

CageView™ Premium User Manual

Quick Start Guide





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Important Note:

The CageView App is available on Microsoft Store for free download.



1. Introduction

CageView[™] is a programmable, detector, and easy-to-handle device used in research centers focusing on biomedical research and animal science. It is designed to provide controlled conditions for measuring food, behavior, drug ingestion, and exercise intensity. It eliminates the need for technicians to measure intake and change the conditions.

Although it has comprehensive and unique features, CageView has a competitive price compared to similar products and is affordable for research laboratories.

CageView[™] consists of two separate modules: **CV-SmartFeeder**[™] and **CV-SmartVision[™]**.

1.1. CV-SmartFeeder™

In most biomedical research studies with rodents (mice and rats), it's essential to provide their daily and hourly food share in a predetermined manner. CageView[™] can be programmed to provide access or remove access to the food source anytime and from almost anywhere. Its features include:

- Scheduling feeding plan
- Saving specific feeding plans
- Changing and removing the scheduled plan
- Monitoring the Smart Feeder performance

1.2. CV-SmartVision™

CageView[™] is programmable to monitor and record the activities of animals. The tracing mechanism consists of the following:

- Tracing the activity of the animal
- Providing the distribution of the activity location over a specific time step
- Compatible with a varied spectrum of light (Using image/video-processing techniques to eliminate the effect of light)



2. CageView[™] Installation Requirements

The following features are the requirements that a machine needs to meet to execute the CageView[™] software:

- OS Type: Windows 10 (64-bit)
- OS Version: Version 2004 (OS build 19041.985) [Minimum Tested] Version 20H2 (OS build 19042.1052) [Recommended]
- Installed Memory (RAM): 8 GB [Minimum Tested]

12 GB or more [Recommended]

Processor: Core (TM) i5-3450 CPU @ 2.10 GHz or equivalent [Minimum Tested]
 Core (TM) i7 4th Gen. CPU and higher or equivalent [Recommended]

Important Note 1: The machine needs to have a working Bluetooth 4+ adapter installed. Most laptops and modern desktop PCs have built-in Wi-Fi and Bluetooth adapters. If your system does not have a built-in Bluetooth adapter, you can utilize an external Bluetooth 4+ dongle.

Important Note 2: For Activity Monitoring, it is recommended to use a machine that has a dedicated GPU.

3. CageView[™] Installation Procedure

This section provides easy-to-follow instructions to install CageView[™].

3.1 Installing CageView App using installer file (Old Versions)

3.1.1. If you are using the "exe" version of the App, go to the installation folder and double-click on "**CageView (x64).exe**".

Name	Date modified	Туре	Size
S≫ CageView (x64).exe	2022-02-09 2:59 PM	Application	253,469 KB
CageView (x64).wixpdb	2022-02-09 2:59 PM	WIXPDB File	143 KB

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3.1.2. By double-clicking the "exe" file, a window will pop up, as shown in **Figure 1**. Read the "End User License Agreement." If you agree with the Terms and Conditions, check the "I agree to the license terms and conditions" box and click the "Install" button.



Figure 1. Software License Agreement.

Note: When clicking the "**Install**" button, you may be asked to give permission for the installation. Click "**Yes**" if you see this message generated by the OS.

3.1.3. Click the "**Install**" button to start installing software. After installation, the following window will appear, and the software shortcut is created on the Desktop.



Figure 2. A Message indicating successful installation with a software icon.



3.2 Downloading and Installing CageView App from Microsoft Store (New Version)

3.2.1. Go to the Microsoft Store and search "CageView."

3.2.2. Click on CageView to see a window containing the CageView App description. On the left side of the window, click Install / Get button to download the software.



Figure 3. CageView App on Microsoft Store



4. Software Updates

This section provides information about CageView App's software updates and step-by-step instructions for the updating process.

4.1. If the CageView App is outdated, the information button (¹⁾) on the bottom of the main window will blink. Click the information button to see an alert stating, "Updates are available," as shown in **Figure 4.**

🔔 CageView		BLE Ready 8 -	6 ×
	Aliver		
	About		
	CageView Version 7.1.2.0 Copyright (c) 2022 Tactile Robotics Ltd.		
	0 Updates are available 🛓		
	You can access the latest privacy policy of the app posted here.		
	This app uses the following third party libraries:		
	FFmpeg		
	This app uses the publicly available compiled FFmpeg library files from <u>Bibbl</u> . FFmpeg dynamic link library (dll) files are located in the FFmpeg directory under your installation location, you can go ahead and replace these LGPL licensed files with a compatible version.		
	GNU LESSER GENERAL PUBLIC LICENSE Version 3, 29 June 2007		
	Copyright (2) 2007 Free Software Foundation, Inc. Everyone is permitted">http://bforg/> Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.		
	This version of the ONU Lesser-General Public License incorporates the terms and conditions of version 3 of the GNU General Public License, supplemented by the additional permissions listed below.		
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	As used herein, "this License" refers to version 3 of the GNU Lesser General Public License, and the "GNU GPL" refers to version 3 of the GNU General Public License.		
	"The Library" refers to a covered work governed by this License, other than an Application or a Combined Work as defined below.		
	An "Application" is any work that makes use of an interface provided by the Library, but which is not otherwise based on the Library. Defining a subclass of a class defined by the Library is deemed a mode of using an interface provided by the Library.		
	A "Combined Work" is a work produced by combining or linking an Application with the Library. The particular version of the Library with which the Combined Work was made is also called the "Linked Version".		
	The "Minimal Corresponding Source" for a Combined Work means the Corresponding Source for the Combined Work excluding any source code for portions of the Combined Work that, considered in isolation, are based on the Application, and not on the Linked Version.		
	The "Corresponding Application Code" for a Combined Work means the object code and/or source code for the Application, including any data and utility programs needed for reproducing the Combined Work from the Application, but excluding the System Libraries of the Combined Work.		
	1. Exception to Section 3 of the GNU GPL		
	You may convey a covered work under sections 3 and 4 of this License without being bound by section 3 of the GNU GPL.		
	2. Conveying Modified Versions.		
	If you modify a copy of the Library, and, in your modifications, a facility refers to a function or data to be supplied by an Application that uses the facility (other than as an argument passed when the facility is invoked), then you may convey a copy of the modified version:		
	a) under this License, provided that you make a good faith effort to ensure that, in the event an Application does not supply the function or data, the facility still operates, and performs whatever sart of its pursoes remains meaningful, or		
	Close		

Figure 4. Updates are available warning

4.2. Click the download button beside the "Updates are available" to initiate downloading and installing process (**Figure 5**).

4.3. If the CageView App is up to date, clicking the ($^{(1)}$) button will show information and a statement that the user is using the latest version of the App (**Figure 6**).

BLE Ready 🚷 🛛 — 🗇



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About	
CageView Version 7.1.2.0 Copyright (c) 2022 Tactile Robotics Ltd.	
C Downloading and installing the updates	
You can access the latest privacy policy of the app posted here.	
This app uses the following third party libraries:	
FFmpeg	
This app uses the publicly available compiled FFmpeg library files from <u>Btbb</u> . FFmpeg dynamic link library (dll) files are located in the FFmpeg directory under your installation location, you can go ahead and replace these USP Licensed files with a compatible version.	
GNU LESSER GENERAL PUBLIC LICENSE Version 3, 29 June 2007	
Copyright () 2007 Free Software Foundation, Inc. Everyone">http://fsf.org/>Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.	
This version of the GNU Lesser General Public License incorporates the terms and conditions of version 3 of the GNU General Public License, supplemented by the additional permissions listed below.	
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An 'Application' is any work that makes use of an interface provided by the Library, but which is not otherwise based on the Library. Defining a subclass of a class defined by the Library is deemed a mode of using an interface provided by the Library.	
A "Combined Work" is a work produced by combining or linking an Application with the Library. The particular version of the Library with which the Combined Work was made is also called the "Linked Version".	
The "Minimal Conresponding Source" for a Combined Work means the Corresponding Source for the Combined Work, excluding any source code for portions of the Combined Work that, considered in isolation, are based on the Application, and not on the Linked Version.	
The "Corresponding Application Code" for a Combined Work means the object code and/or source code for the Application, including any data and utility programs needed for reproducing the Combined Work from the Application, but excluding the System Libraries of the Combined Work.	
1. Exception to Section 3 of the GNU GPL.	
You may convey a covered work under sections 3 and 4 of this License without being bound by section 3 of the GNU GPL.	
2. Conveying Modified Versions.	
If you modify a copy of the Library, and, in your modifications, a facility refers to a function or data to be supplied by an Application that uses the facility (other than as an argument passed when the facility is invoked), then you may convey a copy of the modified version:	
a) under this License, provided that you make a good faith effort to ensure that, in the event an Application does not supply the function or data, the facility still operates, and $- au$	
Close	

Figure 5. CageView App update downloading and installing



Figure 6. Using the latest version



5. Software Usage Instruction

This section provides step-by-step instructions on how to work with CageView[™] software after it is successfully installed.

5.1. Establishing Wireless Connection

The first step is to establish a wireless connection between Smart Feeder and the software. The following sub-steps explain how to connect the Smart Feeder to the software successfully:

5.1.1. Double-click on the software shortcut located on the Desktop or other location on the machine. The first page of the software is shown in **Figure 7**.

5.1.2. The App indicates Bluetooth Low Energy (BLE) adapter status on its title bar on the right (we'll call this spot BLE status indicator henceforth). The user will see "BLE Ready" when the adapter is enabled and turned on. The user can go ahead and add a BLE CageView and connect to it when seeing this message.

5.1.3. When no BLE adapter is found in the system or disabled under the device manager, the "No BLE Adapter" will appear in the BLE status indicator, as shown in **Figure 8**. The user cannot use the BLE functionality of the App in this state. A restart of the App is required when a BLE adapter is connected or enabled after the App's initial start-up.

5.1.4. The "**Power on BLE**" button is shown in the BLE status indicator area when the BLE adapter is detected, but it is turned off by the system. The user cannot use the BLE functionality of the App when the BLE adapter is off. The user can either click on this button to turn on the BLE adapter or turn it on in Windows settings.

Note: The App does not require a restart after turning on the BLE adapter **(Figure 9)**.





Figure 7. The first page of CageView software



Figure 8. On the first page of CageView software, no BLE adapter





Figure 9. On the first page of CageView software, Power on the BLE adapter

5.1.5. Clicking on the "**Add Cage**" button (represented by a plus icon) opens the add cage, as shown in **Figure 10**, to add BLE CageView.

🗻 CageView		BLE Ready 🕄 📃 🗆
	Add New Cage	
	Cocal Area Network (LAN) Bluetooth Low Energy (BLE)	
	Name	
	Physical Dimensions	
	Width: 35 + - Height: 12 + - Unit: Centimeters *	
	Description	
	SmartFeeder	
	Discovered Smartfeeder Devices (2): CV-202202-5F-333 CagetView-20322) •	
	Discovered Smart/Vision Devices (2): C* CV-202202-SV-002 CV-202202-SV-001	
	Configure SmartVision WiFi	
	Cancel	

Figure 10. Add a BLE cage – scanning



5.1.6. To add a BLE CageView, choose "**Bluetooth Low Energy (BLE)**" (as shown in **Figure 10**). Ensure the Smart Feeder is on (by clicking the push button). The software starts initiating a BLE scan for nearby CageView. A spinning animation is shown when a BLE scan is in progress.

5.1.7. The user requires to enter a name for each cage added. Filling in the description field is optional and can contain extra information for reference.

5.1.8. The discovered nearby BLE CageView will be listed in the form. The user will need to choose one of the discovered devices from the list in addition to naming it (**Figure 11**). A valid filled form is shown in **Figure 12**.

🗻 CageView	BLE Ready 🕄 📃 🗆 🔿
Add New Cage	
Cocal Area Network (LAN) Bluetooth Low Energy (BLE)	
Name	
Physical Dimensions	
Width: 35 + - Height: 12 + - Unit: Centimeters •	
Description	
SmartFeeder	
Discovered SmartFeeder Devices (1): CV-202202-5F-333	
Discovered SmartVision Devices (1): CV-202202-SV-002	
Configure SmartVision WiFi	
Cancel	

Figure 11. Add a BLE Cage - scan finished



🔔 CageView		BLE Ready 🚷 🗆 🗙
	Add New Cage	
	Cocal Area Network (LAN) Bluetooth Low Energy (BLE)	
	Name Cage 1 - SFSV	
	Physical Dimensions Width: 35 + - Height: 12 + - Unit: Centimeters •	
	Description	
	SmartFeeder	
	Discovered SmartFeeder Devices (1): CV-202202-5F-333	
	Discovered SmartVision Devices (1): CV-202202-SV-002	
	Configure SmartVision WiFi Add Cancel	

Figure 12. Add a BLE Cage - filled form

5.1.9. To connect the Smart Vision to the software, ensure the SmartVision is connected to a power source and turned on. Then, click the SmartVision button (represented by a camera icon) and scan for nearby SmartVision devices. Once the scan is finished, nearby SmartVision devices are listed in the form; click the desired SmartVision device and configure the SmartVision WiFi.

Note: The user can set up the SmartVision and SmartFeeder individually and cannot add a BLE CageView if the "BLE Ready" message is not indicated in the BLE status indicator area.

5.1.10. To configure SmartVision's WiFi connection, choose and click the desired SmartVision device listed on the form after the scanning process. Then, click on the "**Configure SmartVision WiFi**" checkbox.

5.1.11. The user will see an extension of three unfilled values, as shown in **Figure 13**. Fill the boxes for each value with your WiFi information, then click the "**Add**" button.

Note: The SSID and Password are "case-sensitive." Please ensure to type them correctly.



Note: The "Username" box is optional. This is usually used for WPA2-Enterprise networks such as the ones in universities.

✓ Configure SmartVision W	/iFi		
Please note that all the follow	ing three values are case sens	itive.	
SSID			
Password			
User Name (Optiona	l)		

Figure 13. SmartVision's WiFi configuration for normal networks

5.1.10. A typical main window after adding one BLE CageView is shown in **Figure 14**. The given name for the cage and its ID in the App can be seen on the top left side. A corresponding icon indicates each cage connection mode on the far right. A Wi-Fi icon indicates a LAN CageView, while a BLE icon indicates a BLE one. Also, notice the set IP for a LAN CageView and the BLE address of a BLE one.

5.1.11. Click on any CageView item, open the corresponding cage, and initiate the connection, as shown in **Figure 15.**



🔔 CageView	BLE Ready 🕄 📃 🗆	×
Cages Select the cage to monitor or add a new one		
Cage 203255: Cage 1 - SFSV	C0:CF:16:82:E0:08 ᅟ	
EXTACTILE ROBOTICS	i 🖉 🕇	

Figure 14. The main window - added the BLE CageView

Cage 203	255: Ca	ge 1 - S	FSV						http:	://192.168.0.216:8081/
							1000		Run mouse detector network	PREVIOUS TRAJECTOR
									Activity Heat Map	
									Mouse detector is off	
		-	10			1-			Turn it on to generate movement trajectory	
					1.1					
					11				0 3 10 13 22 25 Cege Width (en)	20 15
	12 3	1 :30 2	30 3	:30 4 :	30 5 30 6	:30 7 :30	8 :30 9 :30	10 :30 11 :30	3 - 0 3 10 3 20 25 Cree with Level 25	30 33
hursday A	12 :30 M:	1 :30 2	2 :30 3	:30 4 :	30 5 :30 6	30 7 30	8 30 9 30	10 :30 11 :30	■	
hursday A PI	12 30 M: M:	1 :30 2	2 :30 3	:30 4 :	30 5 30 6	30 7 30	8 :30 9 :30	10 :30 11 :30	The lid will remain open indefinitely	38 8
hursday A Pi riday A	12 :30 M: M: M: M:	1 :30 2	2 :30 3	:30 4 :	30 5 :30 6	-30 7 :30	8 :30 9 :30	10 :30 11 :30	 Food lid is open The lid will remain open indefinitely Food lid opened at or before 2022-04-29 12:07:01 PM 	B B
hursday ^A Priday ^A aturday ^A	12 30 M: M: M: M: M:		2 :30 3	:30 4 :	30 5 :30 6	-30 7 :30	8 30 9 30	10 :30 11 :30	 Food lid is open The lid will remain open indefinitely Food lid opened at or before 2022-04-29 12:07:01 PM 	B B

Figure 15. Opened BLE CageView



5.1.12. The BLE CageView window with only the SmartFeeder connected is shown in **Figure 16**, and **Figure 17** shows a window with only the SmartVision connected.



Figure 16. Opened BLE CageView, SmartFeeder only

Cage 203257: Ca	nge 3 - SV		http://192.168.0.216:808
		Run mouse detector network	PREVIOUS TRAJECTORIE
		Activity Heat Map	
		Mouse detector is off	
- 2	The second second	Turn it on to generate movement trajectory	
No.	A PART		
	Constant for		
	11		
12 3	1 40 2 40 3 40 4 10 5 40 6 40 7 40 8 10 9 40 10 40 11 40	Do you want to set up the SmartFeeder now?	
12 a huraday and	0 1 40 2 40 3 40 4 10 5 40 5 40 7 40 8 40 9 40 10 40 11 40	Do you want to set up the SmartFeeder now?	
12 a huraday AM, riday AM,	1 49 2 49 3 40 4 10 5 49 6 40 7 49 8 40 9 40 10 40 11 49 2	Do you want to set up the SmartFeeder now?	а 29 33 С
Thursday AMA riday AMA riday AMA PAA		Do you want to set up the SmartFeeder now?	с С
Tiursday Att Pattern State Pat		Do you want to set up the SmartFeeder now?	20 35

Figure 17. Opened BLE CageView, SmartVision only



5.2. CageView SmartFeeder Feature

This subsection provides useful information on how to use the smart feeder feature of the system. The following sub-steps explain various aspects of the software.

5.2.1. The diet schedule for the cage is shown at the bottom left of the opened cage window. The diet schedule presented is only a focused version that shows the current day in the middle, the previous day, and the day after. The weekly diet is defined by a 48 * 7 schedule, each box representing a 30-minute window during the week. We will name this 30-minute window a time slot from now on.

5.2.2. The time slot corresponding to the current time in the week is differentiated by a breathing animation. Clicking each box toggles the diet for that specific time slot. Then, press down the mouse button and swipe over the desired boxes to change the diet schedule more easily.

5.2.3. The focused schedule after some edits is shown in **Figure 18**. Then, the next upcoming event for the cage is updated accordingly at the bottom right (e.g., "Food lid will close in 11 hours, 45 minutes"). Click the "**Week Schedule**" button at the bottom of the focused diet schedule to open the week schedule dialog.



Figure 18. CageView with the diet schedule set



5.2.4. The full weekly diet schedule is presented in the week schedule dialogue, as shown in **Figure 19**. Editing this diet schedule is the same as the focused version. The user can either click on each box individually or press down the mouse button and swipe to change multiple at once. The user can also use this dialogue to save and load their defined diet schedules in the App.

5.2.5. To save the diet schedule, add the name and click the "**Save**" button.

5.2.6. The saved diet schedule's name will be presented by a badge at the top of this dialogue, as shown in **Figure 20.**

Note: The user cannot save the same diet schedule with different names.

5.2.7. After diet schedules are saved in the App, they can be used and loaded onto any CageView that the user wants.

5.2.8. First, the diet from the presented list should be chosen to load a previously saved diet schedule. After selecting a diet schedule from the list, the interface will show a preview (as shown in **Figure 21**) with a different color fading back and forth on top of the current diet schedule to identify the differences and choose the desired schedule more easily.



Note: Please note that editing the diet schedule in this state is disabled, as two diet schedules are presented on top of each other. Click the "**X**" button beside the list to clear your selection and return to your current diet schedule.

CageView Cage 1 ×			BLE Ready 🚯 🛛 — 🗖
Cage 203255: Cage 1 - SFSV			http://192.168.0.216:8081/
		_	
	Week Schedule		
	12 :30 1 :30 2 :30 3 :30 4 :	30 5 :30 6 :30 7 :30 8 :30 9 :30 10 :30 11 :30	
	AM: FFFFFFFFFF	FFFFFFFFFFF	
	PM:		
	Monday PM: AM: AM: AM: AM: AM: AM: AM: AM: AM: A		
	Tuesday AM: FFFFFFFFFF	FFFFFFFFFFFF	
	Wednesday PM:		
	Thursday AM: F F F F F F F F F F	FFFFFFFFFFFF	
	Friday PM:		
	AM: FFFFFFFFFF	FFFFFFFFFFFF	
	PM:		
	Fa	sting Eating	
	Save this schedule: Name	SAVE	
	Load a schedule: Select schedule to load X -	LOAD	
6 W.		Close	
WEEK SCHEDUIE	Cation Cation	ALL EVENTS	
	Fasting		

Figure 19. Week schedule dialog

🗻 CageView Cage 1 X		BLE Ready 8 📔 — 🔲 🗙
🕝 Cage 203255: Cage 1 - SFSV		http://192.168.0.216:8081/
Week Sch	edule Half-day	
	12 :30 1 :30 2 :30 3 :30 4 :30 5 :30 6 :30 7 :30 8 :30 9 :30 10 :30 11 :30	
Sunday	AM: F F F F F F F F F F F F F F F F F F F	
Monday	AM: FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	
Tuesday	AM: F F F F F F F F F F F F F F F F F F F	
Wednesday	AM: F F F F F F F F F F F F F F F F F F F	
Thursday	AM FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	
Friday	AM: FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	
Saturday	AM: F F F F F F F F F F F F F F F F F F F	
	Fasting	
for the second		
Save this schedu	Ule: Name SAVE Diet schedule "Half-day" is already saved	
Load a schedule	2: Select schedule to load X • LOAD	
	Close	
	ALL EVENTS	
WEEK SCHEDULE Fasting Ea	ting	

Figure 20. Week schedule dialogue - diet saved



CageView Cage 1 X		BLE Ready 🤮 🚽 🗆
Cage 203255: Cage 1 - SFSV		http://192.168.0.216:8081/
	Week Schedule Half-day	
		10
	Sunday PM:	
	AM: F F F F F F F F F F F F F F F F F F F	FFFF
	Monday PM:	E F E
	AM: F F F F F F F F F F F F F F F F F F F	FFFF
		E E E
	Wednesday DM-	
	AM: FFFFFFFFFFFFFFFFFFFFFFFFFFF	FFFF
	Thursday PM:	13 13 13 13
	AM: F F F F F F F F F F F F F F F F F F F	FFFF
		FFFF
	Saturday AM: F F F F F F F F F F F F F F F F F F F	FFFF
	Fasting Eating	
	Save this schedule: Name SAVE Diet schedule "Half-day" is alread	dy saved
	Load a schedule: 16-8 Intermittent Fasting X LOAD	
		Close
ENG.		
revenue and		
LEN DUNIDULE	rasting	

Figure 21. Week schedule dialogue - load preview

5.2.9. When a diet schedule is selected, the user can either click the "**Load**" button or the "**Delete**" button, represented by a trash bin icon. The result is shown in **Figure 22**.

Note: In addition to setting the desired diet schedule, the user can manually control the cage's current food lid state by using the switch at the right of the cage's view.

5.2.10. The cage's food lid events are logged by the App for reference. A summarized list of these events and the current state of the cage's food lid can be seen. Also, the user can click the "**All Events**" button to see the complete list of food lid events. The dialog for the food lid events history is shown in **Figure 23**.

Note: Each day's food lid events list can be seen here. The events are sorted by their time in descending order, meaning that the most recent one will always be at the top of the list.





Image: State of the state	Cage 203262: Cage 1 - SFSV		http://	/192.168.0.216:8081/
2 00 1 00 2 00 3 00 4 00 5 00 6 00 7 00 8 00 9 00 10 00 11 00 Sunday AME P F F F F F F F F F F F F F F F F F F F			Run mouse detector network	PREVIOUS TRAJECTORIE
1 0 2 20 1 0 2 0			Activity Heat Map	
12 30 1 30 2 30 3 30 4 30 5 30 6 30 7 30 8 30 9 30 10 30 11 30 Sunday AM F F F F F F F F F F F F F F F F F F F			Mouse detector is off	
12 30 1 30 2 30 3 30 4 30 5 30 6 30 7 30 8 30 9 30 10 30 11 30 Sunday Minday Minday </td <td>Max Max</td> <td>A CONTRACTOR OF THE OWNER OWNER OF THE OWNER OWN</td> <td>Turn it on to generate movement trajectory</td> <td></td>	Max Max	A CONTRACTOR OF THE OWNER OWNER OF THE OWNER OWN	Turn it on to generate movement trajectory	
12 30 1 30 2 30 3 30 4 30 5 30 6 30 7 30 8 30 9 30 10 30 11 30 Sunday AM: F				
Sunday AM: PM: PM: F				20 BS
Sunday PM: A A F<	12 -20 1 -20 2 -20 2 -20 4 -20 5			
AM: F	12:30 1:30 2:30 3:30 4:30 5 AM: FFFFFFFFFFFFFFFFFFF	30 6 30 7 30 8 30 9 30 10 30 11 30	Food lid is open	
AM: Puesday F <th< td=""><td>12 30 1 30 2 30 3 30 4 30 5 AM: FFFFFFFFFFFFFFFFFFF PM: FFFFFFFFFFFFFFFFFF</td><td>30 6 30 7 30 8 30 9 30 10 30 11 30 F F F F F F F F F F F F F F F F F F F</td><td>¹ Food lid is open ⁵ood lid will close in 6 minutes</td><td>•</td></th<>	12 30 1 30 2 30 3 30 4 30 5 AM: FFFFFFFFFFFFFFFFFFF PM: FFFFFFFFFFFFFFFFFF	30 6 30 7 30 8 30 9 30 10 30 11 30 F F F F F F F F F F F F F F F F F F F	¹ Food lid is open ⁵ ood lid will close in 6 minutes	•
Iuesudy phr. ALL EVENTS	12 :30 1 :30 2 :30 3 :30 4 :30 5 Sunday AM: PM: F	30 6 30 7 30 8 30 9 30 10 30 11 30 F F F F F F F F F F F F F F F F F F F	Food lid is open Food lid will close in 6 minutes 〒 Food lid opened at or before 2022-05-09 9:51:17 AM	•
	12 30 1 30 2 30 3 30 4 30 5 Sunday AM: PM: F<	30 6 30 7 30 8 30 9 30 10 30 11 30 F F F F F F F F F F F F F F F F F F F	Food lid is open Food lid will close in 6 minutes Food lid opened at or before 2022-05-09 9:51:17 AM	•

Figure 22. CageView - food lid event added

5.2.11. Choose the log dates, as shown in **Figure 24**. The calendar only shows the dates that the App has records for them. Some days might be crossed with an "**X**" in the calendar, meaning that there are no records for those days in between.



CageView Cage1 X	BLE Ready 0 📃 🗆 🗆
Cage 203255: Cage 1 - SFSV	http://192.168.0.216:8081/
	Run mouse detector network PREVIOUS TRAJECTORIES
Food Lid Events History	
Select the date:	2022-04-29
Food lid opened at Food lid opened at Food lid opened at Food lid opened at Food lid opened at or before	2022-04-29 12:27:54 PM 2022-04-29 12:27:54 PM 2022-04-29 12:27:54 PM 2022-04-29 12:07:01 PM
5 events on this day	Close
Autority PM: Fasting Eating	Food lid closed at 2022-04-2 AL UNITS



🗻 CageView Cage I ×		BLE Ready 🟮 🚽 🗆 🛛
G Cage 203255: Cage 1 - SFSV		http://192.168.0.216:8081/
	Run mouse detector network	PREVIOUS TRAJECTORIES
Food Lid Events History		
Select the date:	2022-04-29	
☐ Food lid opened at ☐ Food lid opened at ☐ Food lid opened at ☐ Food lid opened at or before	2022 S M T W T F S 2002 2002 2002 2002 2002 2002 2002 20	
5 avants on this day	-	
Э ечень мн инэ мау	Close	
WERK SCHEDULE Fasting Eating	Food IId closed at 2022-04-29 12/27/31 FM Food IId closed at 2022-04-2	

Figure 24. Food lid events history - choosing the date



5.3. CageView Activity Monitoring Feature

This subsection provides useful information on how to use the activity control feature of the system. The following sub-steps explain various aspects of the software.

5.3.1. As shown in **Figure 25**, switching the "**Run mouse detector network**" would trigger the mouse detector feature to be executed for each video frame. Having a dedicated GPU installed will significantly improve the performance of this feature execution, as it will be running in real-time for each frame.

5.3.2. After switching the "**Run mouse detector network**," it is required to adjust the cage's corners to fit with the dimension indicators for the mouse detector reading to accurately pinpoint the mouse's activities, as shown on the heat map.

5.3.3. When the mouse is detected in a frame, its position will be added to the activity heat map. The user can see the current movement trajectory updated in real-time at the top right side of the cage's view.

5.3.4. Switching the "**Run mouse detector network**" off again will cause the current trajectory to be finalized and stored if any detected point exists.

5.3.5. Clicking the "**Previous Trajectories**" button will show the history of previously gathered mouse movement trajectories. The dialog presenting the trajectory logs history is shown in **Figure 26**. The previously stored trajectories can be chosen from the list at the top. Each trajectory log is presented by its date, duration, and count of points. If required, the metrics can be exported into *.csv* formats.





Figure 25. CageView - Run mouse detector network



Figure 26. Trajectory logs history



Note: Since the BLE CageView can function independently without the App, some food lid events might be a rough estimate, as the App cannot gather all the logs when not connected to the cage. Every time the cage's current state differs from the last stored food lid event, an estimated food lid event will be generated, stating that the food lid event was opened\closed at or before a certain time.

5.3.6. Since the BLE CageView can function stand-alone without the App, it requires a correct time and the diet schedule to be set on the board. The dialog shown in **Figure 27** will only pop up when the system time the App is running differs from the time set on the BLE CageView.

Note: It is usually a good idea to check if the system time is correct when this dialog is shown.



Figure 27. CageView - Out of sync times

Note: If the system time is correct, accept the dialog, so the system time is written to the BLE CageView.



5.3.7. The dialogue shown in **Figure 28** will only pop up when there is a conflict between the diet schedule set in the App and the one set on the BLE CageView's board. Two options are provided to keep the App's diet schedule version ("**Keep App**" button) or to keep the one set on the board ("**Keep Cage**" button).

Out of S	Svn	c D	Die	et S	Sch	ne	du	les	f	or	Ca	a	e 2	20	32	5	6:	Ca	ae	2 - SF		
The diet sche	duk	e set	on	the	can	e is	dif	erer	nt të	han	wha	at w	e h	ave	e in	the	ar	n an	5			
Diseas shares							L															
Please choos	e m	e on	e yo	bu p	rele	a te) Kei	:p:														
						Ap	p S	:he	dul	e												Cage Schedule
									_			_										
	M.	12:30	1	:30	2 :30	3	-30 4	:30	5 :	30 6	:30	7 :	30 8	30	9	:30	10	30 11	-30		ΔM·	12 30 1 30 2 30 3 30 4 30 5 30 6 30 7 30 8 30 9 30 10 30 11 30
Sunday	PM:												t	t						Sunday	PM:	
Monday	AM:				-		_		4	Ŧ		-	Ŧ	F			4			Monday	AM:	:
	AM:	\vdash		+	+	Н	+		+	+	H	+	+	╈	H	-	+	+		-	AM:	
Tuesday	PM:												t	t						Tuesday	PM:	
Wednesday	AM:	\square		\square	+	\square	-		+	+	\square	+	+	┝	\square	-	+	+		Wednesday	AM:	E E E E F F F F F F F F F F F F F F F F
	AM:		H		+	Η	+		+	+	H	+	+	t	H		+	+		-	AM:	
Thursday	PM:																			Thursday	PM:	
Friday	AM:			\vdash	+	H	+	-	+	+	\square	+	+	┝	\square	-	+	+		Friday	AM:	F F F F F F F F F F F F F F F F F F F
C	AM:				+	Η			+	+	H	+	$^{+}$	t	H		+	+		C	AM:	
Saturday	PM:																			Saturday	PM:	
								astin	9	1	E	ating	1	1								Fasting Eating
												_		1								

Figure 28. CageView – Out-of-sync diet schedules

5.3.8. The App's main window is shown in **Figure 29**. Click the "**Edit Cages**" button presented by a pencil icon to turn on the editing mode.





Figure 29. Editing CageViews

5.3.9. As shown in **Figure 30**, the CageView items in the list will become selectable in the editing mode and clicking on each CageView will select that item instead of opening it. The selected CageViews are indicated and presented differently.

- The user can delete the CageViews that are no longer needed by clicking on the "**Delete**" button presented by a trash bin icon. Deleting the CageView will also delete all the gathered history.
- The user can discard editing by clicking the "Cancel" button presented by an "X."





Figure 30. Editing mode - CageView selected

6. Connecting CageView Devices to an Existing CageView

This section provides step-by-step instructions on how to connect the CageView devices, such as the SmartVision and the SmartFeeder, to an existing CageView.

6.1. Connecting SmartVision Device to an Existing CageView

6.1.1. To connect SmartVision to an existing cage, click the scan button and select your desired SmartVision device. Click the "**Accept**" button afterward (**Figure 31**).

• The user does not need to input the SSID/password/Username for this process if the SmartVision is previously configured. If not, a window will pop up and ask for entering credentials to configure the WiFi connection on the SmartVision device. Ensure the SmartVision is turned on before scanning.



6.2. Connecting SmartFeeder Device to an Existing CageView

6.2.1 When connecting the SmartFeeder to an existing cage, click the scan button and select your desired SmartFeeder device. Click the "**Accept**" button afterward (**Figure 32**).

🗻 CageView Cage 2 X	BLE Ready 🟮 👘 🗖 🗆 🗙
🕝 Cage 203261: Cage 2 - SF	1
SmartVision is not setup for this cage	Con mouse detector network Activity Heat Map Discovered SmartVision now? Discovered SmartVision Devices (1): CV-202202-SV-002 Accept 0 0 0 0 0 0 0 0 0
12 30 1 30 2 30 3 30 4 30 5 30 6 30 7 30 8 30 9 30 10 10 11 30 Wednesday AM: PM: F	 Food lid is open Food lid will close in 11 hours, 34 minutes Food lid opened at or before 2022-05-05 12:25:26 PM
AM: F<	ALL EVENTS

Figure 31. Connecting SmartVision device to an existing CageView

📤 CageVie	w	Cage 2 ×						BLE Ready	0 -	
G Cage 3:	Cage	2						http	://192.168	.0.199:8081/
	1				-	Run mouse	e detector network		PREVIOUS	TRAJECTORIES
							Mouse detector is off			
			as and the		-	Turn i	it on to generate movement trajectory			
			20 11							
				12						
							Do you want to set up the SmartFee	der now?		
							bo you want to set up the smartreet	ier now:)	
						O The lid will n	Discovered SmartFeeder Devices (1): C		
			•••				CageView-203251			
									J	
		SmartF	eeder is not setup	for this cage			Accept			

Figure 32. Connecting the SmartFeeder device to an existing CageView



7. Customizing and Exporting Trajectory Data Into .csv Format

This section provides step-by-step instructions on how to report trajectory data from the SmartVision feature and export it in *.csv* format.

7.1. Selecting Trajectory Log

7.1.1. Click the "**Previous Trajectories**" Button to open the Previous Trajectories Log dialog.

7.1.2. Select the desired trajectory log to view, as shown in **Figure 33**, and the user should see the recorded visual of the activity heat map and movement histogram.

CageView BLE X		BLE Ready 0 🚽 🗗 👋
G Cage 1: BLE		http://192.168.0.248.8081/
	Plan moise detector network Catalogy Heart Mapp Monro detector is off	PREVIOUS TRAJECTORIES
Previous Trajectory I	Logs	
Select the trajectory log to view	: 8/5/2022 2:48 PM - 33 minutes, 9 seconds - 1920 points *	
Select directory to export:	7/19/2022 426 PM - 11 minutes - 539 points 7/21/2022 912 AM - 11 minutes 5 seconds - 555 points	
Target time range:	8/5/2022 12:51 PM - 8 minutes, 53 seconds - 460 points 8/5/2022 13:8 PM - 6 minutes, 4 seconds - 352 points	
Histogram bin interval:	8/5/2022 2:48 PM - 33 minutes, 9 seconds - 1920 points 8/5/2022 3:22 PM - 30 minutes, 22 seconds - 1759 points	
Heat map cell width:	8/11/2022 11:24 AM - 11 minutes, 54 seconds - 690 points 8/11/2022 4:19 PM - 8 minutes, 21 seconds - 485 points	
Heat map cell height:	0.5 cm	
Activity	Heat Map Movement Histogram	
Balance of the second sec	20 20 20 20 20 20 20 20 20 20 20 20 20 2	
	Close	
Friday AM F <t< th=""><th>Food lid opened at 0 telfore 2022-08-19 94603 AM Food lid opened at 0 telfore 2022-08-19 94603 AM Food lid opened at 02:00-05 22:029 PM Food lid opened at 02:02-0512 22:93 PM</th><th></th></t<>	Food lid opened at 0 telfore 2022-08-19 94603 AM Food lid opened at 0 telfore 2022-08-19 94603 AM Food lid opened at 02:00-05 22:029 PM Food lid opened at 02:02-0512 22:93 PM	

Figure 33. Selecting trajectory log to view



7.2. Customizing Target Time Range

7.2.1. To customize the target time range, drag the slider to set the preferred time range, as shown in **Figure 34**.

🗻 GageView BLE X				BLE Ready 🛈 — 🗇
G Cage 1: BLE				http://192.168.0.248:8081/
		Run mouse detector network		PHENIOUS TRAJECTORIUS
			Activity Heat Map	
Previous Trajectory (ogs			
Select the trajectory log to view:	7/21/2022 9:34 AM - 2 hours, 59 min	utes - 9168 points	•	
Select directory to export:	Location	20, 150	P 832087	
Target time range:	the second second		Contract Shires	
Histogram bin interval:	1 minute		1 hour	
Heat map cell width:	0.5 cm	0 10 10 10 10 10 10	100 cm	
Heat map cell height:	0.5 cm		100 cm	
Activity H	rleat Map	Movement Histogram		
E S MARKET CASH WE CAS	20 20 20 30 30	0 [5] 980 10 10 10 10 10 10 10 10 10 10 10 10 10 1		
			Close	
Friday AM F </td <td></td> <td>Teod lid opened at or before 2022-08 Food lid observed at or before 2022-08 Food lid observed at 2022-05-12 2293 Food lid closed at 2022-05-12 2074 Food li</td> <td>-19 9:46:03 AM 55 2:30:29 PM 9 PM RM ALLOUDITS</td> <td></td>		Teod lid opened at or before 2022-08 Food lid observed at or before 2022-08 Food lid observed at 2022-05-12 2293 Food lid closed at 2022-05-12 2074 Food li	-19 9:46:03 AM 55 2:30:29 PM 9 PM RM ALLOUDITS	

Figure 34. Customizing time range

7.3. Customizing Histogram Bin Interval

7.3.1. To customize the histogram bin interval range, drag the slider to set the preferred time bin, and the user should see a difference in data distribution on the movement histogram (**Figure 35**).

Note: The user can customize the histogram interval with various excrements of time, e.g., 10 minutes, 20 minutes, 30 minutes, 1 hour etc. The differences in chosen time excrements can be seen on the movement histogram.



CageView BLE X					BLE Ready 0 - 0
		• • •	in mouse detector network	Activity Heat Map	PRIMOUS TRANCTORES
	Previous Trajectory Loc Select the trajectory log to view. Select directory to export: Target time range: Histogram bin interval: Heat map cell width: Heat map cell height:	Sgs 7/21/2022 8:34 AM - 2 hours, 59 minutes - 9168 points Location 58art 1 minute 20 minutes 0.5 cm 0.5 cm	م 	- 3 hour - 1 hour 1 hour 10 cm	
	Activity H	feat Map	Movement Histogram		
Friday PAC Saturday AAC			Food lid opened at or before 2022-08-19 944 Food lid opened at or before 2022-08-05 230 Food lid opened at 2022-05-12 229-39 PM Food lid opened at 2022-05-12 2203-09 PM	Close 6-03 AM 229 PM	

Figure 35. Customizing histogram bin interval

7.4. Customizing Heat Map Size

7.4.1. Drag the sliders for the cell width and height to customize the heat map cell size to set the desired size range. The user should see a difference in cell size on the heat map. This feature allows the user to limit the range and focus on a specific cage for closer observation (**Figure 36**).

Note: The user can also customize the heat map size on the BLE CageView window (**Figure 37**).





🔔 CageVisw BLe X		BLE Ready 0 - G
G Cage 1: BLe		http://192.168.0.248:8081/
	Run mouse delector network	PREVIOUS TRAMETORIES
	Activity Heat Map	, n
Previous Trajectory Lo	gs	
Select the trajectory log to view:	7/21/2022 9:34 AM - 2 hours, 59 minutes - 9168 points *	
Select directory to export:	Location D Exercise	
Target time range:	Start - 3 hours	
Histogram bin interval:	15 minutes	
Heat map cell width:	0.5 cm	
Heat map cell neight:	0.3 cm	
Activity H	at Map Movement Histogram	
12 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	20 20 20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
	Close	
Thursday AM P	Constant open insettingey Constant open insettingey Constant open insettingey Constant open of at 2022-05-12 223-20 PM Food lid opened at children 2022-05-12 223-20 PM Food lid obsed at 222-05-12 223-20 PM Food lid obsed at 222-05-12 223-20 PM	

Figure 36. Customizing heat map size



Figure 37. Customizing heat map size on the BLE CageView window





7.5. Exporting Trajectory Data

7.5.1. Once trajectory data has been customized, exporting the.*csv* and plot images can begin.

7.5.2. Click on the magnifier glass icon and select the folder to export the trajectory log-in, as shown in **Figure 38**.

7.5.3. After selecting the folder, click the "**export**" button (**Figure 39**). The exported data can be accessed in the previously chosen folder.

7.5.4. After customizing the trajectory points to export, where the target time range is trimmed, a dialog will pop up to give the user an option to export only the trimmed points or export all the existing points in the trajectory log (**Figure 40**).



Figure 38. Selecting the folder for exporting



🚣 CageView BLE X			BLE Ready 🚯 🚽 🖒 🚿
🚱 Cage 1: BLE			http://192.168.0.248.8081/
		Run mouse detector network	PRIVIOUS TRAJECTORIES
		Activity Heat Map	
			+ 10
Previous Trajectory Logs			
Select the trajectory log to v	iew: 7/21/2022 9:34 AM - 2 hours, 59 minute	s - 9168 points *	
Select directory to export:	C/Users\Amir\Documents\Exports	C INFORM	
Target time range:	Start	- 3 hours	
Histogram bin interval:	1 minute	1 hour	
Heat map cell width:	0.5 cm	100 cm	
Heat map cell height:	0.5 cm	100 cm	
Acti	vity Heat Map	Movement Histogram	
		Close	
Friday Anno Friday Anno Saturday Anno Mitter Soldback Factoring		Ti Food lid opened at or before 2022-08-19.9.46:03 AM Food lid opened at or before 2022-08-05 2:3029 PM Food lid opened at 2022-05-12 2:29:39 PM Food lid opened at 2022-05-12 2:29:00 PM ALLINONS	

Figure 39. Folder chosen for the trajectory log ready to export



Figure 40. Export Trimming Confirmation Dialog



8. Assembling Smart Feeder

In this section, assembling the Smart Feeder system will be explained by a 5-step procedure. A video is provided with the package that shows how to assemble the Smart Feeder to the cage.

8.1. First mount part 2 on part 1, as shown in **Figure 41**.

NOTE: The first and second rails of part 2 (right side) must be inserted in the guide rails of part 1 (right side). Make sure the longitudinal rail of part 2 should come behind the extrusion on the left side of part 1.

8.2. Place part 3 and screw it with the help of bolts and the L key.

8.3. Place part 4 and screw it with the help of bolts and the L key.

8.4. Place part 5 and screw it with the help of bolts and the L key.

8.5. Place the battery pack and connect it to the port provided in part 3.

NOTE: Battery wire should pass through the U shape extrusion, as shown in **Figure 42**, and the battery bar will require 8 AA batteries.

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Figure 41. Different parts of the food control module



Figure 42. Battery wire and its path





Figure 43. Final assembly of the SmartFeeder



If you need any technical support, please contact our technical support:

302-135 Innovation Drive, R3T 6A8

Winnipeg, MB, Canada

(888) 822-7621

✓ info@cageview.com