2017

Computer Assisted Scoring & Analysis (CASA)



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DNA Fiber Analysis 4/17/2017

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Step 1: Installation

A. Double-Click Installation Package





Figure 1: Image of the installer program

Figure 2 Preparation for installation splash screen

B. During the Installation Process

CASA_2017 Installer	↔	-	×
	Connection Settings		1
CASA_2017 2017.0405 COMPUTER AIDED SCORING AND ANALYSIS OF DNA FIBERS (CASA-Fibers)			1
The scoring of DNA fibers for different parameters associated with DNA replica origins, elongations, terminations), DNA damage/DNA modifications (events of nts, number of events in a cluster, distance between events), and replication asso (location of RAP in a replication track, number of RAPs per replication track, dist very time consuming and is subjected to user bias. To decrease the time needed bias, we developed a program called CASA (Computer Aided Scoring and Analy scores and measures these parameters and places the raw data in an Excel File. 1 minute to analyze an image that contains hundreds of fibers/replication tracks to analyze data from an experimental set (assuming 20 images analyzed)	f interest per 1,000,000 ociation proteins tance between RAP) is d and to minimum user ysis) which rapidly It takes approximately		
Paul Chastain pchastaiii@gmail.com			
< Back Next >	Cancel	1	

Figure 3: Installation Begins



Figure 4: Windows 10 warning for installation of our program. Just click on yes.

Installation Op	otions					×
Choose installatio	n folder:					
C:\Program Files\	DNA Fiber Analysi	s\CASA_2017		Browse		
			Restore	Default Folder		
Add a shortcut	t to the desktop				1	
< Back	Next >			Cancel		

Figure 5: Installation Options - <u>Note clicking on the box next to Add a shortcut to the desktop will add shortcut</u> <u>to the desktop.</u> We suggest you click to add shortcut. You can designate the location of the program (this is where the program lives as well as the excel file, license, and how to install and run the program

Required Software	. ↔	81-20		×
MATLAB Runtime is required.				
Choose installation folder:		MA	TLA	AB°
C:\Program Files\MATLAB\MATLAB Runtime	Browse		RUNTIME	
	Restore Default Folder			
			/	
		\sim		<
MATLAB and Simulink are registered trademarks of The MathWorks, Inc. mathworks.com/trademarks for a list of additional trademarks. Other pro				
be trademarks or registered trademarks of their respective holders.	,			
WARNING: This program is protected by copyright law and international				
1984-2016, The MathWorks, Inc. Protected by U.S. and other patents. See	MathWorks.com/patents			
< Back Next >	Cancel		MathW	/orks*

Figure 6: MATLAB (the core image analysis engine) needs to install its runtime/compiler. It is about 216 MB. If you have trouble installing this (or if you do not have access to the internet), I can send you an installation package that has the MATLAB Runtime embedded.

License Agreement	↔			×
The MathWorks, Inc.				^
MATLAB RUNTIME LICENSE				
IMPORTANT NOTICE BY CLICKING THE "YES" BUTTON BELOW, YOU ACCEPT THE TERMS OF THIS LICENS SO, SELECT THE "NO" BUTTON AND THE INSTALLATION WILL BE ABORTED.	se. If you are no	OT WILLING	TO DO	
1. LICENSE GRANT. Subject to the restrictions below, The MathWorks, Inc. ("MathWorks you are an individual or an entity, a license to install and use the MATLAB Runtime the purpose of running software created with the MATLAB Compiler (the "Application purpose. This license is personal, nonexclusive, and nontransferable.	("Runtime"), solel	y and expr	essly for	
2. LICENSE RESTRICTIONS. You shall not modify or adapt the Runtime for any reason decompile, or reverse engineer the Runtime. You shall not alter or remove any propr copies of the Runtime. Unless used to run Application Software, you shall not rent, I the Runtime, provide service bureau use, or use the Runtime for supporting any other not sublicense, sell, or otherwise transfer the Runtime to any third party. You shall not	prietary or other le lease, or loan the er party's use of th	egal notice Runtime, ti ne Runtime	s on or in me share e. You shal	
Do you accept the terms of the license agreement? • Yes No				
< Back Next >	Cancel	-	MathWo	orks

Figure 7: License Agreement. You need to agree to this license agreement otherwise you cannot install the software. Also, CASA program has its own license agreement. By clicking on yes, you agree to both.

■ Installation Complete ↔	_		×
Installation completed successfully.			
Product Configuration Notes:			
This installs CASA onto your PC computer with all the components you need. Good luck and may you have beautiful data!		/	
Finish			

Figure 8: Installation is complete.

C. After Installation

1. A shortcut should be located on your desktop (if you pressed the checkbox during the installation – See Figure 5)



Figure 9: Image of the CASA icon on the desktop.

2. Excel Files, License, and Program are now located on your computer.

📜 appdata	4/5/2017 2:39 PM	File folder
application	4/5/2017 2:39 PM	File folder
📜 sys	4/5/2017 2:39 PM	File folder
📜 uninstall	4/5/2017 2:40 PM	File folder

Figure 10: Files and folders that were placed onto your computer

📜 EULA	4/5/2017 2:39 PM	File folder		
Excel Files	4/5/2017 2:39 PM	File folder		
📕 To Make Exe	4/5/2017 2:39 PM	File folder		
CASA_2017	4/5/2017 1:39 PM	Application	5,885 KB	
icon	4/5/2017 12:54 PM	Icon	7 KB	
readme	4/5/2017 1:39 PM	Text Document	2 KB	
🗪 splash	6/6/2015 4:15 AM	PNG image	46 KB	

Figure 11: Folders and Programs in Application Folder.

Location of the Programs/Folders

CASA Program

Program Files-> DNA Fiber Analysis -> CASA_2017->Application

Excel File Template

- > Where all the data from the images will be placed
- > DNA Fiber Analysis -> CASA_2017->Application ->Excel Files

Matlab compiler/runtime

Program Files-> MATLAB -> MATLAB Runtime

Uninstaller

Program Files-> DNA Fiber Analysis -> CASA_2017

Step 2: To Run Program

A. Press Icon



Figure 12: Icon for CASA Program.

It takes a few minutes for the program to start (it has to acquire enough memory to run)

CASA_info_05-Apr-2017	4/5/2017 1:56 PM	File	3 KB
		18/1929	000000000

Figure 13: Log file is created to record program activities.

- As it opens, the program will place a log file in the location where the CASA program is located. This log file records all the activities performed by the program. The name given to the log file is CASA_info_Date, where Date refers to the date the program is run.
 - If you run the program multiple times during the day, it will overwrite the log file (since they all have the same date). Therefore, it is recommended that you rename this log file prior running the program again (i.e., for the example above, I would change CASA_Info_05-Apr-2017 to CASA_Info_05-Apr-2017_Run1. I would rename run 2 to be CASA_Info_05-Apr-2017_Run).

B. Select Excel File

CASA_2017	÷ _	
Where is Excel Template [Defa File]	ault: C:\Program Files\DNA Fiber Analysis`	\CASA\Excel 🔨
File Selector		×
← → v ↑ 📜 « app	lication \rightarrow Excel Files \checkmark \heartsuit	Search Excel Files
Organize 👻 New folder		· · · · · · · · · · · · · · · · · · ·
 Dropbox OneDrive This PC Desktop Documents Downloads Music Pictures Videos Local Disk (C:) My Book (D:) 	Name	Date modified Type ted 4/2/2017 6:39 PM Microsoft
V My BOOK (D.)	<	>
File nam	e:~	(*.xl*) ∨ Open ▼ Cancel

Figure 14: Picking Excel File

- A dialog box should open up and ask you to select an excel file. During the installation process, the Excel file was placed into your Program File Folder. (It is also located in your dropbox folder.)
 - > DNA Fiber Analysis -> CASA_2017->Application ->Excel Files

4 5 17 Replication Dynamics Abbrviated Fork Speeds.xls	4/5/2017 4:55 PM	Microsoft Excel 97	34,415 KB
--	------------------	--------------------	-----------

> Click on Excel File and then select the file.

Next, you will need to enter a set of parameters (i.e., values) that the program will use to detect, select, and analyze your fibers.

C. Parameters



Figure 15: Parameters for CASA

Signal to Noise Ratio (how much above background does the fiber have to be).

- I typically use between 1 and 3.
- The algorithm takes the line tracing as the center of the line and takes each value along that tracing as a "middle point" of the signal. For each middle point of the signal, it determines a line that is perpendicular to that middle point (using the line tracing as a frame of reference) and uses the middle point of the signal plus the first two adjacent points along the perpendicular line (both above and below) as total Signal. For "Noise," the program sums the next three points along the perpendicular line (above and below). For the S/N, CASA divides the Signal by the Noise (giving more weight to the signal than the noise).

Discontinuity (how much signal loss along a fiber is acceptable)

- ➤ I typically use 30.
- Discontinuity is the percentage of the fiber without any signal (either there is no signal, or the signal is below the minimum average signal allowed).
- > So "30" means that 30% of the fiber does not contain any "signal."

Number of empty continuous blank signal

- ➤ I typically use either 4 or 5.
- This parameter enables you to define how much of a gap in the signal you are okay within your fibers.
- Let us say a fiber has 30% discontinuity. That loss of signal can be throughout the fiber or a long, continuous stretch within the fiber. If the fiber has a long, continuous stretch without a signal, it may mean that CASA thought that two closely spaced fibers were one fiber.

Vessel (i.e., fiber) Thickness

- > I usually use 8 for DNA fibers and 10 for chromatin fibers.
- > Vessel Thickness is how thick (wide) a fiber is.
- Typically, DNA fibers are about 6 8 in thickness, chromatin is 8 10 in thickness, and bundles are 11 or so.

Minimum Ave Signal (Intensity) of Fiber

- I usually use 10, 25, or 50.
- This parameter reflects how much average signal the fiber has across its entire length.

CASA Fiber Confidence Level (Note: Experimental Parameter)

- > For right now, we pick -2.
- This experimental parameter tries to figure out how confident the CASA program is with a fiber. This parameter is based on the percent continuity, number of empty continuous blank signals, and average signal of the fiber. We have not come up with a value that means this is a "lovely" fiber versus this is a "terrible" fiber. Hence, why we select -2 for the value that is acceptable as of right now, all fibers are lovely to us.
- Currently, we use this parameter to see how one set of fibers compare to another. For instance, if one set of fibers has a confidence value of 0.6 and another set has a confidence level of 0.2, then you may feel more confident about the first fiber analysis than the second analysis.

What the colors represent

- Since the program does not know what it is analyzing, CASA will ask you for that information.
- Currently, this version of the program only utilizes two colors for its analysis of replication tracks
- Since our IdU is usually red and the first pulse and CldU is usually green and the second pulse. We do not label the DNA.
 - We input, 4 for DNA, Pulse 1 (1) red, Pulse 2 (2) green.
- As an aside, we have another version that can do three colors for analysis. We have used this program to do the following: Quantify DNA damage within fluorescently labeled replication tracks, quantifying inter-origin distances between replication tracks along a stained DNA fiber, characterizing replication patterns within Fiber Fish, characterizing the relationship between DNA damage associated proteins and stalled/stopped replication forks along chromatin fibers.
 - Currently, it is not commercially available as we are still optimizing this program. With that being said, if you want to help us optimize or beta test the program, please let us know.

Multi RG Tracks (more than 3 color segments) – Note: This pop-ups in a separate window

- > Yes/No
- We usually allow the computer to analyze fibers that have red-only, green-only, red-green, red-green-red, and green-red-green replication track patterns. Depending on what we are interested in measuring, we may also analyze more complex replication patters (replication tracks with multiple red and green segments).

Multi RG Tracks		2005	^
Show Multi Rec	and Green Tracks		

Figure 16: Multi RG Popup Window.

Min size for one color track

- I usually have 10 as my limit
- If you have a high background (or background dots), you may want to have 20 as your value. Typically, this will stop CASA from trying to connect the background dots into lines.

Min size for two color track

- I usually have 20 as my limit
- In the excel sheet, you can further define the min size of each segment within the two color lines.

Min size for three color track

- I usually have 30 as my limit
- In the excel sheet, you can further define the min size of each segment within the three color lines.

D. The program will ask you where the folder container the images is located.

- Images have to be in tif format (if your image is in a different format, please let me know and I will either 1) change CASA's computer code so will analyze those images as well, or 2) write an ImageJ/FIJI macro to convert your images to Tif – free of charge).
- Image files have to be in a subfolder (a folder within a folder). The main folder can have as many subfolders that you want to be analyzed (it analyzes all of the subfolders (but not any folders within the subfolders)).



Figure 7: Folder Structure Needed for Program to Work

Step 3: What Happens When CASA Runs.

As the program runs, it opens up each image and assesses/analyzes the images for DNA fibers. Once a fiber has been found, CASA will sequentially "walk along" the fiber length. With each step, the program determines the color of that step and then moves along to the next step. Once it has walked along the entire length of the fiber, it then assigns a color to the line. If the line only has one color, then the color of the line is that color. If the line has multiple colors, it will divide the line into different segments with each segment one color.

After it processes the image, it will save a markup image of the image it analyzed in a folder called CASA Images. Each fiber in the markup image is enumerated (numbered) and has a box around it. The top and bottom lines show you how CASA color coded each segment of the line (i.e., did it assign that area to be red or green). The edges represent the beginning and end of the fiber. It also places the name of the image on the image as well as the parameters it used for its fiber analysis. The raw data that is generated by CASA is moved into an Excel File that allows all the data to be aggregated into one file (the file can be found in CASA results).

Below is a quick overview of additional steps that CASA performs.



A. CASA converts image intensities into a 3D "relief map."

Figure 17: a Relief map of signal intensities within an image.

B. CASA marks up the image with its assessment of the red and green tracks along with a unique identifier for each fiber tracing.



Figure 18: Section of Image that was analyzed by CASA. Fibers are enumerated, traced, and color segments identified.

C. CASA places raw data into an Excel file

The raw data for up to 20 images are located in one excel file. The location of each image data is in a different Excel tab. The raw data from Image 1 (the first image it analyzes) is placed in an Image1 tab, Image 2 in Image 2 tab, etc. (maximum of 20 images per Excel File). The first tab of the Excel file contains a summary of the raw data in Image1, Image2, Image3, etc.

*	Cut Calibri	- 11	- A' A'		* 3	Wrap Test	Ge	neral				1	Norn	nal	Ba	d C	12	3	名		E Aut	toSum -	27	
		U - E-	·	# # 4	保保 出	Merge & Cent	er.= 5	- 16	34 . 23	Con	ditional atting -	Format a	S Good	d	Ne	utral	1	Insert	Delete	Format	200		Sort &	
ipbe	and R.	Foet			Alignment		- 14	Number	1.19					Styles					Cells			Edit		
D2	0 + (-	Le .	_																					
A	B	C.	-	0		E	E	Ģ	н	1.18	SAME	ECTIAN	with -	M	N	0 P	0	B	5	T	W.	У.	¥.	-
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						Fied Or	dy	Gieen	Ordy	3	Red-Gin		-			E-B-	-la-				_			_
						Average		Average	-	AN	erage .					Average								
							Number		Number		-	Number			Give I G	teal 1	-	-		Number	All Field T		Filmer, I	-
	-	Sheet Name Image 1		Acquired Fre	m Image Side to x 0000.tut	Red		Greent 50.3	1	Fled	Cite-ere		Tracks	D-mer 1	G1+62 65	-62	111	th level	Advert		Tracks	Green's C	R5+R2	L
	2	Image 2 Image 3	Merge G De	s. Set 1Cond 21	Side 1x x 0001.txt Side 1x x 0002.txt			70.4	2	10.3	310	3												
		Image 4 Image 5	Merge G De	a_Set 1Cond 21	Ride to x 0002.ht Ride to x 0003.ht Ride to x 0004.ht	1		59.0 55.6	13122	8.3	63.0 39.0	4												
	6	Image 6	Merge G Der	s_Set 1Cond 25	lide lex 0005 hd			43.8	24	115	50.3	5												
	6	Image 7 Image 8	Merge_G_Der	s_Set 1Cond 21 s_Set 1Cond 21	Bide to x 0006.tut Bide to x 0007.tut			30.7 26.2		1	52.4													
	.9	Image 9	Merge_G_Der	e_Set 1Cond 21	Side to x 0008.64			24.8	25	6.0	13.6	- 2	-											
						3																		
										-	-								-		_		_	Г
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						Ave: age	1	Average	-	A-	10.000	-	-	-		Average	-			-				Ξ
						Fled	Number	Element.	Number	Red	Giners	Number	All Fled Tracks	aller 1	G1+G2 G3	G2	1.0110	Electron of	Constant Infranti	Number	All Flech Tracks	gran .	R1ml R5+R2	
	Average of Image Averag					1	-	45.7	207.0	90	415	210	the second se	100000	and a second	100		1	-	+		- Constant	1000	1
	Fiel %																-							
	Average of All Fibers Rel 30							46.6	207.0	92	44.8	23.0												

Figure 19: Excel data containing raw data and summary of images analyzed.

ID	-	green (small)	red9 👻	green (large)
39		6	21	15
18		9	18	41
57		9	5	19
56		9	5	13
103		6	4	16
10		22	15	43
19		29	18	31
7		43	24	48
4		43	26	50
80		60	5	66

The Data is searchable so one can focus on red and green patterns of interest

Figure 20: Raw data within each image tab can be restricted based on various parameters.

Click on the triangle after each column label, and a pull-down tab will have all the ways in which that column can be searched. To search for a specific parameter just click on the corresponding box and it will be colored in (if you click on it again the box will be deselected. You can search multiple column parameters at one time).

The parameters can be further refined within the Excel file.

For instance, one can make sure that small tracks are not measured.

Parameter Settings		
max length	1000	max Length of Total Fiber
min size	5	Fiber Length is Below this do not count
R or G	5	if length is less than this, don't count it
R:G		if any segment is smaller than this length, do count fiber
3 color	5	if any segment is smaller than this length, do count fiber
Discontinuity of Signal Tolerated:	50%	Less than ths % of non-continuous signal, sco and analyze
Level above background Needed:	0	Greater than this ratio, score and analyze
Vessel Thick Max:	10	Less than this value, it is counted
Sig Intensity:		If Segment Average Signal Intensity is Lower, not count fiber
Level of Confidence	-2	
All Fibers Scored (including multi):		688.0
All Fibers Scored (excluding multi):		631.0

Figure 21: Parameters that can be refined in Excel File.

Pulse Lengths for each nucleotide precursor can be entered.

The replication rates (and number of replication forks per MB) are based on the pulse durations of the nucleotide analogs. To adjust the rates according to your pulse lengths, please enter those values as well.

Red Pulse = (min)	10	min	
Green Pulse = (min)	20	min	

Figure 22: Pulse Times for Red and Green Incubations.

Objective Lenses Used.

The replication rates values are based on Fiber FISH probes hybridized to DNA fibers that were analyzed using a 63X objective. To "correct" for when people use different objectives, we ask you to input your objective where it says Magnification (where the 40 is located below). Please do not enter it in the Magnification for conversion (as this the magnification we used in our original measurements).

40	x	
60	х	

Figure 23: Objective Magnification of Images.

Number of Replication Forks per Replication Pattern

To determine the number of replication forks per Mb we decided upon the following:

- A. A Red-only track only needed one 1 replication fork to make this track.
- B. A Green-only track needed to have 1.5 replication forks to make this track.
 - a. Our reasoning is that this track could be due to either a replication fork that was stalled before the first pulse but then continued after the second; or if it was an origin that initiated during the second pulse.
- C. A Red-Green only needed 1 replication fork to make this track.
- D. A Red-Green-Red track needed two replication forks to make this pattern.
- E. A Green-Red-Green track needed two replication forks to make this pattern.

Note: These values are based on pulsing with red then with green. If you pulsed with green then red, then the values for red-only and green-only need to be manually switched in the excel file.

Replicatio	on Synthesis Assumptions		
Red Only Track	1	active forks	These values are when Red is pulsed first
Green Track	1.5	active forks	and green is pulsed second
Red-Green Track	1	active forks	If the opposite is true then r-only should be changed to 1.
Green-Red-Green	2	active forks	Green-only to 1
Red-Green-Red Tracks	2	active forks	
Red-Green Clusters	1.5	active forks	
Replication	Rates		
bases replicated	(pixesls * /2.2)*3862))		
	ave bases replicated		
	(really ave pixes		
Replication Rates per fork	replicated)/ pulse time		

Figure 24: Number of Replication Forks per replication pattern.

Errors:

Q1: Why do I get an error saying "Undefined function or variable 'matlabrc"?

A1: Sometimes Matlab gets confused, and the compiler gets corrupt (people at Matlab do not know why).

How Do I fix this? Delete the following folder: mcrCache7.13

How do I do this? My computer's name is 603A1, so I go to the location of the location which contains the folder (for me it is the following: \Users\603A1\AppData\Local\Temp\603A1\mcrCache7.13) and delete it.

For you, the location of the file should be the same, except 603A1 is replaced by your computer's name.

So if your computer is named TAMU, then it would be located in the following location: C:\Users\TAMU\AppData\Local\Temp\TAMU\mcrCache7.13

Control Panel (1)
Show hidden files and folders
Documents (49)
FINDER.DAT
🐒 vsd_certona
3 autocomplete
i autocomplete_styles
💿 sIFR-print
Music (3)
sentinel
12 Water Shows The Hidden Heart
.iTunes Preferences
Files (183)
INLS582GROUP FINAL PROJECT-1edit7.05pm
SINLS582GROUP FINAL PROJECT-1
FINDER.DAT
FINDER.DAT
₽ See more results
hidden files × Shut down +
🚱 🗣 🖸 🥹 🚞 🗹 📀

Okay, but I cannot see AppData.

You need to search for hidden files with Window's search. Or, go to Control Panel\Appearance and Personalization and find an option called Show hidden files and folders.

	iew Sear	rch		
Folder	You are u	can apply the view (s using for this folder to a Apply to Fo <u>l</u> ders	uch as Details or Icons all folders of this type. <u>R</u> eset Folde	
Advance	d settings:			
	lways show Display file io Display file s	v icons, never thumbn; v menus con on thumbnails size information in fold ull path in the title bar (lertips	=
	Don't sho Show hide lide empty o lide extensional lide protected	w hidden files, folders den files, folders, and drives in the Compute ons for known file type ed operating system f er windows in a separa	l drives er folder es files (Recommended)	~
	Don't sho Show hide lide empty o lide extensional lide protected	den files, folders, and drives in the Compute ons for known file type ed operating system f	l drives er folder es files (Recommended)	

After that, press the radial button which says "Show hidden files, folders, and drives).

Then you should be apple to find *AppData*

Q2: Why do I receive an error regarding missing mcImcrrt7x.dll when I run my stand-alone application compiled with MATLAB Compiler?

A2: Sometimes the installer places "the this is where the program engine" (i.e., the dll) at the wrong location in the "environmental variable" and CASA cannot "see it."

To fix this, you need to delete the text which contains the text -

C:\Program Files (x86)\MATLAB\MATLAB Compiler Runtime\v713\runtime\win32;

To get to the environmental variables do the following:

How to set the path and environment variables in Windows

Windows Vista and Windows 7 users

- 1. From the <u>Desktop</u>, right-click **My Computer** and click **Properties**.
- 2. Click Advanced System Settings link in the left column.
- 3. In the System Properties window click the **Environment Variables** button.
- 4. In the Environment Variables window (as shown below), highlight the Pathvariable in the Systems Variable section and click the Edit button. Add or modify the path lines with the paths you want the computer to access. Each different directory is separated with a semicolon as shown below.

Variable	Value
TEMP TMP	C:\Documents and Settings\Techno\Loc C:\Documents and Settings\Techno\Loc
ystem variables	New Edit Delete
ystem variables Variable	New Edit Delete
Variable NUMBER_OF_P	Value
Variable NUMBER_OF_P OS Rath	Value 2 Windows_NT C:\WINDOWS\system32;C:\WINDOWS;
Variable NUMBER_OF_P OS	Value 2 Windows_NT

5. Finally, delete the text that has MATLAB\MATLAB Compiler Runtime\v713\runtime\win32; in it (between the ";"s).

C:\Program Files (x86)\NVIDIA Corporation\PhysX\Common;C:\PROGRAM FILES (X86)\INTEL\ICLS CLIENT\;C:\PROGRAM **FILESVINTELVICLS** CLIENT\;%SYSTEMROOT%\SYSTEM32;%SYSTEMROOT%;%SYSTEMROOT%\SYS TEM32\WBEM;%SYSTEMROOT%\SYSTEM32\WINDOWSPOWERSHELL\V1.0\;C:\P ROGRAM FILES\INTEL\WIFI\BIN\;C:\PROGRAM FILES\COMMON FILES\INTEL\WIRELESSCOMMON\;C:\PROGRAM FILES VINTEL VINTEL (R) MANAGEMENT ENGINE COMPONENTS\DAL;C:\PROGRAM FILES\INTEL\INTEL(R) MANAGEMENT ENGINE COMPONENTS\IPT;C:\PROGRAM FILES (X86)\INTEL\INTEL(R) MANAGEMENT ENGINE COMPONENTS\DAL;C:\PROGRAM FILES (X86) VINTEL VINTEL(R)MANAGEMENT ENGINE COMPONENTS\IPT::C:\PROGRAM FILES\DELL\DELL DATA PROTECTION/ACCESS/ADVANCED/WAVE/GEMALTO/ACCESS CLIENT\V5\;C:\PROGRAM FILES (X86)\SECURITY INNOVATION\SI TSS\BIN\;C:\Program Files\WIDCOMM\Bluetooth Software\;C:\Program Files\WIDCOMM\Bluetooth Software\syswow64;;C:\Program Files (x86)\Intel\OpenCL SDK\2.0\bin\x86;C:\Program Files (x86)\Intel\OpenCL SDK\2.0\bin\x64;C:\Program Files (x86)\QuickTime\QTSystem\;

So the text I want to find has MATLAB v713 runtime and win32 as part of the text...MATLAB\MATLAB Compiler Runtime\v713\runtime\win32;

Which would be this "sentence" – remember sentences start with hard drive name and end with;

C:\Program Files (x86)\MATLAB\MATLAB Compiler Runtime\v713\runtime\win32;

Next, just delete the appropriate sentence. <u>Make sure you only delete the sentence</u> and the (from the beginning to the ";") otherwise major problems can occur.

So this is what my environmental variable now are...

C:\Program Files (x86)\NVIDIA Corporation\PhysX\Common;C:\PROGRAM FILES (X86)\INTEL\ICLS CLIENT\;C:\PROGRAM **FILESVINTELVICLS** CLIENT\;%SYSTEMROOT%\SYSTEM32;%SYSTEMROOT%;%SYSTEMROOT%\SYS TEM32\WBEM:%SYSTEMROOT%\SYSTEM32\WINDOWSPOWERSHELL\V1.0\;C:\P FILES\INTEL\WIFI\BIN\:C:\PROGRAM ROGRAM FILES\COMMON FILES\INTEL\WIRELESSCOMMON\:C:\PROGRAM FILESVNTELVNTEL(R) MANAGEMENT ENGINE COMPONENTS\DAL;C:\PROGRAM FILES\INTEL\INTEL(R) COMPONENTS\IPT:C:\PROGRAM MANAGEMENT ENGINE FILES (X86)\INTEL\INTEL(R) MANAGEMENT ENGINE COMPONENTS\DAL;C:\PROGRAM FILES (X86)\INTEL\INTEL(R) MANAGEMENT ENGINE COMPONENTS\IPT;;C:\PROGRAM FILES\DELL\DELL DATA PROTECTION/ACCESS/ADVANCED/WAVE/GEMALTO/ACCESS CLIENT\V5\;C:\PROGRAM FILES (X86)\SECURITY INNOVATION\SI Software\;C:\Program TSS\BIN\;C:\Program Files\WIDCOMM\Bluetooth Files\WIDCOMM\Bluetooth Software\syswow64;;C:\Program Files (x86)\Intel\OpenCL SDK\2.0\bin\x86:C:\Program Files (x86)\Intel\OpenCL SDK\2.0\bin\x64:C:\Program Files (x86)\QuickTime\QTSystem\:

Sometimes you need to place that statement at the beginning of the variables.