

# **Quick Start Guide**

Labeling Discrete Events - 8/30/2023

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# **1.0 Prerequisites**

This guide assumes you have completed the Getting Started guide at the link below:

https://sensiml.com/documentation/guides/getting-started/overview.html

The Getting Started guide goes into more detail on how to use the SensiML Toolkit and should be completed before continuing.

# 2.0 Quick Start Project

The **Gesture Demo** has five trigger events. This demo detects when a user does a specific gesture with a wearable device. To make this more accessible for the demo we hold the sensor in our hand and make the gestures, but in the real world you would attach the sensor to a wearable strap.

Download the Gesture Demo project at the following link:

https://sensiml.com/documentation/\_static/file/gesture-demo.zip



Events of interest: A, D, L, M, U

# **3.0 Labeling Discrete Events**

Before we dive into labeling discrete events, let's look at a screenshot of one of the files in the Gesture project.



#### Depending on the file you opened it may look slightly different with more or less events

Notice that this file has many segments. In the continuous example from the <u>Getting Started</u> <u>Guide</u> the file only had one segment over the entire length of the file. The way you create segments in a discrete example is different from a continuous example because you will be using an **auto session** to detect your events instead of manually placing segments in the graph.

### **Auto Sessions and Segmentation Algorithms**

An auto session is different from a manual session because it uses a **segmentation algorithm** to detect each event in your file, instead of placing events manually. The SensiML Toolkit provides multiple **segmentation algorithms** that can detect events for various use cases.

For now, let's take a look at **My Auto Session** in the Gesture Demo. This session was already created for this demo, but we will go over how to create your own sessions later in this guide.

1. In the Project Explorer, click on the session options to change sessions



2. Right+Click on **My Auto Session** 

Type	Name	Files	Segments	Label Distribution	Algorithm	Created
Auto	My Auto Session	20	213		General Threshold	8/22/2022 10:18:04 AI
Manual	My Training Session	5	113			8/22/2022 10:18:04 AI
Manual	My Training Session	5	113			8/22/2022 10:18

3. Click Edit

# Sessions

Туре	Name	Files	Segments	Label Distribution	Algorithm	Cre
Auto	My Auto Session	20	213		General Threshold Segmentation	8/2
Manual	My Training Session	5	113		Edit	8/2
+ Add New	Session				Delete	
			Seler	+	Can	

4. Here you can see the parameters we used for the segmentation algorithm used in **My Auto Session** 

ession: My Auto Session						
lead-only mode. Session parar egments have been saved in t	neters cannot be changed when he session.					
General Threshold Segmentat	ion 🔹 🚺					
Inputs						
First Column Of Interest	Magnitude (GyroscopeX, GyroscopeY, GyroscopeZ)					
Second Column Of Interest	Magnitude (AccelerometerX, AccelerometerY, AccelerometerZ)					
Maximum Segment Length	169					
Minimum Segment Length	68					
Threshold Space Width	20					
Initial Vertical Threshold	4464.997					
First Threshold Space	sum					
First Comparison	max					
Second Vertical Threshold	1534.051					
Second Threshold Space	sum					
Second Comparison	min					
Drop over max length	False					

These parameters may be different depending on the project

### **Using Auto Sessions**

Next, we are show how to use the **segmentation algorithm** in **My Auto Session** to automatically detect our events in a file

- 1. Open any of the files in the Gesture Demo
- 2. Now let's use the segmentation algorithm to generate segments. Click **Run Algorithm** above the graph and the DCL will use the algorithm to automatically generate segments for this file.



 After the DCL detects the segments, you still need to label the segments with an event. To do this, Shift+Click to highlight the segments you want to label and click the Edit button

	rs				
ld	Label	Start	Length	Status	
		283	169	1	
2		756	169	1	
		1,210	169	1	
4		1,680	169	1	
		2,101	169	1	
		2,470	169	1	

4. Select the event label

Select Labe Select labels to add to Project Properties to a	o the segment. Open update labels
Label	A
	D
	L
	M
	Noise
	U
L	Clear
Auto add to futu	ure segments
Done	Cancel

### **Creating Auto Sessions**

In the Gesture demo we already setup the **My Auto Session** algorithm for you with customized parameters. But let's say you are starting a new project from scratch and don't know what algorithm to use. There are two ways you can setup an algorithm; You can customize your own algorithm, or you can have the DCL auto train an algorithm for you.

#### **Customizing Algorithms**

There are five standardized segmentation algorithms in the SensiML Toolkit. If you are a data science expert and know the algorithm you want to use, you can select it from the dropdown and setup your parameters yourself.



#### **Auto-Training an Algorithm**

You can have the DCL automatically find a segmentation algorithm for you without knowing any data science. The DCL can be trained with **example events** and it will automatically find a segmentation algorithm that will detect those events. To train the DCL with example events, create a manual session to work in and then create segments around each of the events you want to use as your example training data. We will go over this in more detail, for now let's take a look at a training session that has already been created in the Gesture demo called **My Training Session**.

1. In the Project Explorer, select the session My Training Session



You will notice in the Project Explorer that five files already have segments in **My Training Session**.

			Proje	ect Explorer 🗲
Files	Knowledge Packs			
Search	n Project Explorer			☆ 2
Status	File	Segments	Uploaded	Device Subject
•	User001_A.csv	24	5/2/2022 8:29 AM	Sensor User001
•	User001_D.csv	28	5/2/2022 8:29 AM	Sensor User001
•	User001_L.csv	20	5/2/2022 8:29 AM	Sensor User001
•	User001_M.csv	17	5/2/2022 8:29 AM	Sensor User001
	User001_U.csv	24	5/2/2022 8:29 AM	Sensor User001
•	User002_A.csv	0	5/2/2022 8:29 AM	Sensor User002
•	User002_D.csv	0	5/2/2022 8:29 AM	Sensor User002
•	User002_L.csv	0	5/2/2022 8:29 AM	Sensor User002

To view all of these files together, highlight the files, right + click, and click Compare Files

				Project Explorer
Files	Know	ledge Packs		
Search	n Project	Explorer		* <i>2</i>
Status	Video	File	Time	Segments Label Distribution
		User001_A.csv	1:36	24
		User001_D.csv	1:34	28
		User001_L.csv	1:35	Rename
		User001_M.csv	1:35	Delete
		User001_U.csv	1:34	
٠		User002_A.csv	0:32	Upload
٠		User002_D.csv	0:33	Download
•		User002_L.csv	0:32	
•		User002_M.csv	0:32	Export
•		User002_U.csv	0:33	Copy UUID
•		User003_A.csv	0:33	
•		User003_D.csv	0:33	Segments
•		User003_L.csv	0:32	Metadata 🔹
•		User003_M.csv	0:33	Sensor Configuration
•		User003_U.csv	0:33	
•		User004_A.csv	0:30	Label Distribution
•		User004_D.csv	0:27	Compare Files
•		User004_L.csv	0:27	Concrete Auto Section
$\bigcirc$		User004_M.csv	0:27	Generate Auto Session
~				

This shows you all of the training data that was used in **My Training Session**:



When building a training data set, you want to have a variance of data from each event on your project. For example, if I am training the letter A gesture event, I need to give the DCL some small, medium, and large versions of the letter A so that my algorithm is not overfitting to one size. Collecting variance on your events is very important to build a robust application. I also want to train the DCL with similar variance on every type of event in my project, for the Gesture demo this is the D, L, M, U events.

#### Adding More Training Data

The session **My Training Session** already has enough data to be used as a training session, so this step is optional. Here are the steps to add more training data to the session. Follow the steps below for how to add more training data. This is useful when you have a specific event that is not performing how you expect it to.

- 1. Open the Project Explorer
- 2. Select the session **My Training Session**
- 3. Open any file that has 0 segments. These files were not used as training data for this project
- 4. To add more training data, manually place new segments around each event and save

*Important:* It is important to put a segment on every event in the file. If you skip events, then the DCL will be attempting to find an algorithm that also skips those events

#### How to Use Your Training Session to Auto-Train a Segmentation Algorithm

After you have created your training session, you can auto-train the DCL to find a new segmentation algorithm. Select the session you wish to use as your training session and then click *Generate auto session*.

1. Open the project explorer

- 2. Select the session **My Training Session**
- 3. Highlight the five files that are labeled with segments
- 4. Right+Click
- 5. Click Generate auto session

				P	Proje	ect Explorer	)
Files	Knowl	edge Packs					
Search	n Project	Explorer				\$ S	
Status	Video	File	Time	Segm	ents	Label Distribution	î
		User001_A.csv	1:36		24		
		User001_D.csv	1:34		28		
		User001_L.csv	1:35	Г	20		
		User001_M.csv	1:35		R	lename	
•		User001_U.csv	1:34		Delete		
٠		User002_A.csv	0:32				
٠		User002_D.csv	0:33		Upload		
٠		User002_L.csv	0:32		Download		
٠		User002_M.csv	0:32		Funert		
٠		User002_U.csv	0:33	Export			
٠		User003_A.csv	0:33	Copy UUID			
٠		User003_D.csv	0:33				
•		User003_L.csv	0:32		S	egments	•
•		User003_M.csv	0:33		N	/letadata	•
•		User003_U.csv	0:33		S	ensor Configuration	
•		User004_A.csv	0:30				
•		User004_D.csv	0:27		L	abel Distribution	
•		User004_L.csv	0:27		C	Compare Files	
$\bigcirc$		User004_M.csv	0:27				
					Ģ	senerate Auto Session	R
					A	Add Video	~

6. Once the DCL has found an algorithm it will create a new session called **Generated Session** with a new algorithm selected

	Generated Jession
Algorithm:	
General Thresh	old Segmentation 🔹 🧃
First Column Of Accelerometer	Interest (column used to identify the start of the segment): Z
Second Column segment):	Of Interest (column used to identify the end of the
Magnitude (Gy	roscopeX, GyroscopeY, GyroscopeZ) 🔻
Threshold Space space): 15	Width (the size of the window to transform into threshold
13	
Maximum Segm have):	ent Length (maximum number of samples a segment can
Maximum Segm have): 186	ent Length (maximum number of samples a segment can
Maximum Segm have): 186 Minimum Segm have):	ent Length (maximum number of samples a segment can ent Length (minimum number of samples a segment can
Maximum Segm have): 186 Minimum Segm have): 91	ent Length (maximum number of samples a segment can ent Length (minimum number of samples a segment can
Maximum Segm have): 186 Minimum Segm have): 91 First Threshold S the first vertical	ent Length (maximum number of samples a segment can ent Length (minimum number of samples a segment can ispace (space to transform signal into to compare against threshold):

7. Click Done

Now you can use the **Generated Session** to detect segments like how we showed in <u>Using Auto</u> <u>Sessions</u>. Notice that we only use five files in our training data set. As mentioned before, if you pick events that have enough variance in them, then the DCL will be able to find a **segmentation algorithm** that can detect all events in your project without you having to manually train every file.

### 4.0 Building a Model for Discrete Events

Next, we are going to show some of the differences between building a continuous model and a discrete model through the Analytics Studio.

### Query

The only difference in the Query step is you will select **My Auto Session** as the Session instead of the manual training data. See screenshot:

Query	Show Segments
All Classes -	
Session	Label Distribution by segment
My Auto Session -	50
Label	
Label	
Metadata	40
segment_uuid 🗸	
Source	
GyroscopeX, GyroscopeY, GyroscopeZ, AccelerometerX, AccelerometerY, AccelerometerZ	30
Query Filter	
[Label] IN [U,M,L,D,A]	20
ADD NEW QUERY	
	10

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## **Model Building**

The main difference between continuous and discrete events in the Build Model screen is the **Segmenter** step will automatically be filled with the segmenter properties in your auto session instead of the windowing segmenter.



### **Next Steps**

Everything else in the model building process stays the same as the <u>Getting Started Guide</u>. The Getting Started Guide also gives more detailed descriptions on terms and ways to explore your model data within the Analytics Studio.