



Power in
your hand
is
unlimited

Group 4 Gesture Recognition

Have you ever thought
about ...

Our creativity
might be
hindered
from peripheral
around us



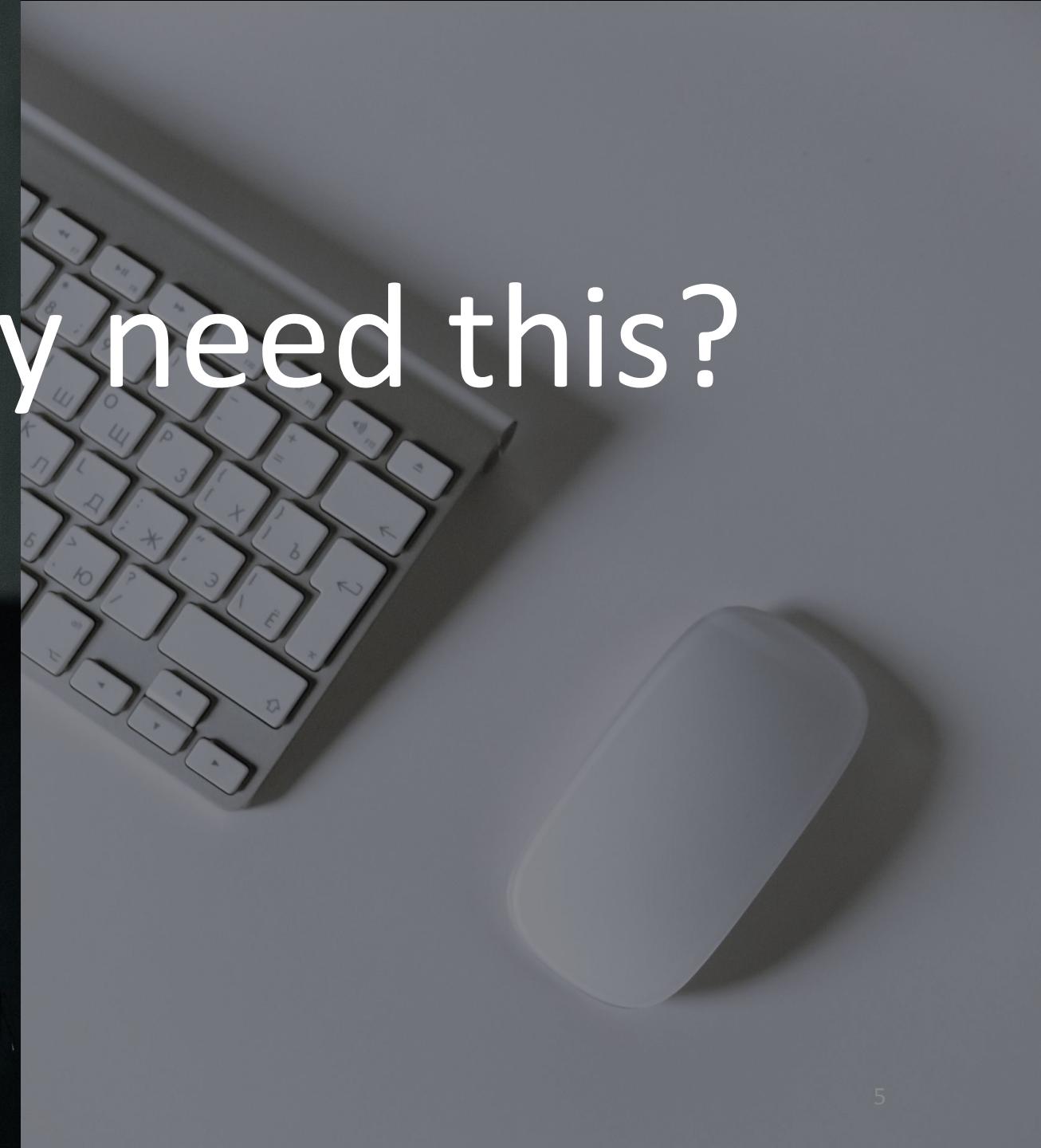
Like a painter

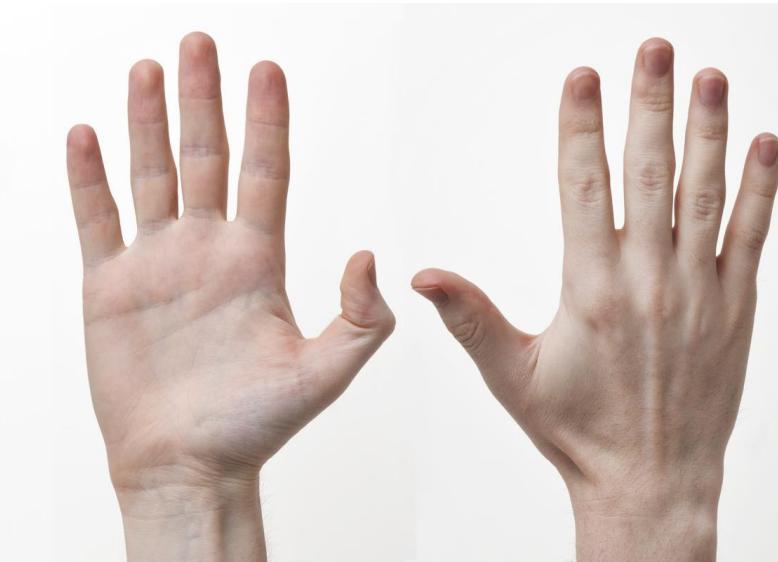
They only need few
handy tools to make
huge heady works





Do we really need this?





**How about replacing
partial PC function with
bare
hands**

**Operating a computer with
hand gesture**

is no longer an imagination



What are we aiming at?

- Gesture recognition
- Gesture controlled Mouse
- Gesture controlled Keyboard
- GUI monitoring system

Framework



Data
Collection



Training Data



Gesture
Recognition



Operating
System



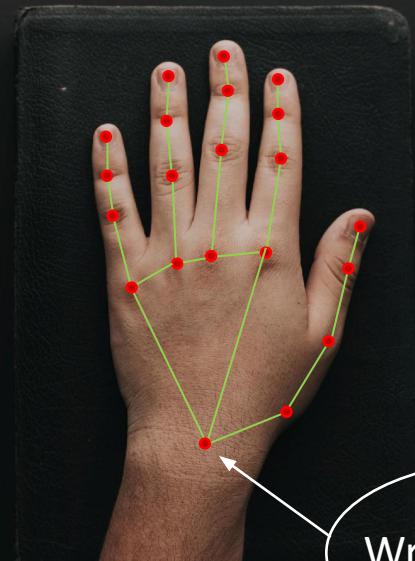
GUI Monitor





Data Collection

Absolute coordinates



21 key point
coordinates

Wrist (561,465)



Training Data

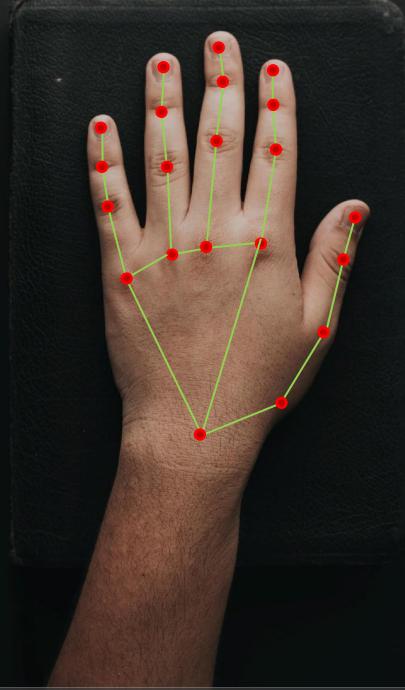
Gesture
Recognition

Operating
System

GUI Monitor



Data Collection



Wrist (561,465) Convert to relative coordinates from ID:0

21 key point coordinates all minus (561, 465)

Wrist (561, 465) convert to (0, 0)



Training Data



Gesture
Recognition



Operating
System

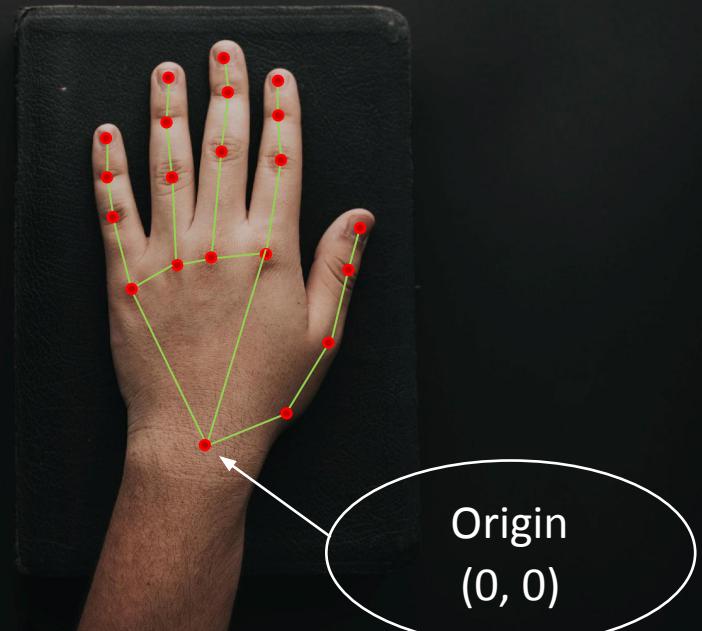


GUI Monitor



Data Collection

Relative coordinates



Training Data



Gesture
Recognition



Operating
System



GUI Monitor



Data Collection



Training Data



Gesture
Recognition



Operating
System



GUI Monitor
13



Data Collection



Clockwise Spin



Counterclockwise Spin



Moving



Training Data



Gesture
Recognition



Operating
System



GUI Monitor
14



Data Collection



Clockwise Spin (Time series coordinates)

T-15	T-14	T-13	...	T-02	T-01	T
[550, 165]	[526, 176]	[509, 188]	...	[644, 219]	[644, 196]	[642, 178]



Convert to relative coordinates from T-15

T-15	T-14	T-13	...	T-02	T-01	T
[0, 0]	[-24, 11]	[-41, 23]	...	[94, 54]	[94, 31]	[92, 13]



Normalized to fit screen width and height
(X Divided by width and Y divided by height)

T-15	T-14	T-13	...	T-02	T-01	T
[0, 0]	[-0.025, 0.0204]	[-0.0427, 0.0426]	...	[0.0979, -0.1]	[0.0979, -0.0574]	[-0.0958, -0.024]



Training Data



Gesture
Recognition



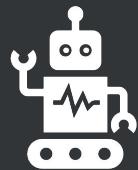
Operating
System



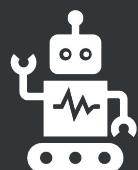
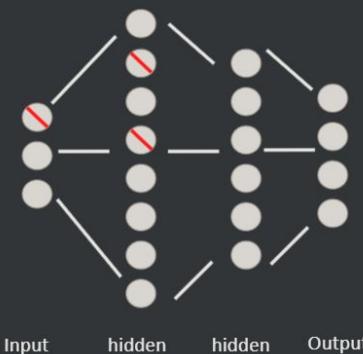
GUI Monitor



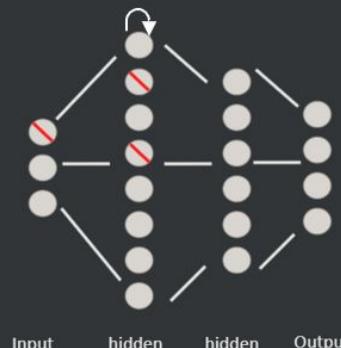
Training Data



Static gesture model: NN model 1&2



Dynamic gesture model: LSTM model



Gesture
Recognition



Operating
System



GUI Monitor



16 Data
Collection



Training Data



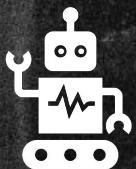
Gesture
Recognition

Operating
System

GUI Monitor

Data
Collection

30000+ Training Data



Static gesture model



Training Data



Gesture Recognition



Operating System

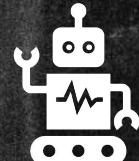


GUI Monitor



Data Collection

Confusion matrix



Static gesture model



Training Data



Gesture
Recognition



Operating
System



GUI Monitor



Data
Collection

Accuracy:
97%



Static gesture model



Training Data



Gesture
Recognition



Operating
System



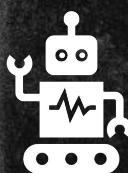
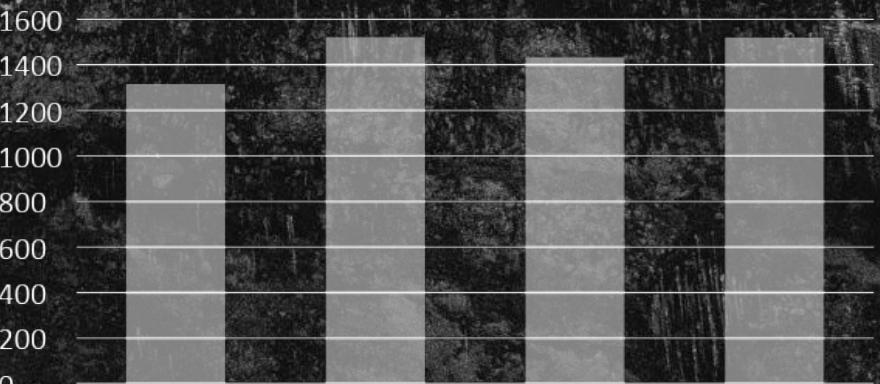
GUI Monitor



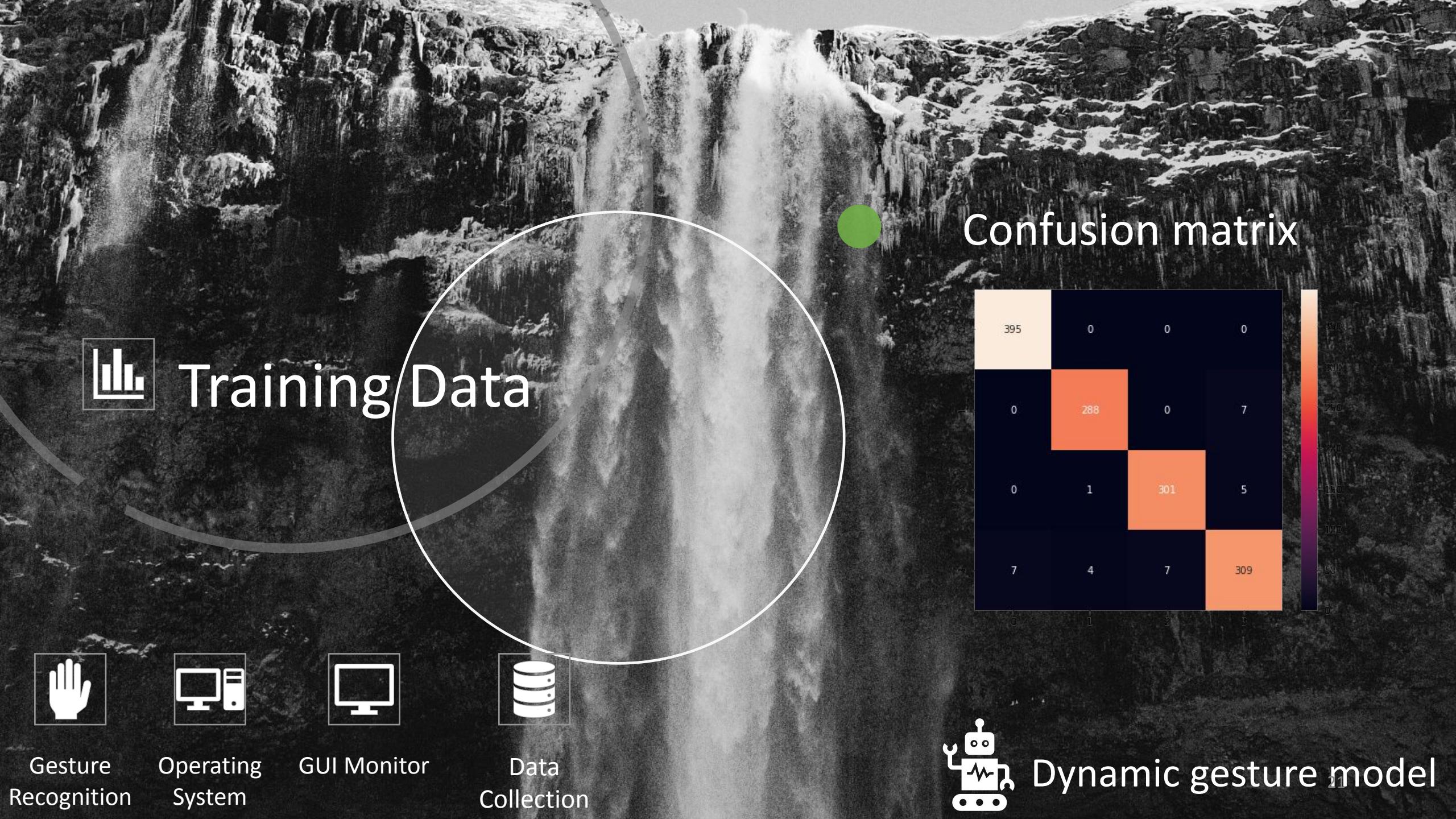
Data
Collection



5000+ Training Data



Dynamic gesture model



A large, dark, monochromatic photograph of a waterfall cascading down a rocky cliff face, serving as the background for the diagram.

Confusion matrix



Training Data

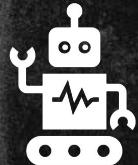


Gesture
Recognition

Operating
System

GUI Monitor

Data
Collection



Dynamic gesture model



Training Data



Gesture
Recognition



Operating
System



GUI Monitor

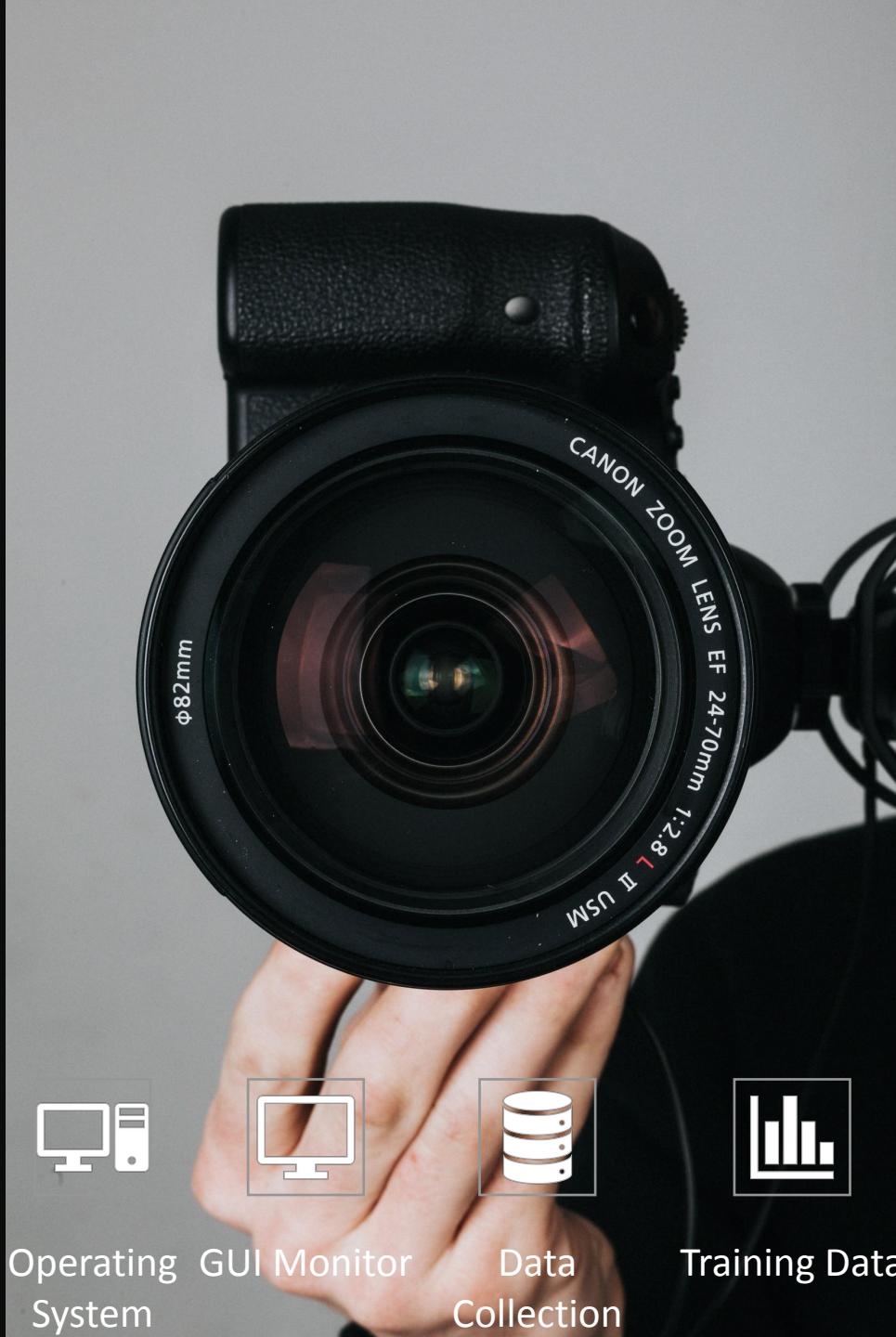


Data
Collection



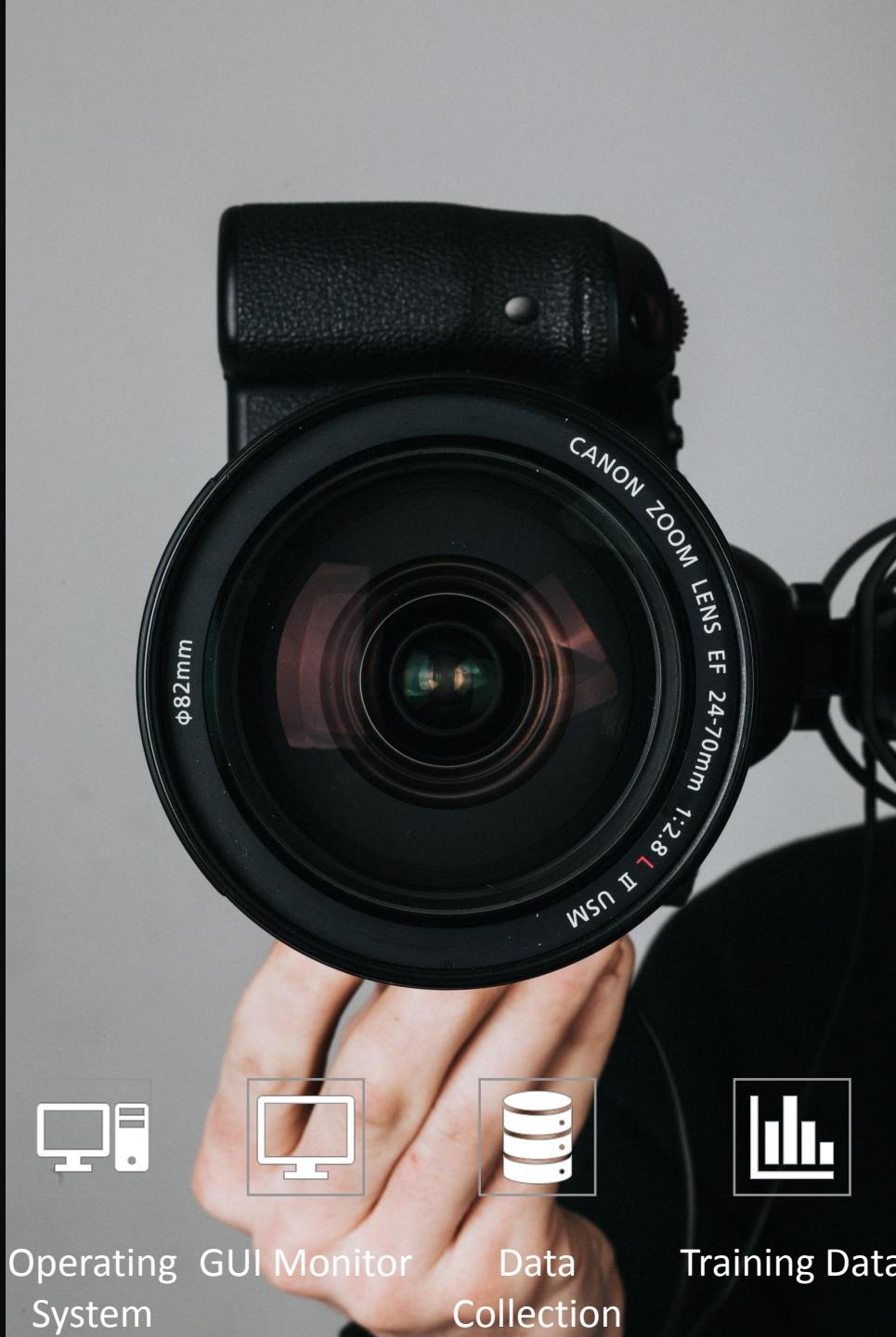
Dynamic gesture model

Accuracy:
98%



Gesture Recognition

How do they **see** you?



Operating System



GUI Monitor



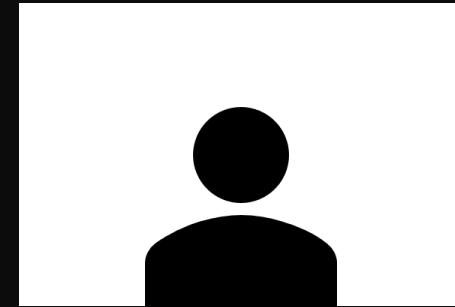
Data Collection



Training Data



Gesture Recognition



Record all the images
frame by frame



Operating System



GUI Monitor



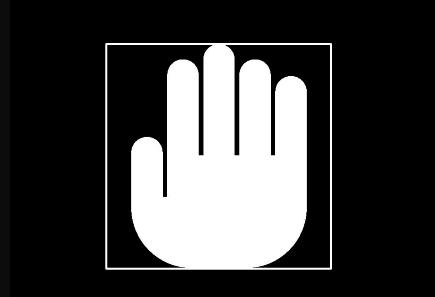
Data Collection



Training Data



Gesture Recognition



Detect your hand



Operating System



GUI Monitor



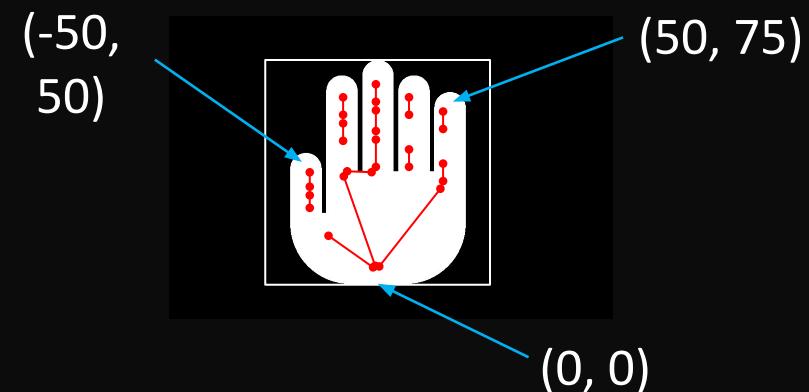
Data Collection



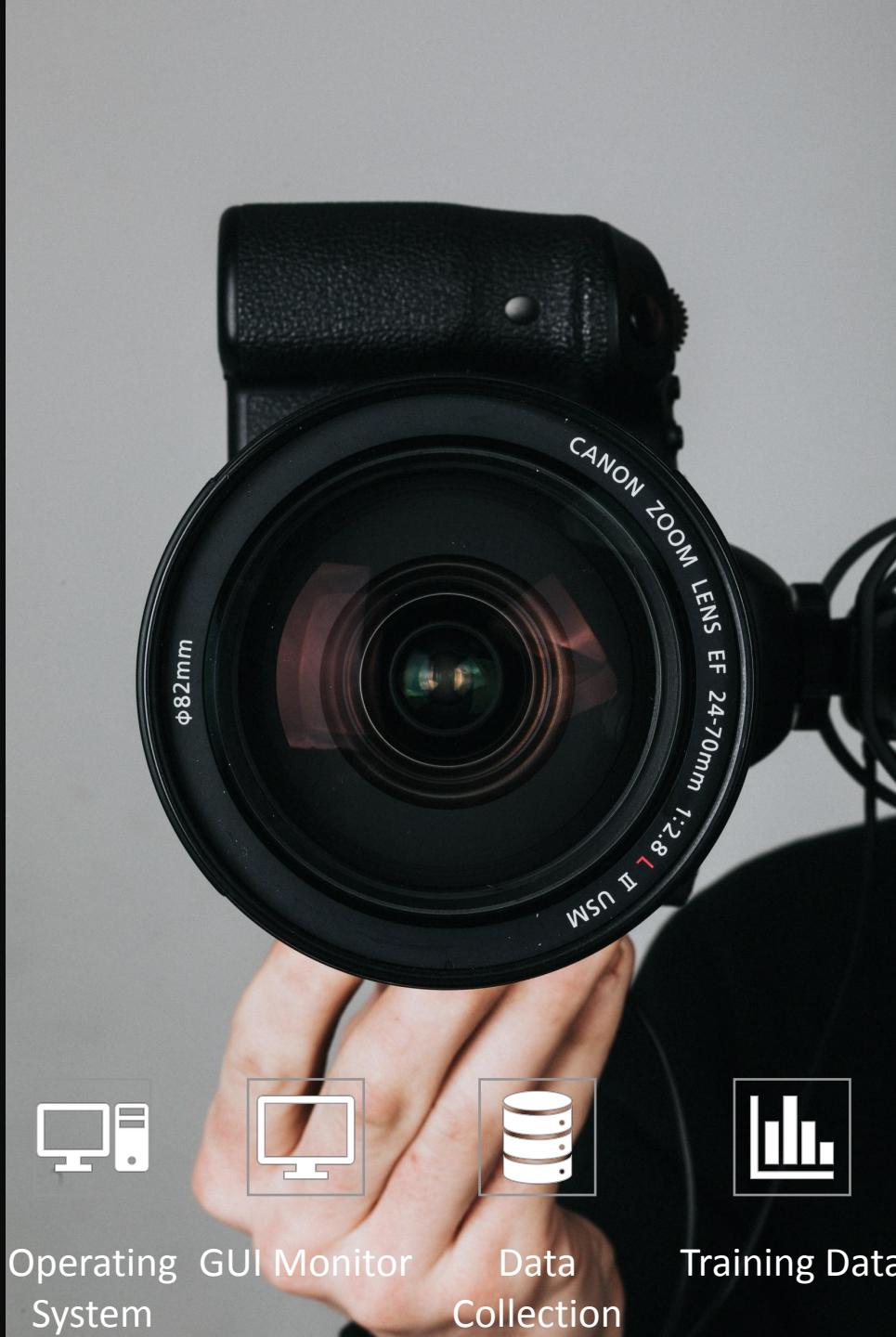
Training Data



Gesture Recognition



Analyze and digitize it



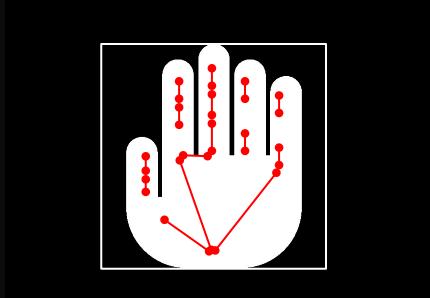
Operating System
GUI Monitor

Data Collection

Training Data



Gesture Recognition



ID:0	ID:1	ID:2	...	ID:20
(0, 0)	(-50, 50)	(50, 75)	...	(XX,YY)



Operating System



GUI Monitor
Data Collection



Training Data

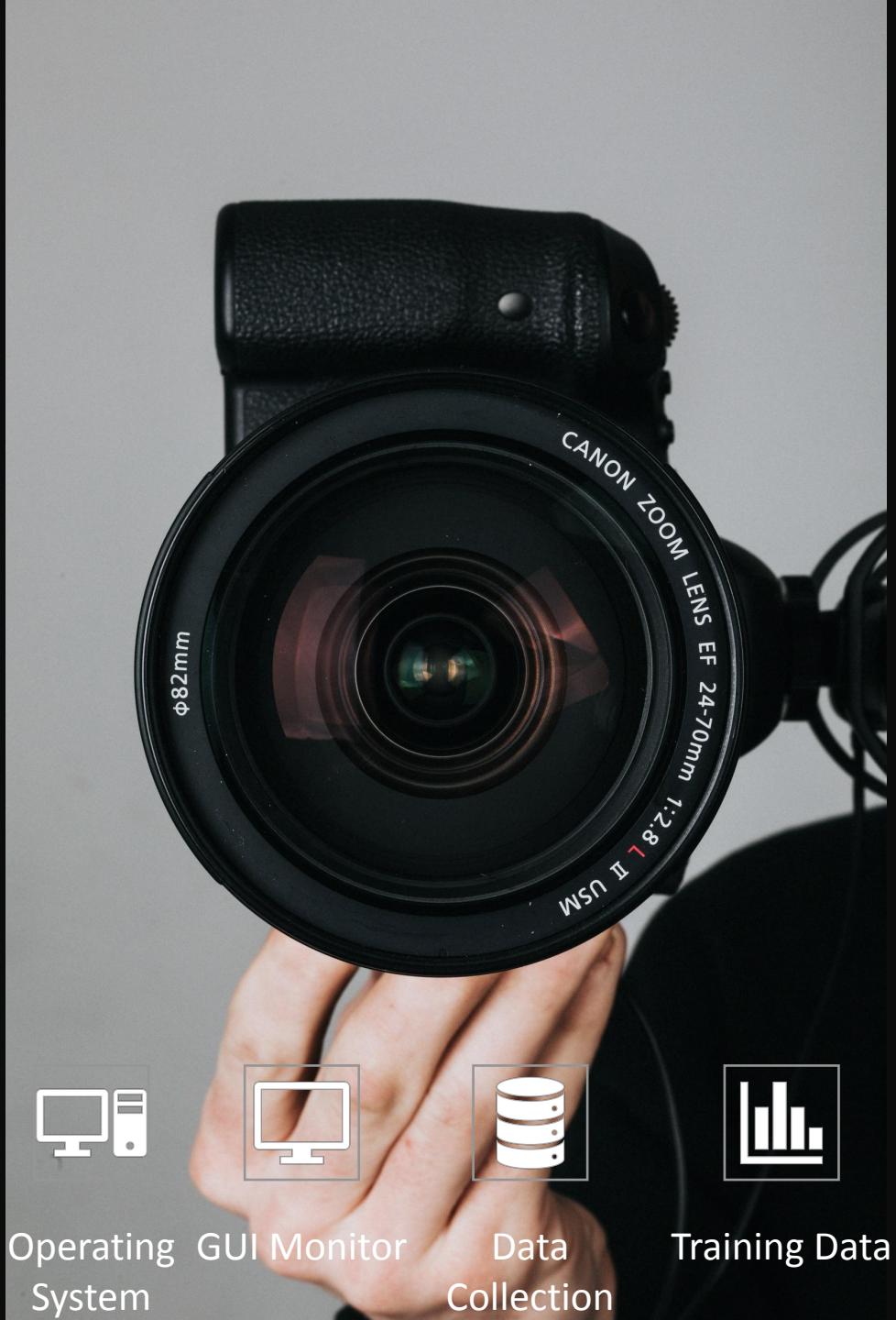


Gesture Recognition

Open

Model





Operating System



GUI Monitor



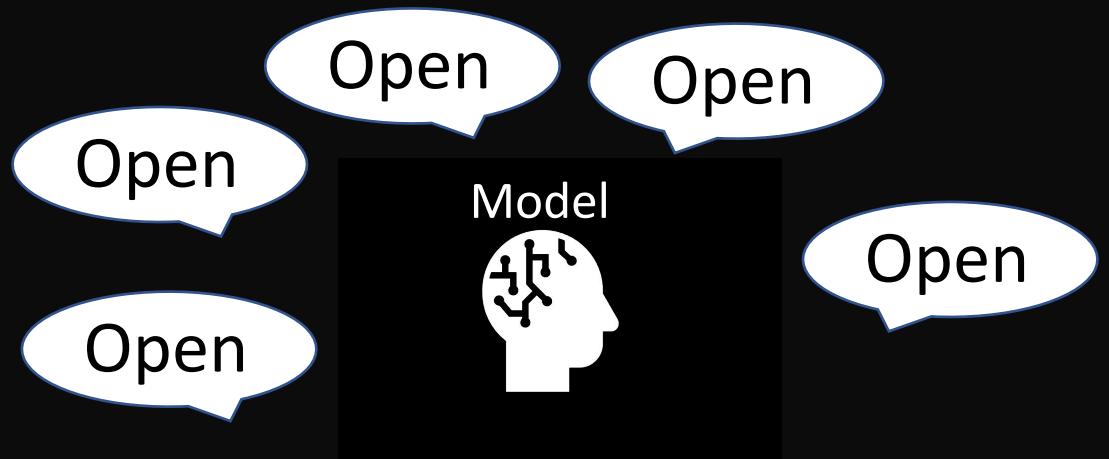
Data Collection

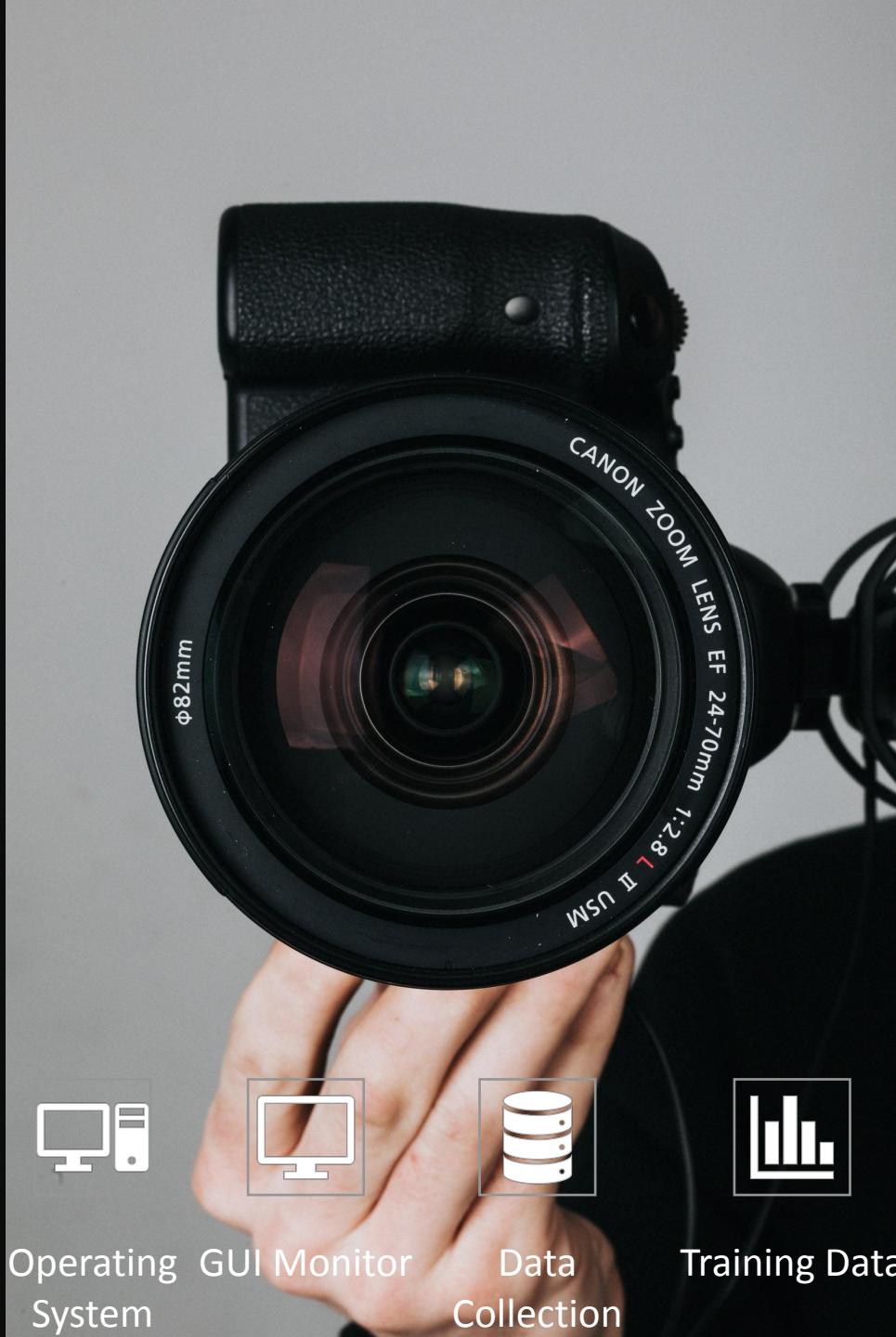


Training Data



Gesture Recognition





Operating System
GUI Monitor

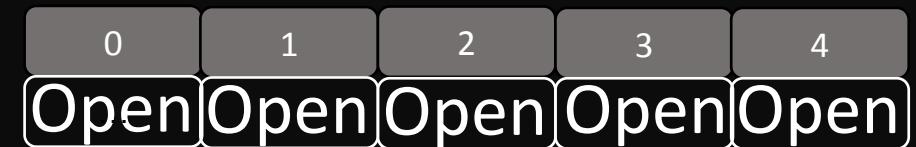
Data Collection

Training Data

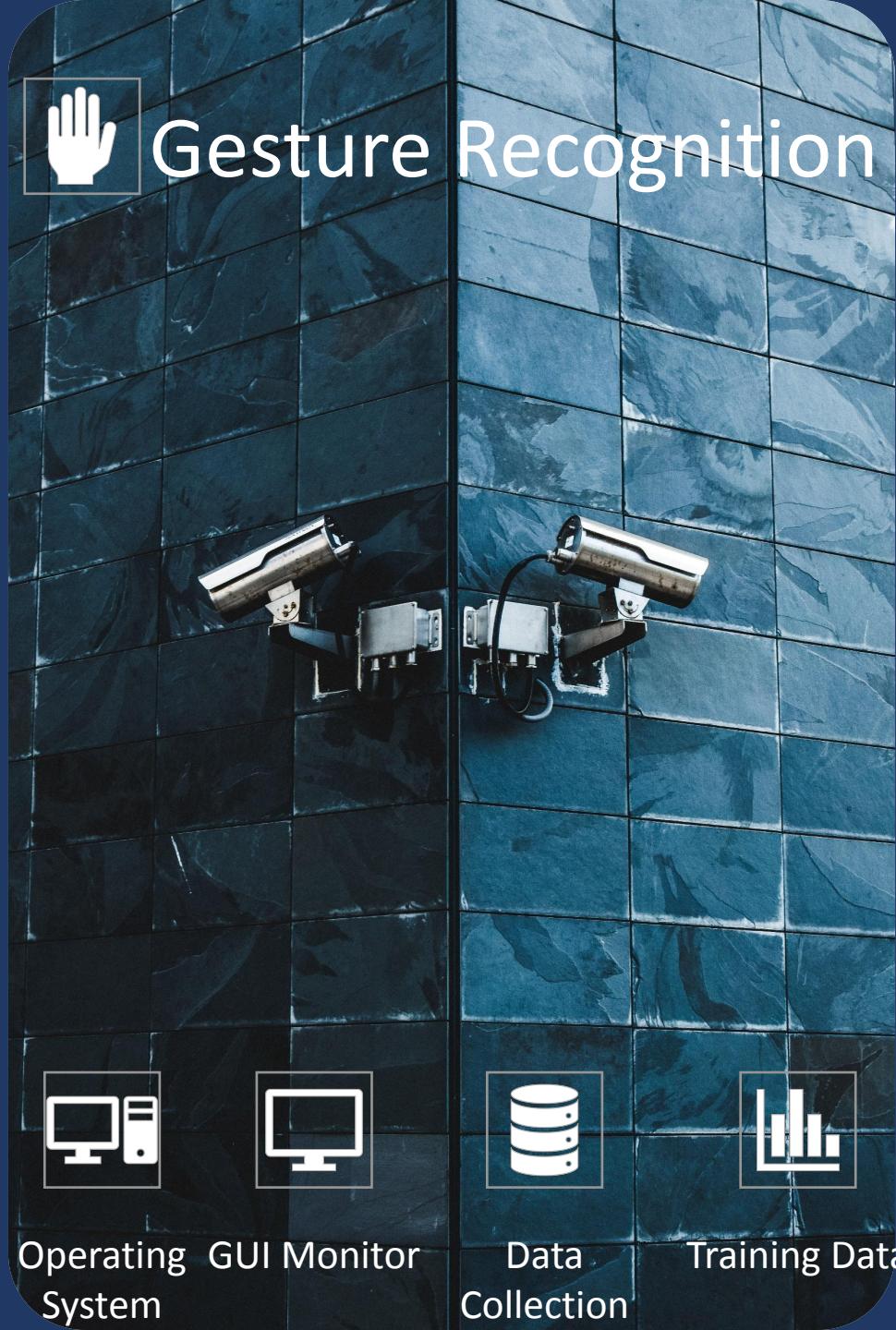


Gesture Recognition

Deque



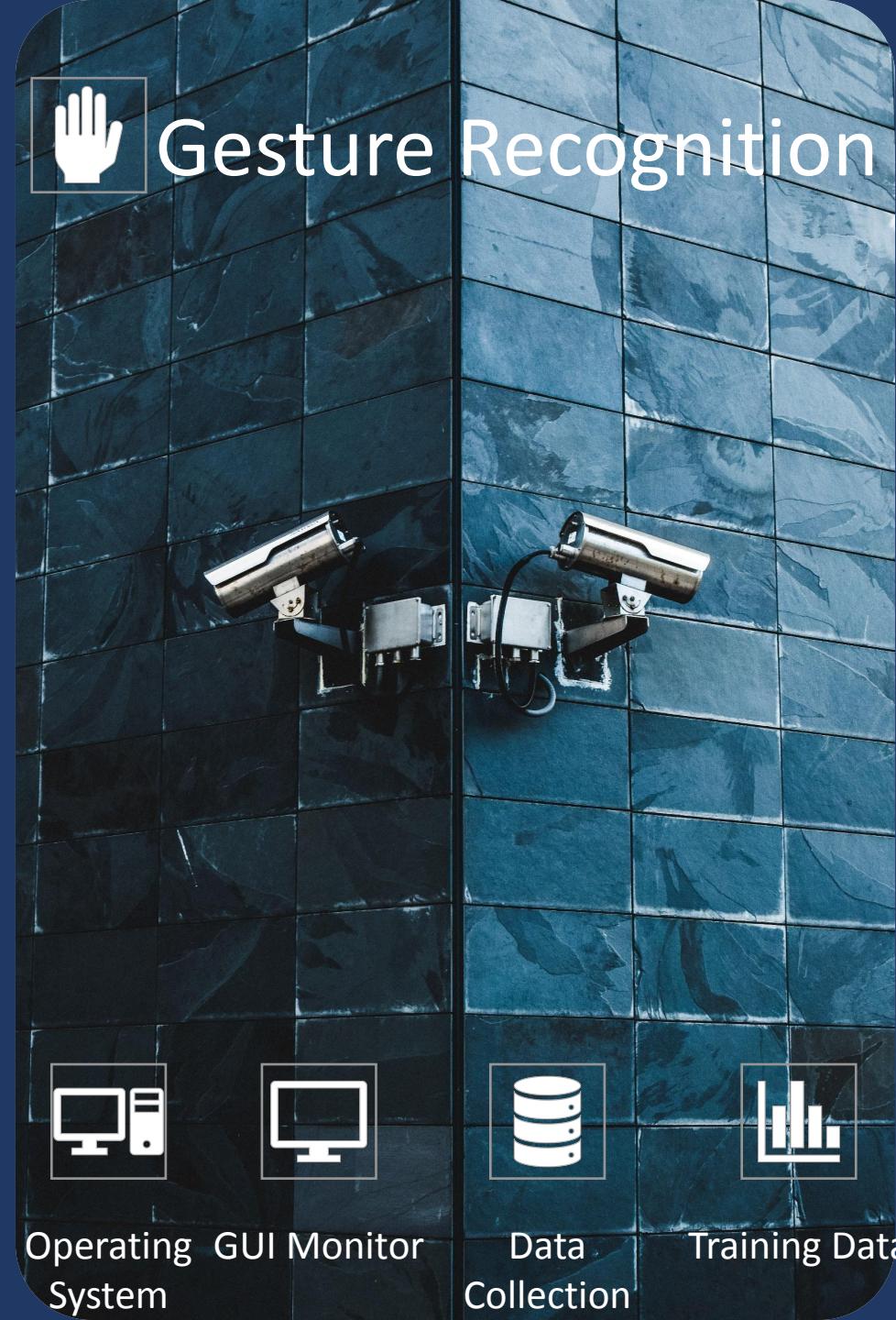
Static



Dynamic

Static

Model 1
Model 2

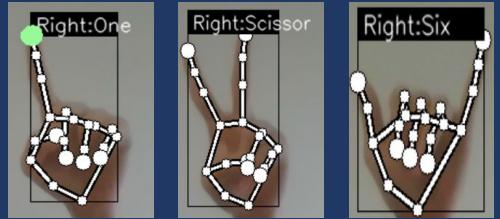


Dynamic

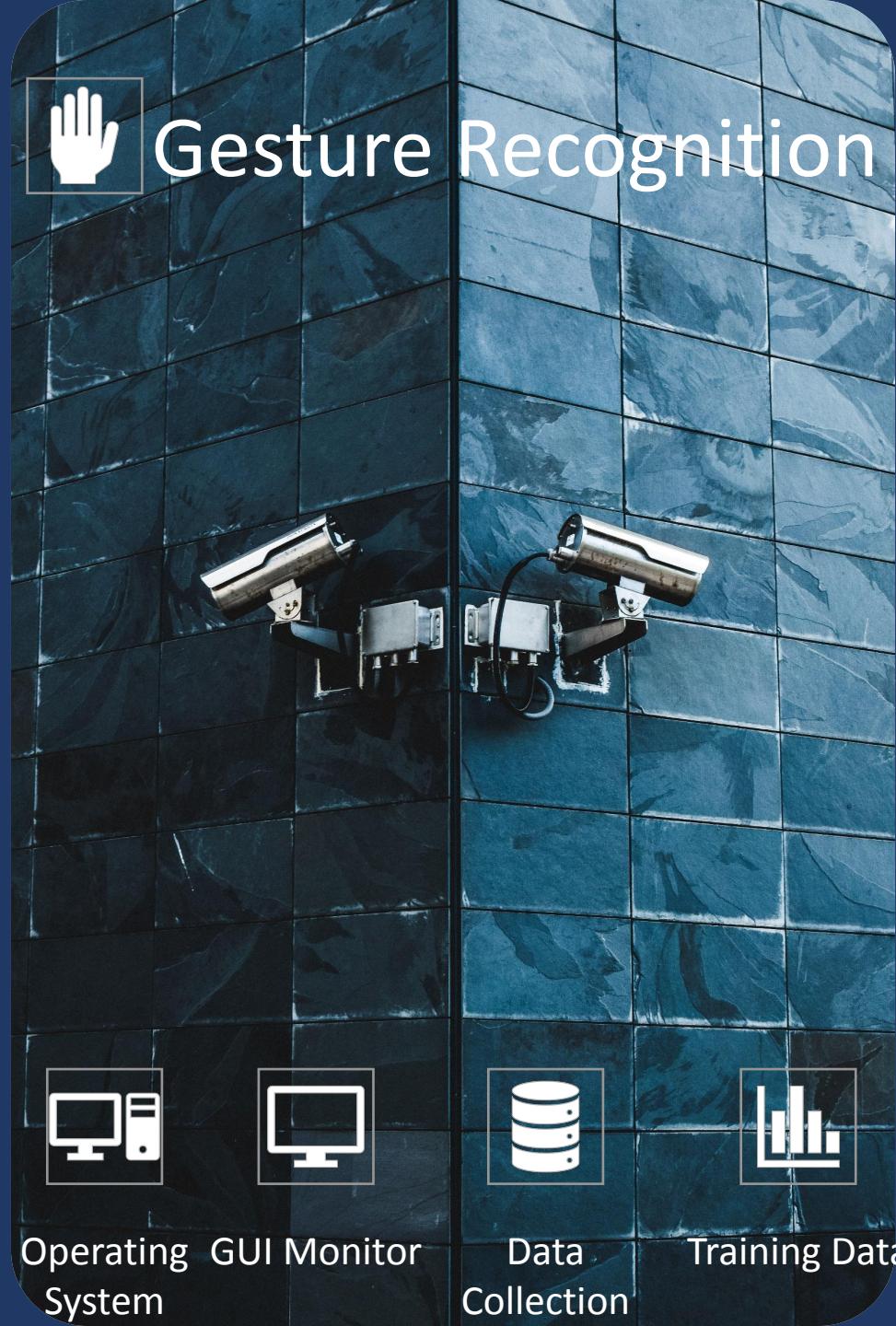
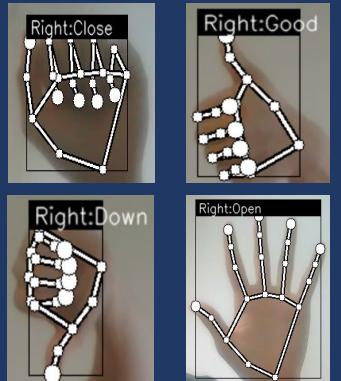
LSTM Model

Static

Model 1



Model 2



Dynamic

LSTM Model

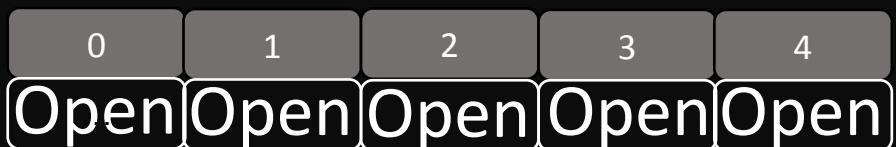


None is all included



Operating System

Deque



Close ←



Gesture
Recognition



Training Data



Data
Collection



GUI Monitor





Operating System

Deque



OK



Gesture
Recognition



Training Data



Data
Collection



GUI Monitor





Operating System

Deque

Open **Open** Open Open Close OK



Gesture
Recognition



Training Data



Data
Collection



GUI Monitor





Operating System

Six



Training Data



Data Collection



GUI Monitor



0	Open	1	Open	2	Open	3	Close	4	OK
---	------	---	------	---	------	---	-------	---	----



0	Open	1	Open	2	Open	3	Close	4	OK
---	------	---	------	---	------	---	-------	---	----



0	Open	1	Open	2	Open	3	Close	4	OK
---	------	---	------	---	------	---	-------	---	----



0	Open	1	Open	2	Open	3	Close	4	OK
---	------	---	------	---	------	---	-------	---	----





Operating System



Open [Open] [Open] Close OK Six



Open [Open] [Open] Close OK Six



Open [Open] [Open] Close OK Six



Open [Open] [Open] Close OK Six

Six



Gesture
Recognition



Training Data



Data
Collection



GUI Monitor





Operating System



Open [Open] Close OK Six Six



Open [Open] Close OK Six Six



Open [Open] Close OK Six Six



Open [Open] Close OK Six Six

Six



Gesture
Recognition



Training Data



Data
Collection



GUI Monitor





Operating System

Six



Training Data



Data Collection



GUI Monitor



0	1	2	3	4
Six	Six	Six	Six	Six



0	1	2	3	4
Six	Six	Six	Six	Six



0	1	2	3	4
Six	Six	Six	Six	Six



0	1	2	3	4
Six	Six	Six	Six	Six





Operating System



0	1	2	3	4
Six	Six	Six	Six	Six



Gesture
Recognition



Training Data



Data
Collection



GUI Monitor



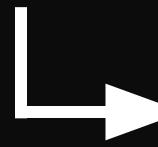


Operating System



0	1	2	3	4
Six	Six	Six	Six	Six

X 8



Function: Changing Mode



Gesture
Recognition



Training Data



Data
Collection



GUI Monitor





Operating System

Mode

🌙 Sleep

◀ Mouse

⌨️ Keyboard



Gesture
Recognition



Training Data



Data
Collection



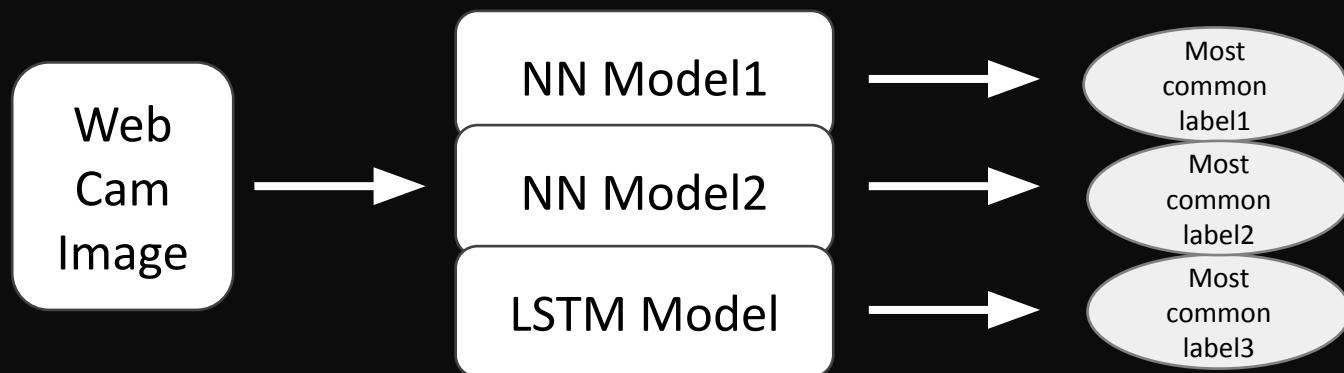
GUI Monitor





Operating System

SleepMode



Gesture Recognition



Training Data



Data Collection



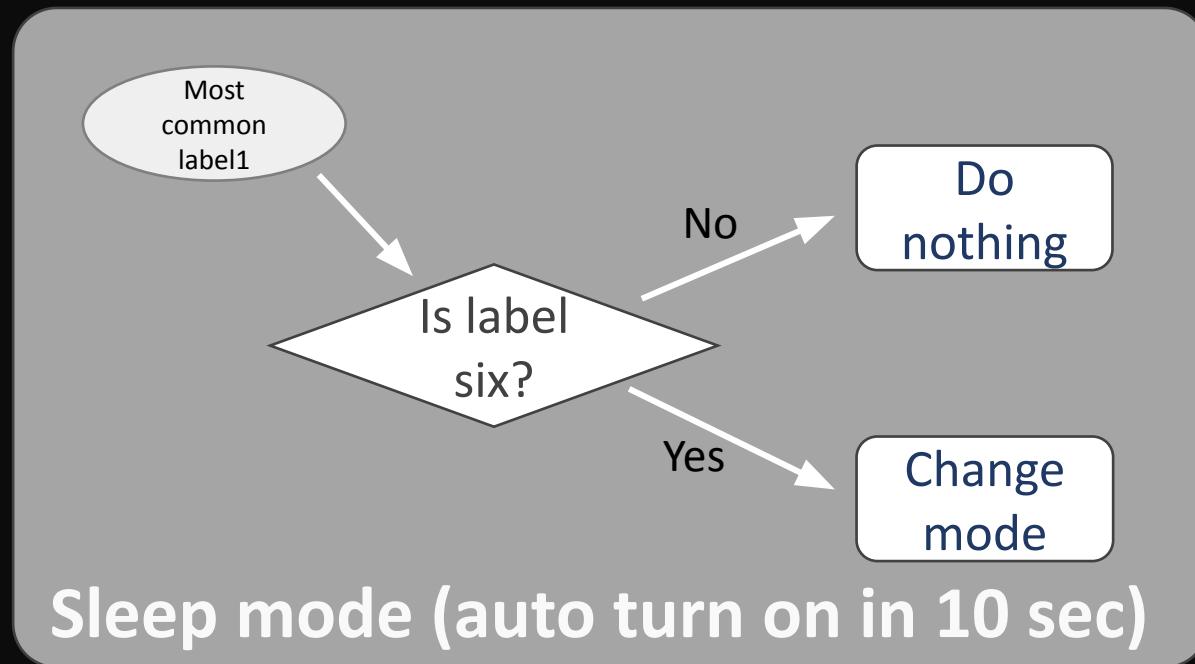
GUI Monitor





Operating System

SleepMode



Gesture
Recognition



Training Data



Data
Collection



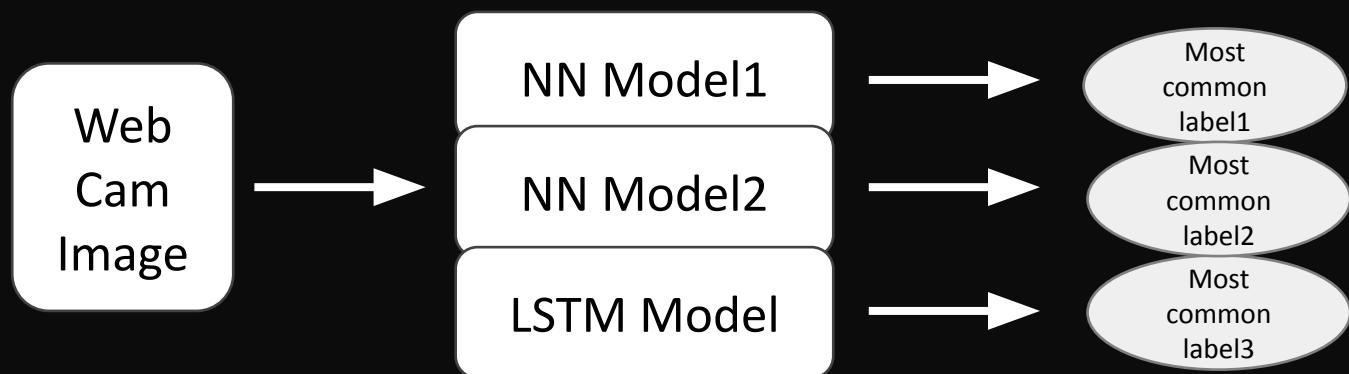
GUI Monitor





Operating System

Mouse Mode



Gesture Recognition



Training Data



Data Collection



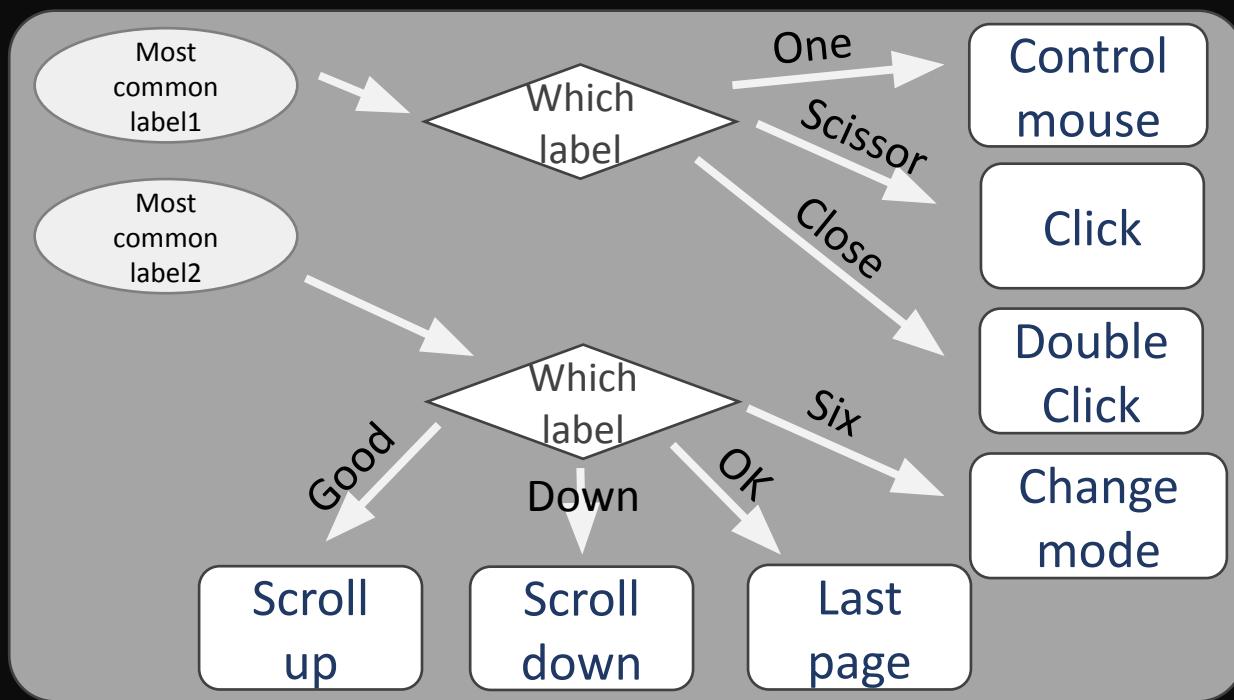
GUI Monitor





Operating System

Mouse Mode



Gesture Recognition

Training Data



Data Collection



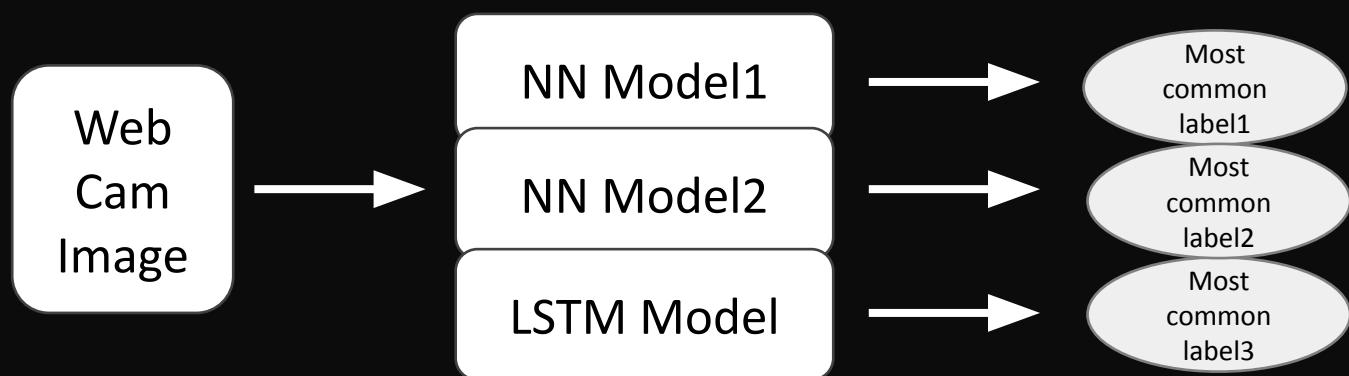
GUI Monitor





Operating System

Mouse Mode



Gesture
Recognition



Training Data



Data
Collection



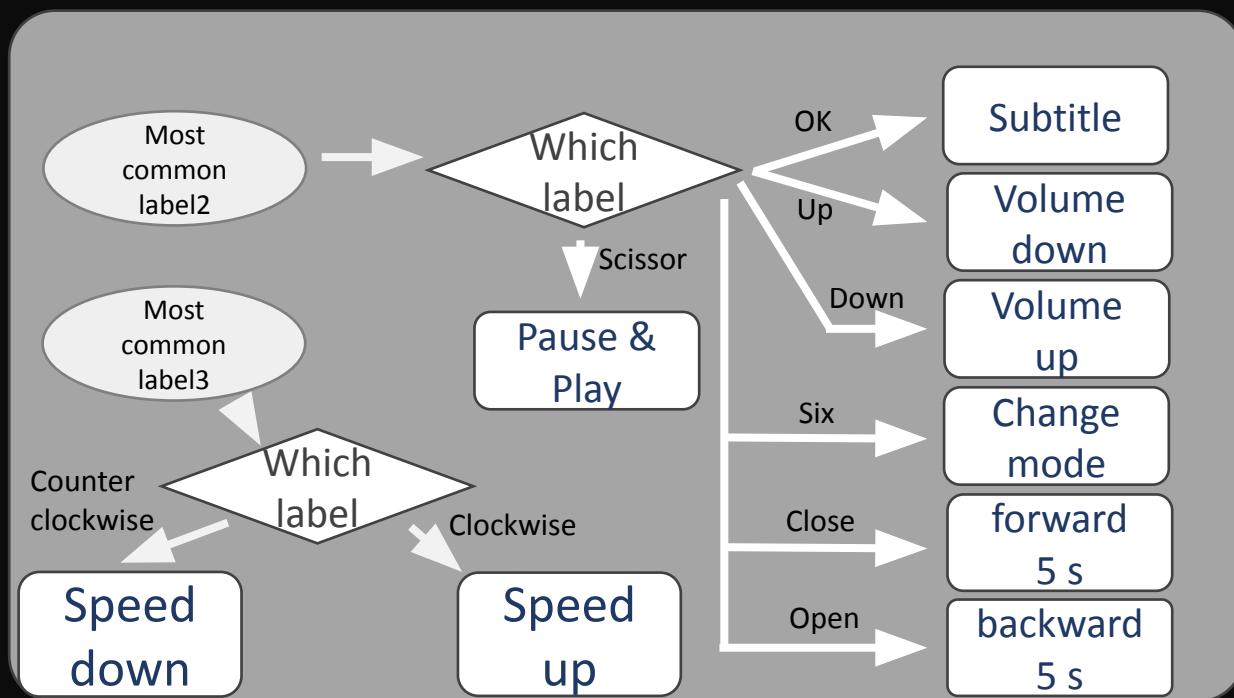
GUI Monitor





Operating System

Mouse Mode



Gesture Recognition



Training Data



Data Collection



GUI Monitor





GUI Monitor



Data
Collection

Training Data

Gesture
Recognition

Operating
System



◀ Mouse Mode



⌨️ Keyboard Mode



🌙 Sleep Mode