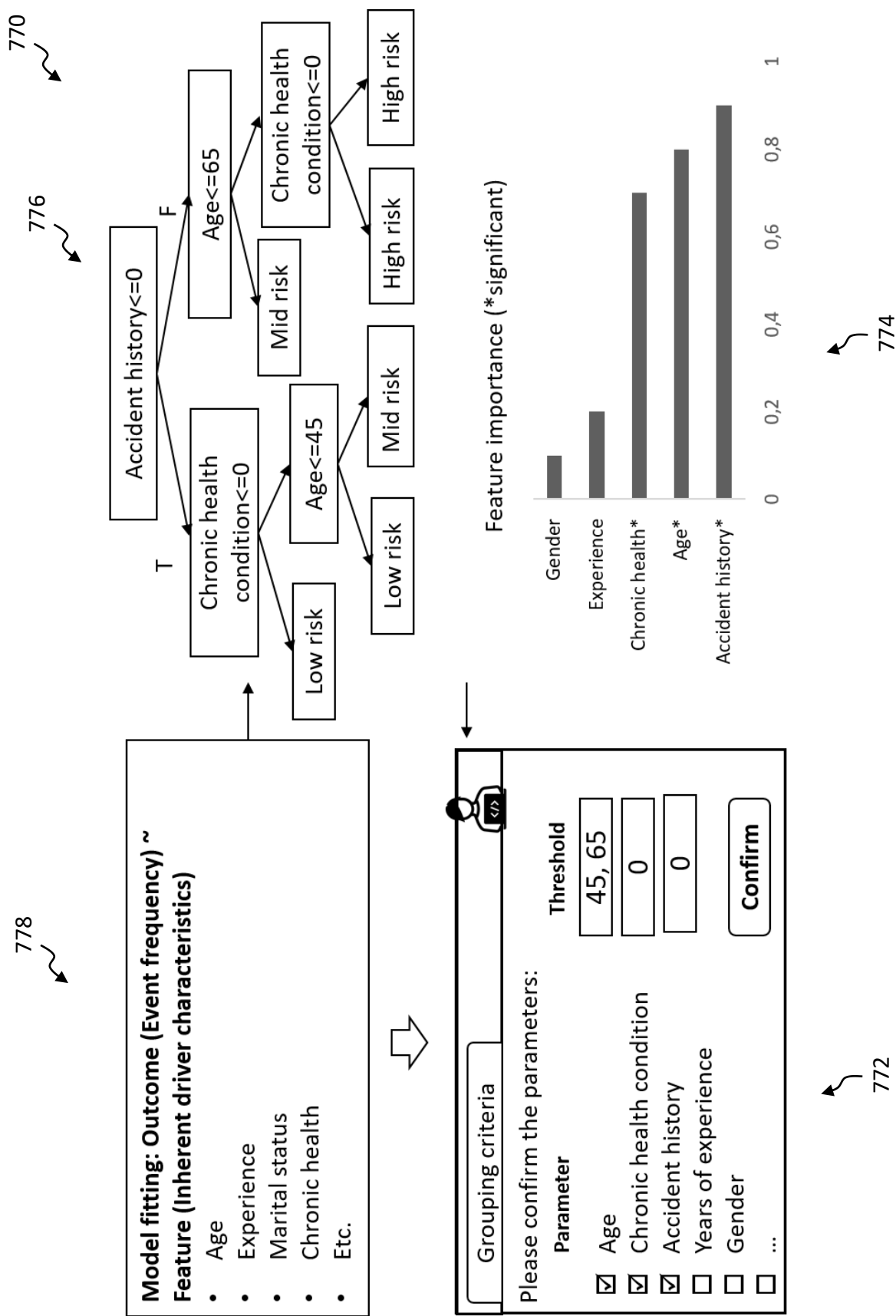


FIG.8A

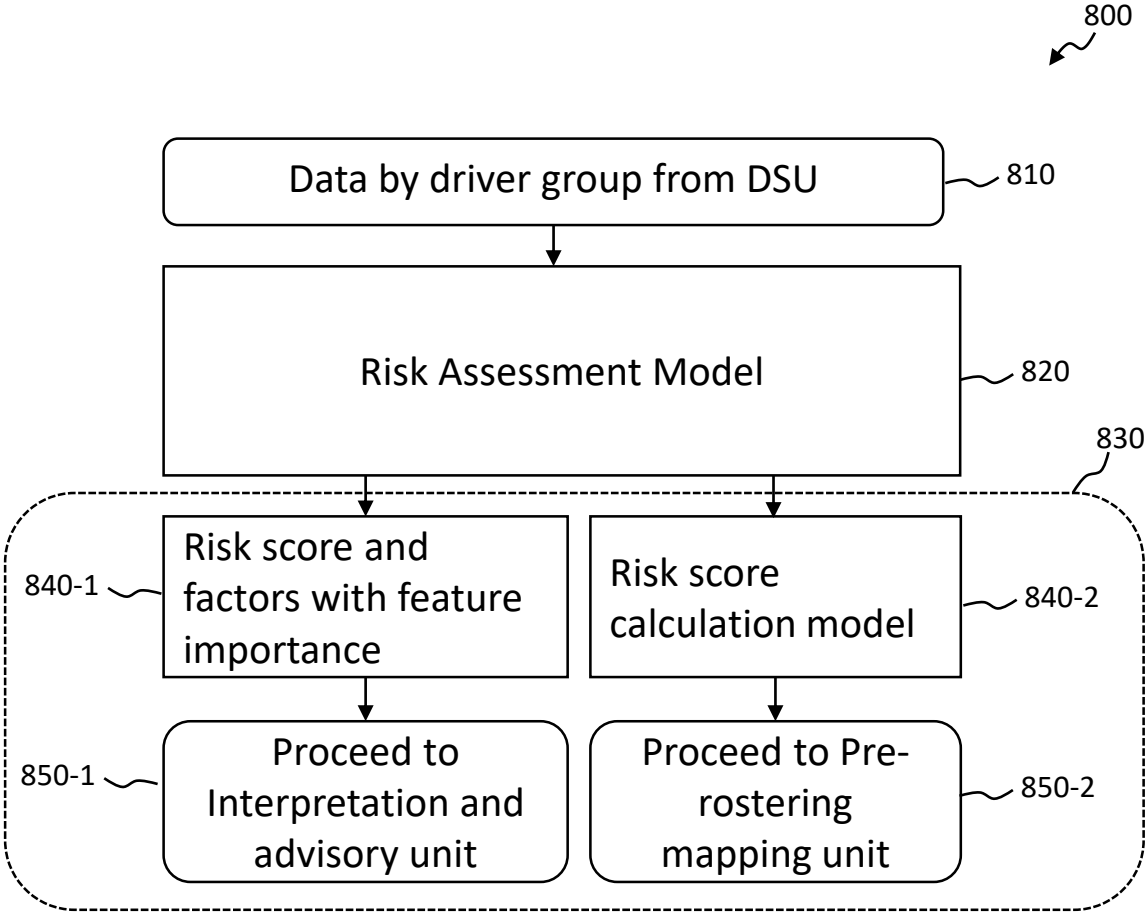


FIG.8B

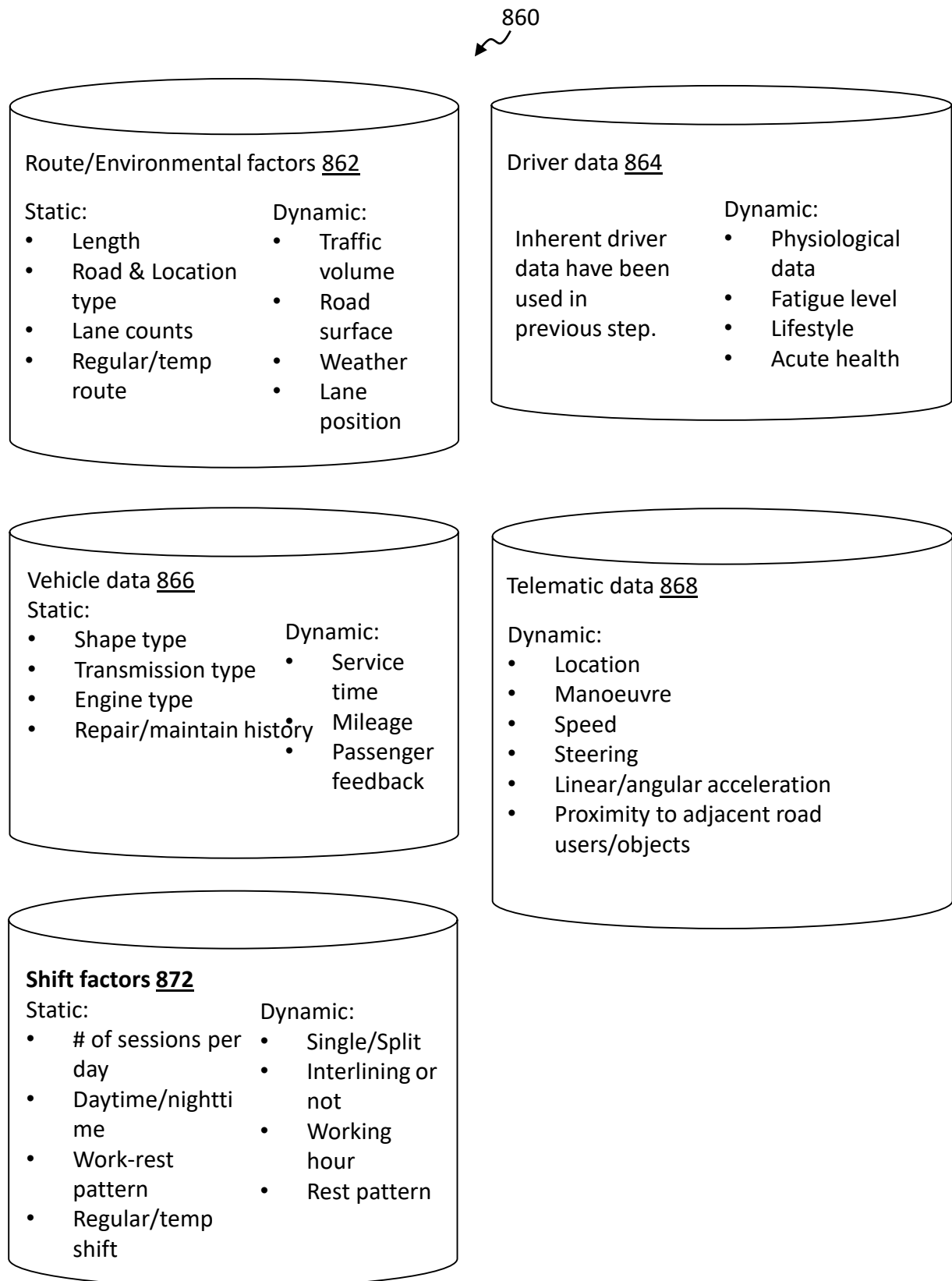


FIG.8C

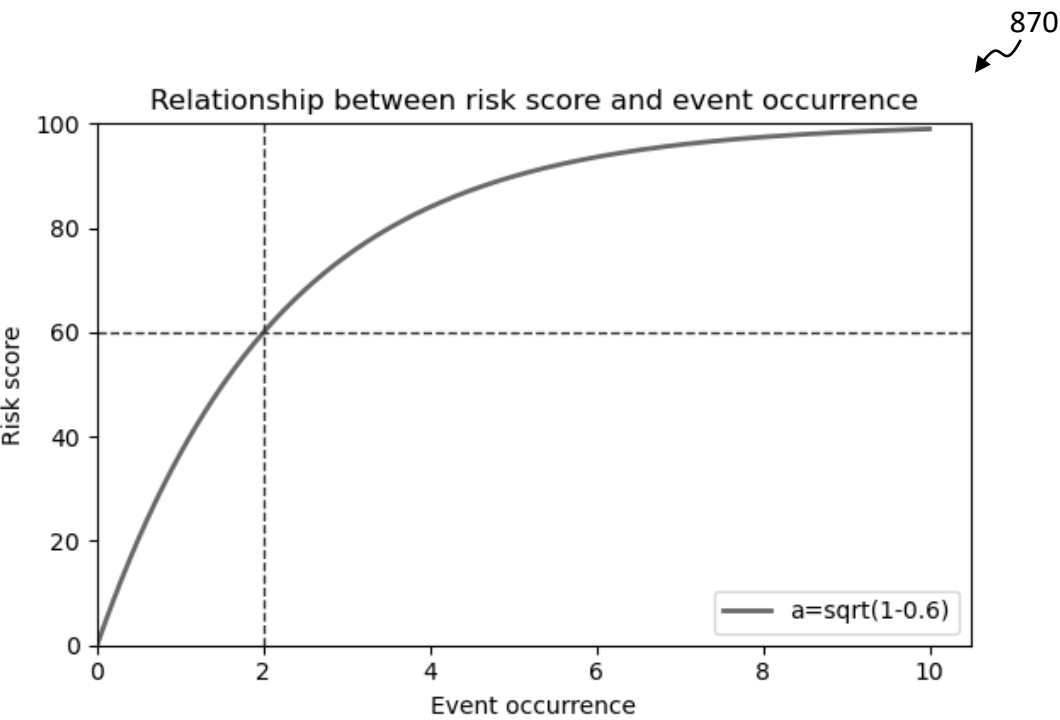
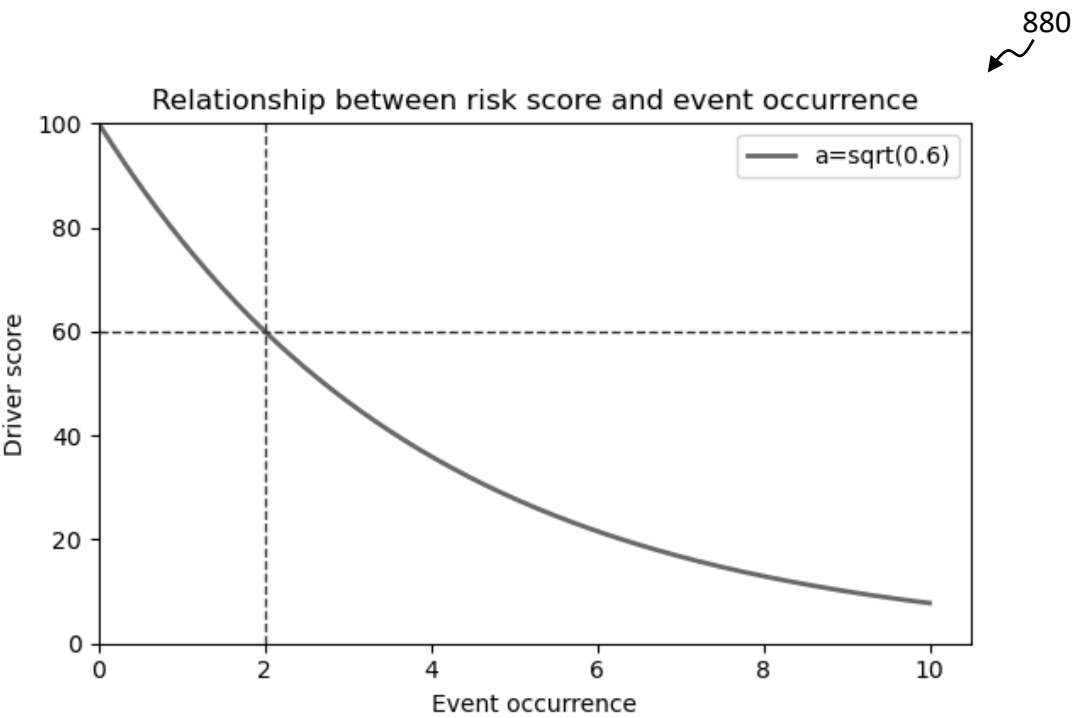
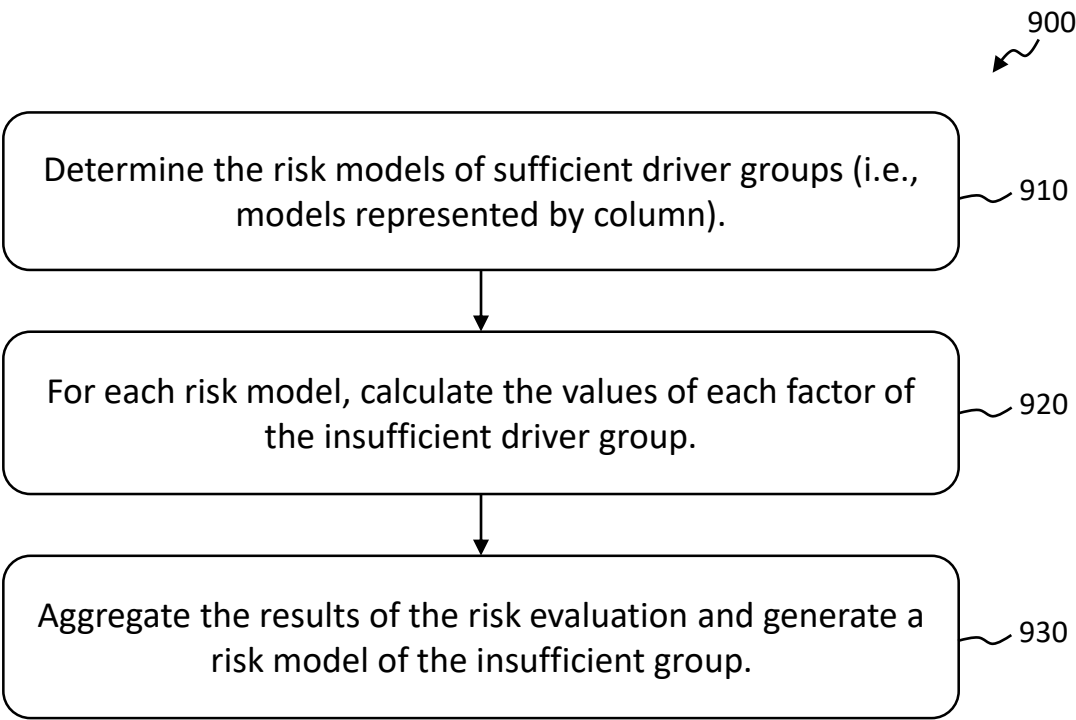


FIG.8D

890

872	874	876	878	882	884	886	888	892	894
Driver id	Driver age	Accident history	Time	Event occurrence	Risk score	Route factors	Shift factors	Other factors	Model
AB	40	0	i	$x_{i,AB}$	$R(x_{i,AB})$	...	...	...	1
AB	40	0	i+1	$x_{i+1,AB}$	$R(x_{i+1,AB})$	...	...	...	1
...									1
RA	38	0	i	$x_{i,RA}$	$R(x_{i,RA})$	...	...	...	1
RA	38	0	i+1	$x_{i+1,RA}$	$R(x_{i+1,RA})$	...	...	...	1
...									1

FIG.9



Driver Group

e.g., Age

40 50 60

950

Rain	95%	?	5%
Evening shift	70%	?	30%
Long drives	10%	?	85%

Risk Factors

FIG.10

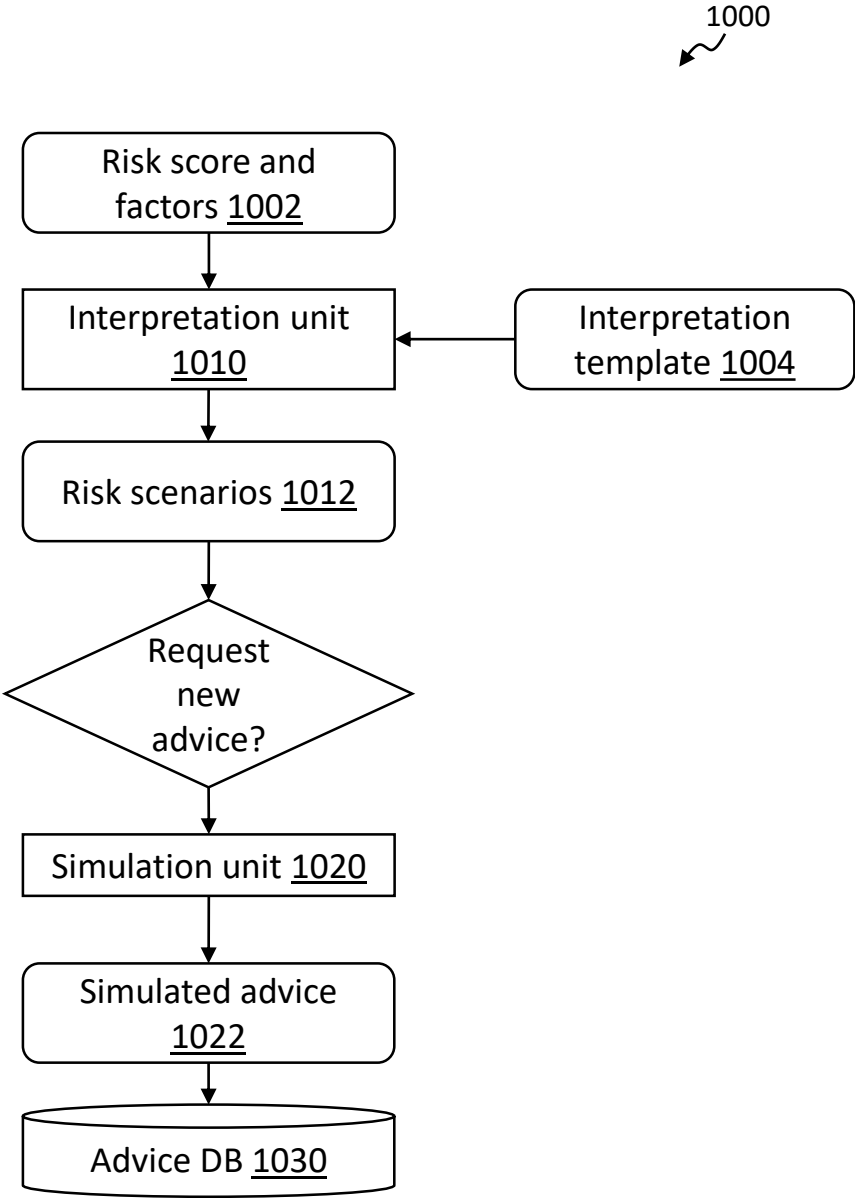


FIG.11A

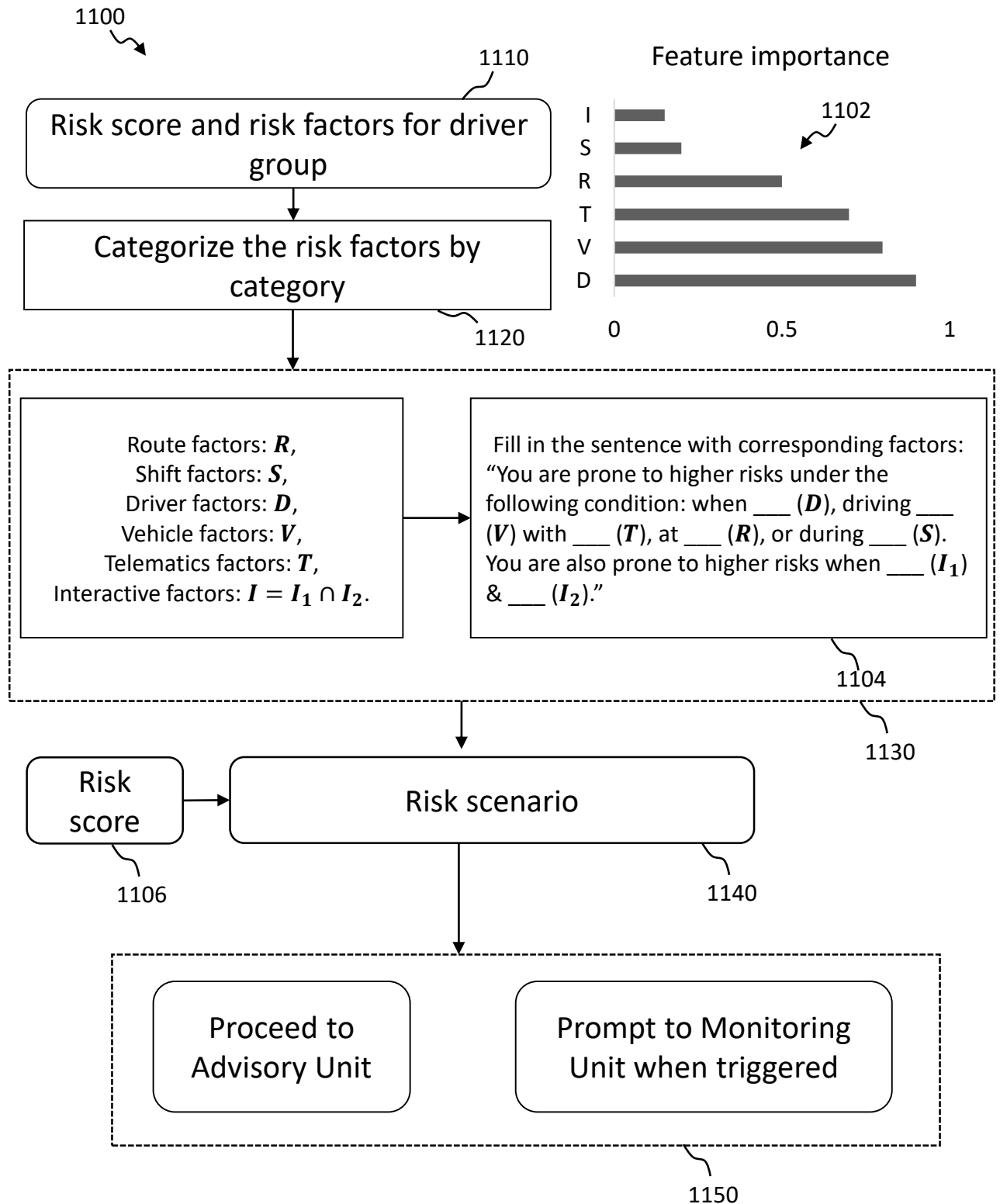


FIG.11B

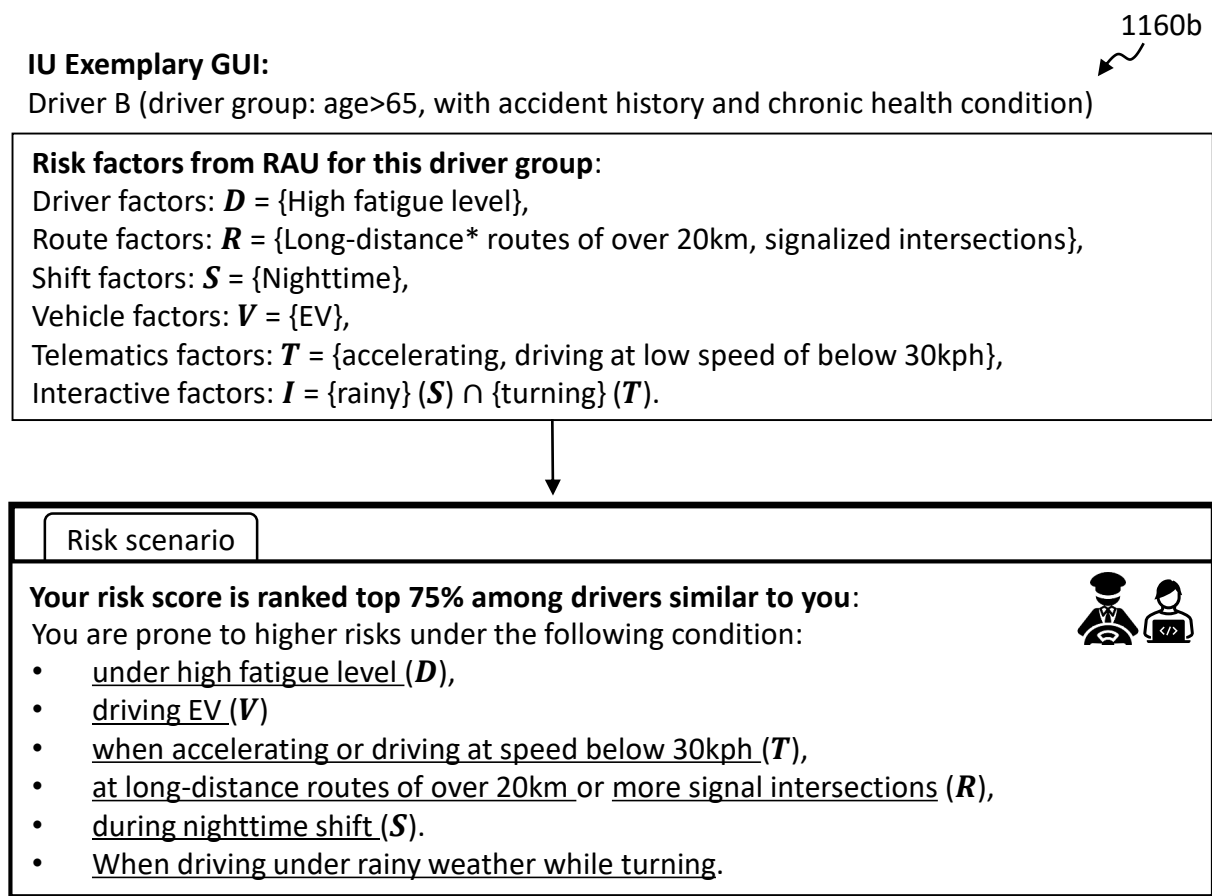
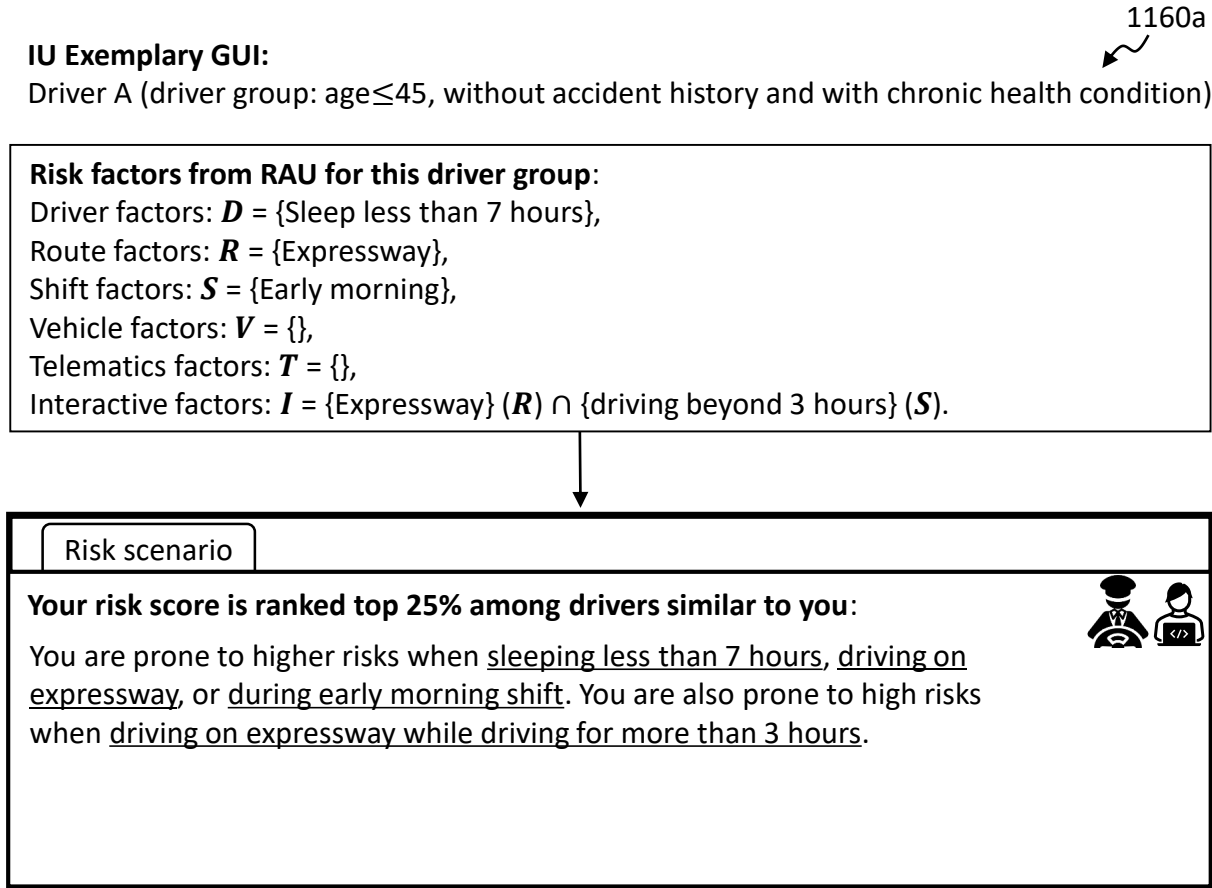


FIG.12

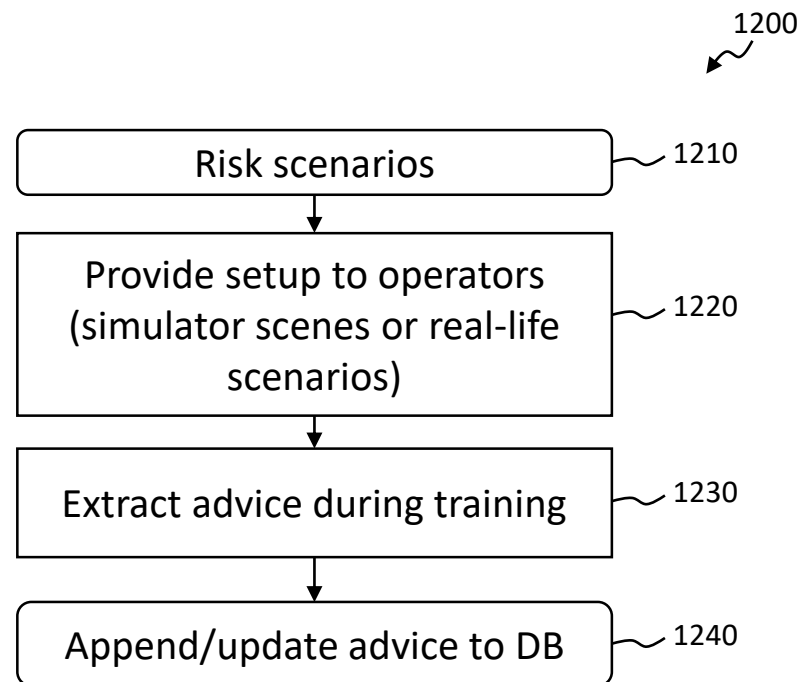


FIG.13

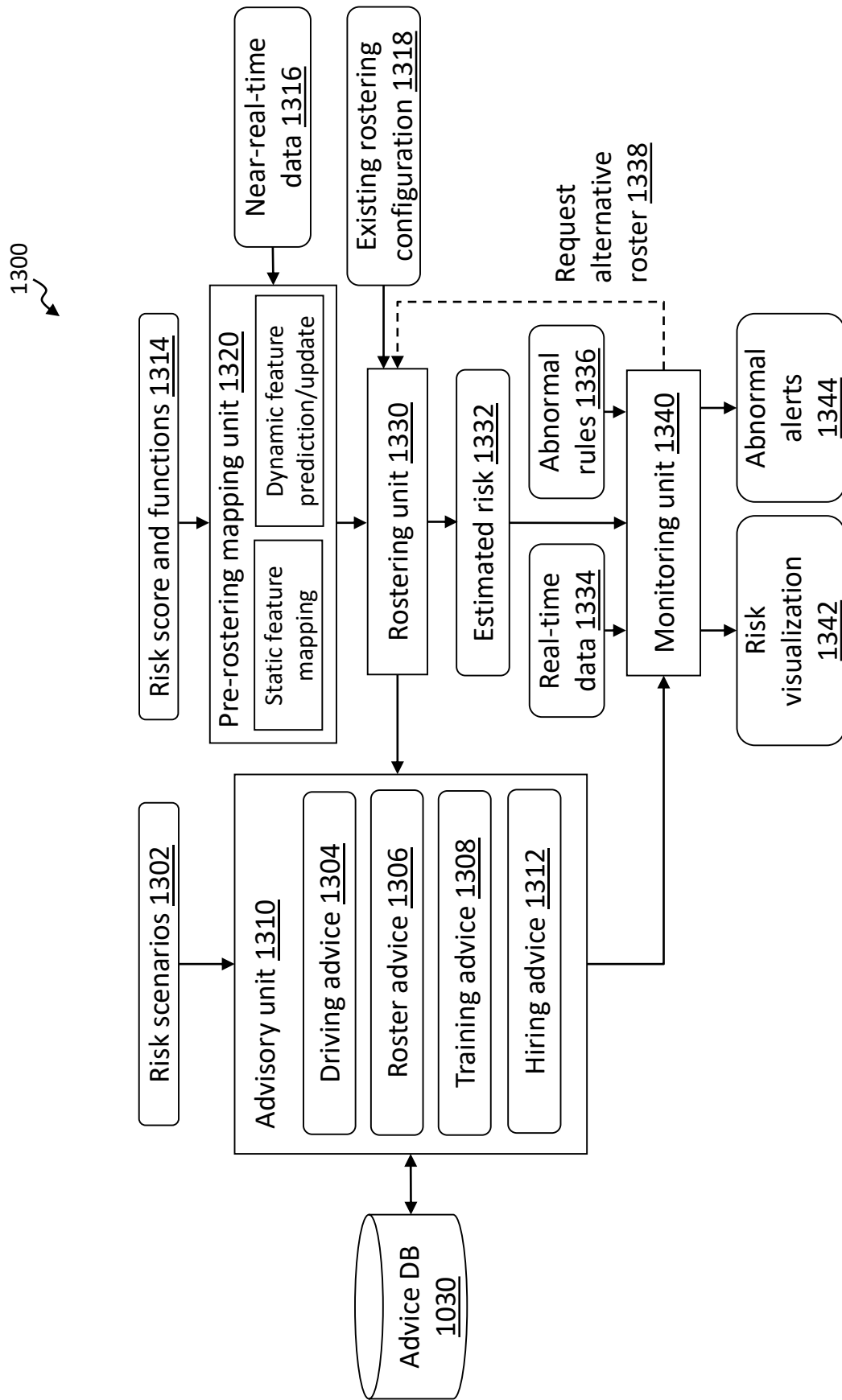


FIG.14A

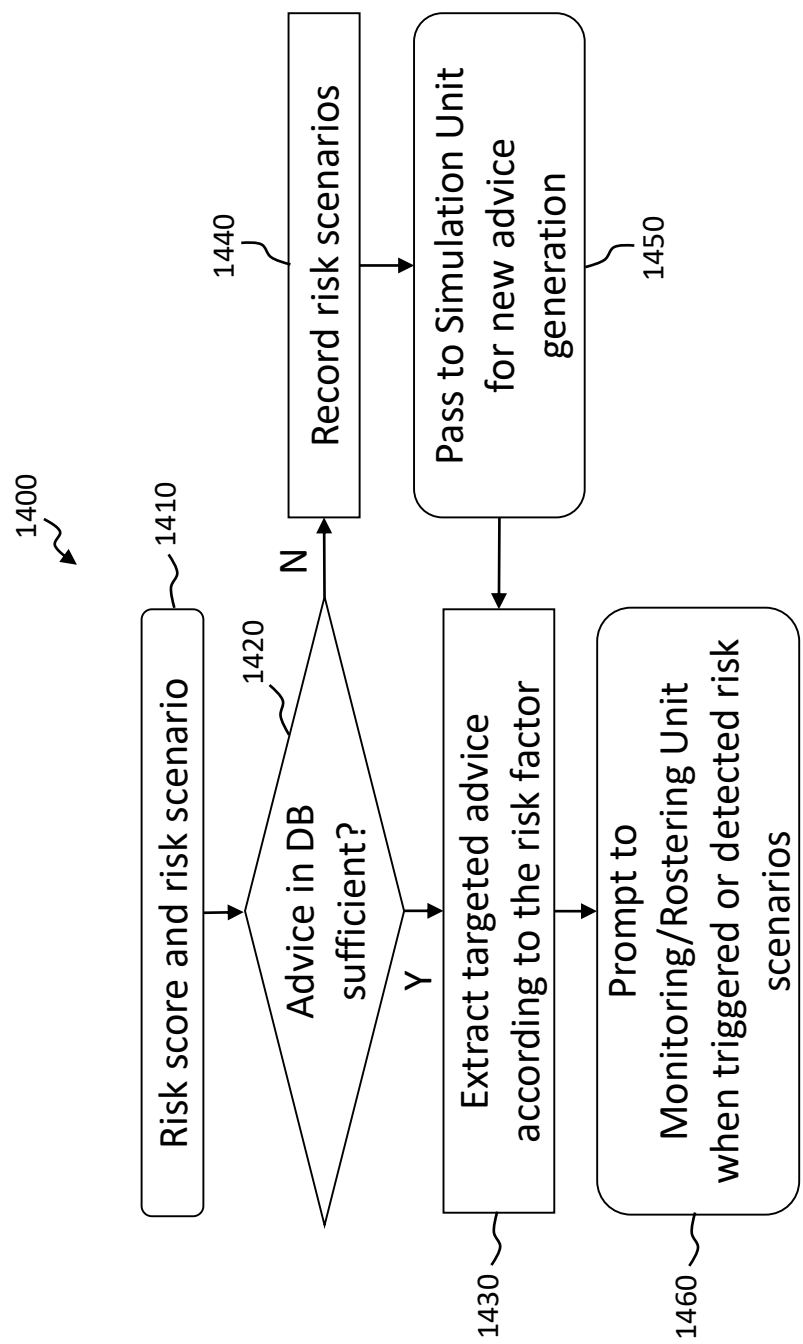


FIG.14B

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i. Advice DB

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Risk factor	Action
Sleep hour less than 7 hours	Options: Take more frequent breaks or Suggest ideas for improving sleep hygiene
High fatigue level	Options: Slowdown or Call for substitute
Night-time	Maintain speed <80KPH
...	...

ii. Observations

1482

1484

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Driver (group)	Risk factor				
	Driver	Telematics	Route	Shift	Vehicle
Driver A (G1)	Sleep hour: <7	-	Express way	Early morning	-
Driver B (G2)	High fatigue	Normal speed	Short distance	Daytime	Driving EV
Driver C (G2)	Low fatigue	High Speed	Long distance	Night-time	Driving ICEV

FIG.14C

1488

Risk scenario
(From IU)

Your risk score is ranked top 75% among drivers similar to you:

You are prone to higher risks under the following condition:

- under high fatigue level (*D*),
- driving EV (*V*)
- when accelerating or driving at speed below 30kph (*T*),
- at long-distance routes of over 20km or more signal intersections (*R*),
- during nighttime shift (*S*).
- When driving under rainy weather while turning.




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Advice to drivers


Top 3 suggestions given your risk scenarios:

- Please try to maintain a regular sleep schedule by avoiding food within 2 hours and listening to relax music.
- Please accelerate slowly, especially when driving EV.
- Please mind your distance with other vehicles/pedestrians during congestion.

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Advice to operators


Top 3 suggestions given Driver B's risk scenarios:

- Please properly schedule rest.
- Please consider training the driver with EV, especially for acceleration.
- Please consider training the driver in simulator with more intersections/congestion and at night.

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FIG.15A

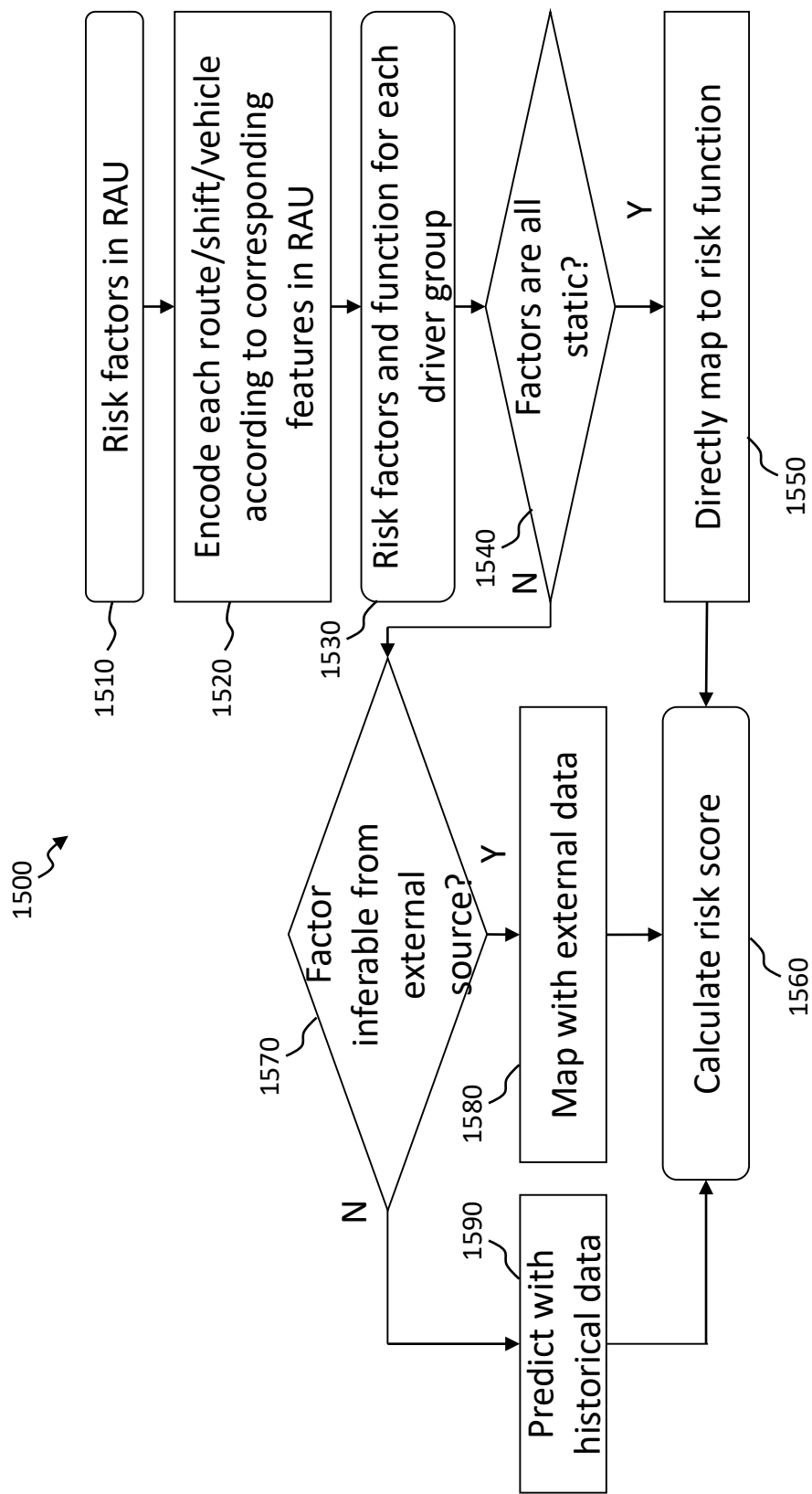


FIG.15B

1504

Route	R1	R2	R3	R4	...
96	1	1	1	1	...
97	0	1	1	0	...
...					

1506

Veh	V1	V2	V3	V4	...
1	1	0	1	1	...
2	0	1	1	1	...
...					

1508

Shift	S1	S2	S3	S4	...
1	1	1	1	0	...
2	0	0	0	1	...
3	0	1	1	1	...

1512a

1502a

PMU example 1:
Risk(driver A) = F(D1,R1,R2,S1,S2)

Driver	Route	Vehicle	Shift	Score
A	96 R1,R2	1	1S1,S2	80
			2	40
			3S2	60
		2	1	80
			2	40
			3	60
	97 R2	1	1	60
			2	20
			3	40
		2	1	60
			2	20
			3	40
	...	...	...	...

Route				
Route	R1	R2	R3	R4
96	1	1	1	1
97	0	1	1	0
...				

Vehicle				
Veh	V1	V2	V3	V4
1	1	0	1	1
2	0	1	1	1
...				

Shift				
Shift	S1	S2	S3	S4
1	1	1	1	0
2	0	0	0	1
3	0	1	1	1
...				

FIG.15C

PMU example 2:
Risk(driver B) =
F(D2,R3,R4,V1,S3,S4,T1,T2,T3)

Driver	Route	Vehicle	Shift	Score
B	96 R3,R4	1 V1	1 S3	44
			2 S4	55
			3 S3,S4	66
		2	1	33
			2	44
			3	55
	97 R3	1	1	33
			2	44
			3	55
		2	1	22
			2	33
			3	44
	...	...	...	...

FIG.16A

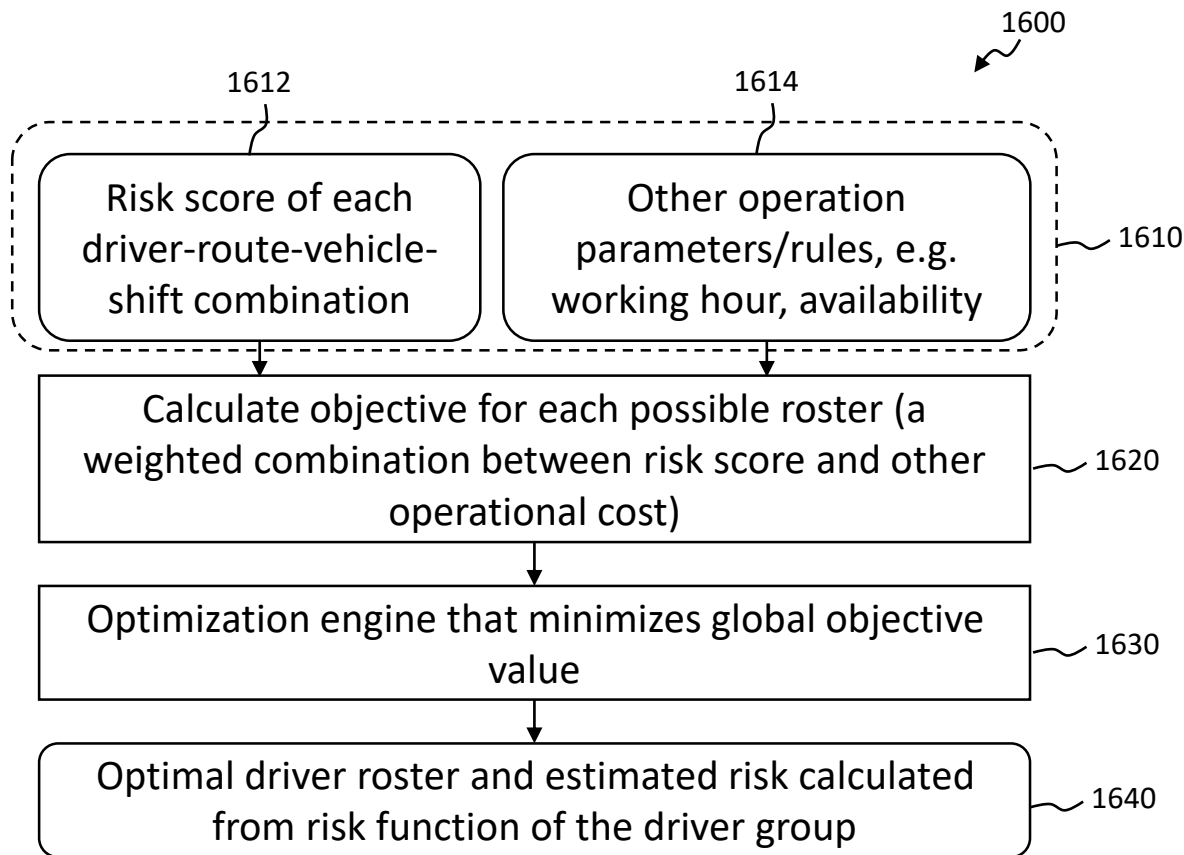


FIG.16B

1616 ↗

1618 ↗

Scheduling KPI

Please assign weight:

- ☐ Risk (defined in previous step)
- ☐ Late arrival
- ☐ OT hours
- ☐ Imbalanced workload
- ☐ ...

Overview

Date: dd/mm/yyyy

	Route	Shift	Vehicle	Avg risk
DriverA	96	AM	XXX (EV)	High
DriverB	96	PM	YYY (EV)	Low
DriverC	97	PM	ZZZ (ICE)	Low
...				

FIG.16C

1622 ↘

Driver	Route	Vehicle	Shift	Score	Roster1	Roster2	Roster3
A	96	1	1	80	1	0	0
			2	40	0	1	1
			3	60	1	0	0
B	96	2	1	33	0	1	1
			2	44	1	0	0
			3	55	0	1	1
C	97	3	1	65	1	1	0
			2	45	0	0	1
			3	25	1	1	0
D	97	4	1	25	0	0	1
			2	34	1	1	0
			3	58	0	0	1
Objective value					308	252	256

FIG.17A

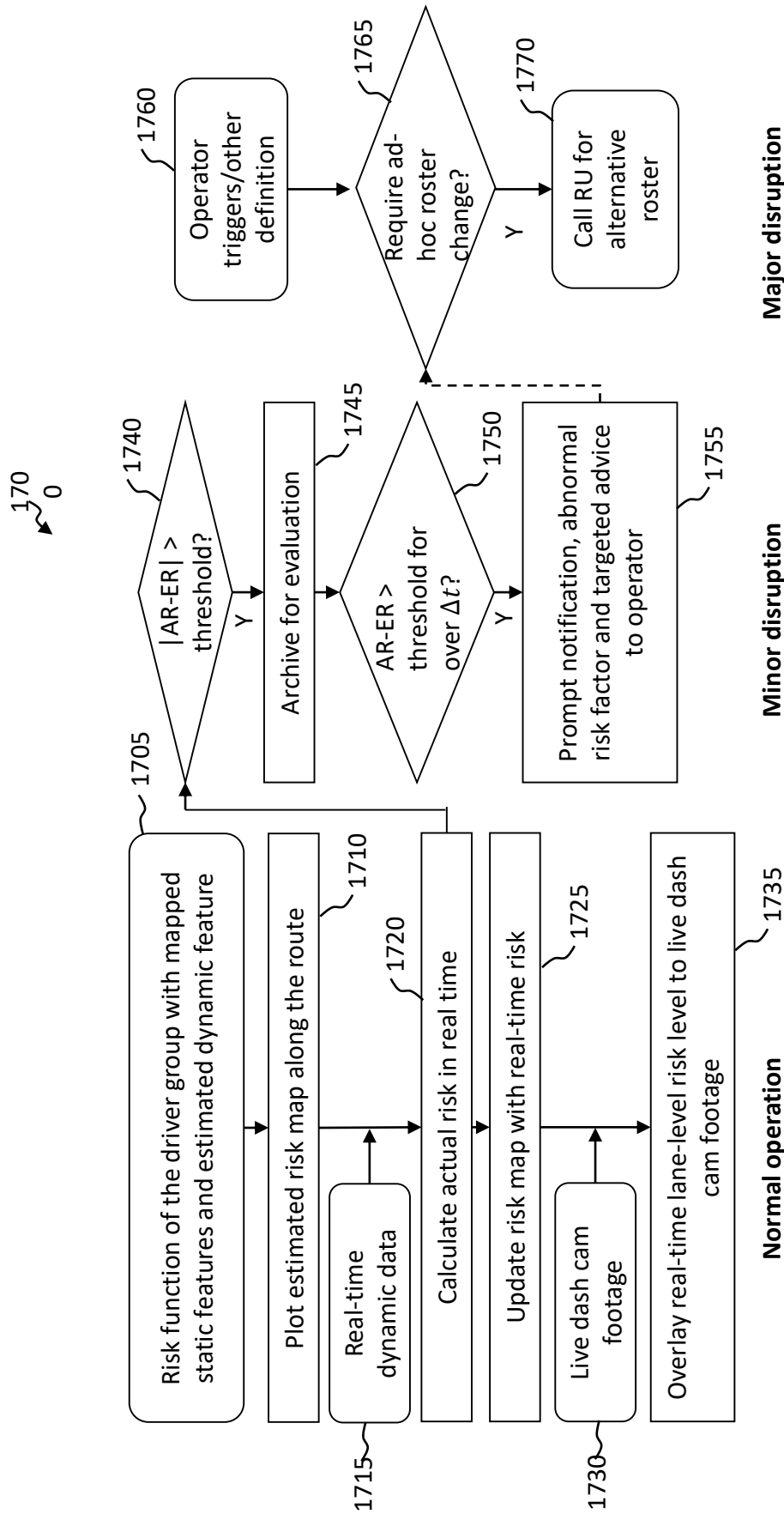


FIG.17B

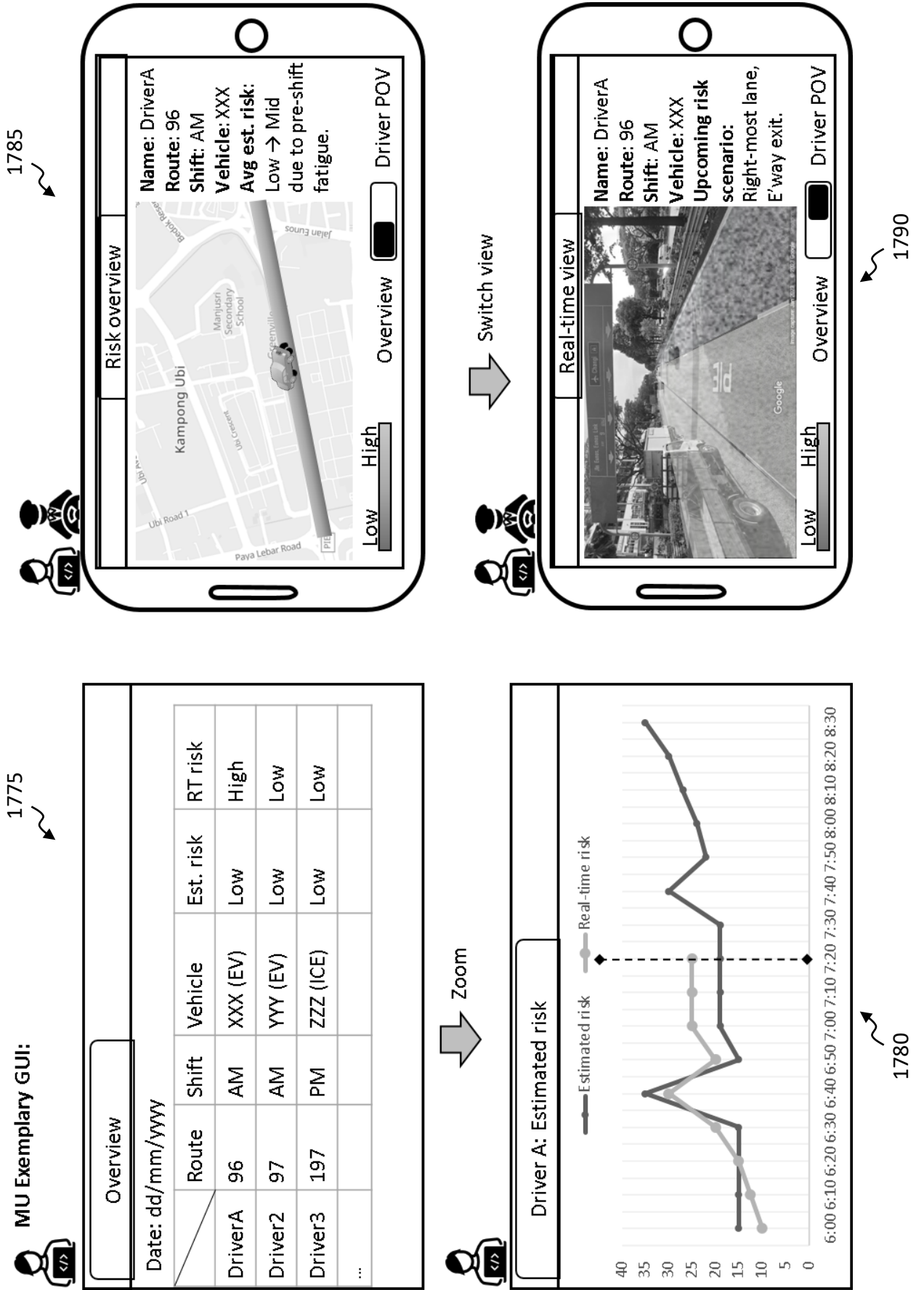


FIG.18

