Installation

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This document describes all the steps and necessary information to successfully install the matRad software and test it.

System Requirements:

Treatment planning tutorials can be done with systems starting with 2GB RAM. For a more detailed treatment planning and realistic resolutions, we recommend 8GB RAM or more. More information can be found on:

https://github.com/e0404/matRad/wiki/Minimum-System-Requirements.

It runs **on a 64-bit computer for**: Windows, Linux & Mac (32-bit OS is not supported).

Simplified matRad installation for Masterclass:

The easiest option is to use the matRad standalone application (for Windows) that does *NOT* require MATLAB.

It can be downloaded from the following links:

- Windows 64-bit: <u>https://drive.google.com/file/d/1DGCQgSOxjWZuQ68kxJBW7YdFUd_u</u> <u>tZf2/view</u>
- Linux 64-bit: <u>https://drive.google.com/file/d/1wzdXEfEsR7R2F2E9YaMw9-</u> <u>CdVHhb8I6U/view</u>
- Mac 64-bit: <u>https://drive.google.com/file/d/1hDS_qoRtPr6wzsNmpprr_d2UdW7d5r</u> <u>Pz/view</u>

Opening the respective links, one can download the file for the corresponding software:

(matRad_installerMac64_v_2_4.dmg, matRad_installerWin64_v_2_4.exe, matRad_installerLinux64_v_2_4.install)

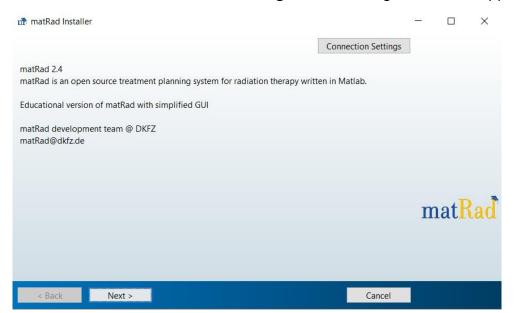
Once the matRad file is downloaded on your computer, continue with the installation, by clicking at the respective image according to the operating system.

For Windows 64-bit

For Windows the .exe file has the following image.

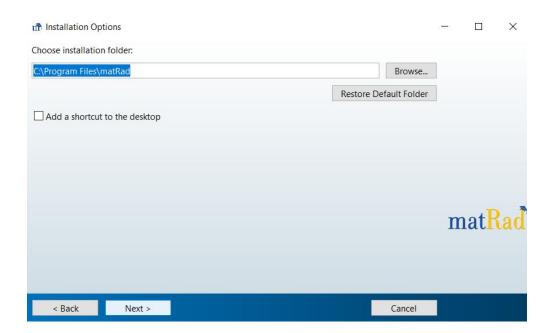


Click on the *matRad_installerWin64 image*, the following window will appear.



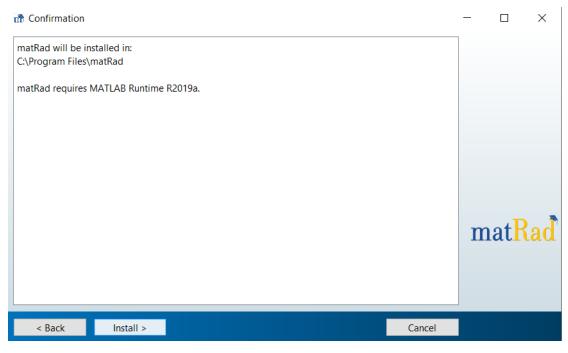
Then, click "*Next*" and the next window will unfold.

Then, select the directory on the hard disk, where it will be installed.



Then click on the "*Install*" button to confirm the installation process.

Then, a charging bar will appear that will inform, about the installation process.



Once the process is finished, double click on the image of the matRad application in the corresponding file, where it is installed.



For Windows, two files should be shown, with the names:

- "application" and

- "appdata"

📕 appdata	11/20/2020 1:31 PM	File folder
application	11/20/2020 1:48 PM	File folder

After the installation, it should be verified that the data were downloaded checking in the "application" file.

The application file contains the matRad application button, together with the data for the different cases (LIVER, HEAND_AND_NECK etc).



The application icon will pop up and there will be a waiting time to load the software.



Test

The matRad software contains in the "application" file data for three cases:

- TG-119 or C-phantom (testing sample),
- Liver case and

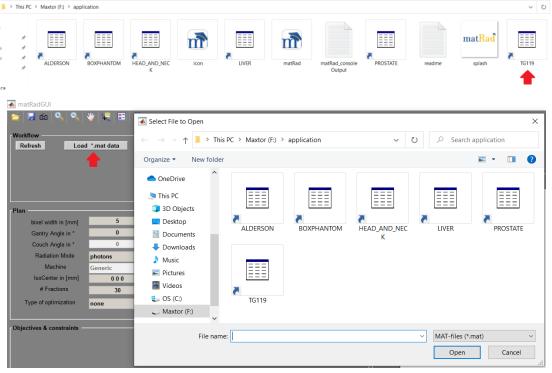
Tamat Rad GU

- Head and Neck (H&N).

By clicking on the image above the software will be loaded and the initial matRad screen will appear. Notice the different panels (Workflow, Plan etc.).

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Show DVH/QI	visualize plan / beams	0				About
		0 0.1	0.2 0.3 0.	.4 0.5 0.6 0.	7 0.8 0.9 1	

Add the patient data by clicking "*Load**.*mat data*" from the Workflow panel. To try the functionality of the software, let's load the testing sample data (TG-119).



After loading the data, the image below is expected to appear.

Observe that objective & constraints have appeared in the respective panel.

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Workflow Calc. influence Mx Optimize Save to GUI Refresh	matRad difz. GERMAN CANCER RESEARCH CEN	TER ION
	Viewing	min -1000 max 1040.3
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Radiation Mode photons ✓ Stratification Levels Machine Generic ✓ 7	100 - 600	Window Width:
IsoCenter in [mm] 251.3 236.4 162.6 # Fractions 30	150	Range: -1000 1040
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plot iso center Show DVH/QI visualize plan / beams	500 50 100 150 200 250 300 350 400 450 500 x(mm)	About

Next step is to set the parameters of the treatment plan from the "*Plan*" panel.

As a test example, optimize a single photon beam at 0 degrees gantry angle, by setting the parameters at the left-hand-side panel "*Plan*".

For testing set the parameters:

Radiation Mode: photons Gantry angle: 0 Bixel width : 5

Note that: "Cubes" of bixel-size build up the tissue.

After this is done, press the "*Calc. Influence Mx*" button to continue with the next step: the calculation of the matrix of influence (of the radiation).

A charging bar should appear, and it may take some time.

Refresh	Load *.mat data	Calc. influence Mx	Optimize	Save to GUI
			Recalc	
		_		
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After the calculated matrix, press the *optimization button*, which will also show the "*Progress of Optimization*" panel displaying the exponential dose distribution as a function of iterations.

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	1	2 3		6 7 8	9 10	11
Sto	p		# iter	ations		

To save the calculations click on the "*Save to GUI*" button that will be enabled only after the optimization.

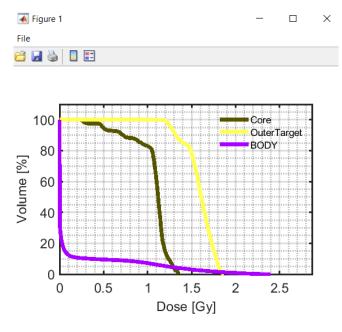
Refresh	Load *mat data	Calc. influence Mx	Optimize	Save to GUI
			Recalc	▲
				_
		Status:	ready for optimization	

Then click on the **Dose-Volume Histogram button**: it is the last step in order to obtain the optimization's results..

ľ	Visualization				
	Slice Selection		Type of plot	intensity 🔻 GoTo Internal	 plot CT plot contour
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I					plot iso center
				Show DVH/QI	🕐 visualize plan / beams
l					

This function will provide

- the corresponding DVH histogram and
- the table containing the mean doses distributed in each organ, target, tissue, together with the maximum and minimum doses and the standard deviation of the values.

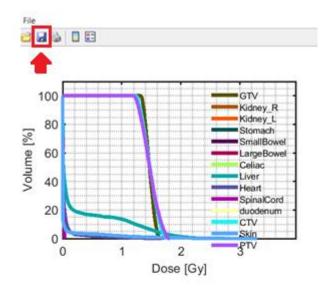


	max	min	mean
Core	1.3525	0.2364	1.0615
OuterTarget	1.8672	1.0975	1.5905
BODY	2.3969	0	0.1373

For each case, save the corresponding DVH and its table. They are needed to be able to compare the different cases at the end of the masterclass session.

Saving them can be performed by clicking on the *disk sign* above DVH and setting an appropriate file name for each case, e.g. for TG-119 and 1 angle radiation of photons a suggested name is

"C_1_photons_NameOfParticipant". Save the type of file to JPEG format.



	max	min	mean	
GTV	1.6394	1.3173	1.4714	-
Kidney_R	0	0	0	
Kidney_L	0	0	0	
Stomach	0	0	0	
SmallBowel	0	0	0	
LargeBowel	0	0	0	
Celiac	0	0	0	
Liver	2.6394	0	0.2547	
Heart	1.6705	0	0.0370	
SpinalCord	0.0383	0	0.0053	
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	Portable Network Graphics file (*.png)					
	Portable Pixmap file (*.ppm)					
	Scalable Vector Graphics file (*.svg)					
	TIFF image (*.tif)					
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Then change the plan parameters (e.g. set up for protons, and/or change the angles) and repeat the process already described above. At the end, the aim is to compare the results for photons, protons and C-ions.

For Linux 64-bit

The installation for Linux is performed in a similar way, as already described above for Windows installation.

After downloading from the link, start the installation in console as shown in the next figure.

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written in Matlab.	source treatment pl of matRad with simp nt team @ DKFZ			

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matRad 2.4 matRad is ar written in Ma Educational matRad deve matRad@dkl	Connection Settings If your Internet connection requires a proxy server, enter the server name and port information. If your Internet connection does not require a proxy server, or if you are unsure, leave the fields blank. Server: Port: User: Port: Password: Password:
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1. LICENSE GRANT. Subject to the restrictions below, The MathWorks, Inc. ("MathWorks") hereby grants to you, whether you are an individual or an entity, a license to install and use the MATLAB Runtime ("Runtime"), solely and expressly for the purpose of running software created with the MATLAB Compiler (the "Application Software"), and for no other purpose. This license is personal, nonexclusive, and nontransferable.			
2. LICENSE RESTRICTIONS. You shall not modify or adapt the Runtime for any reason. You shall not disassemble, decompile, or reverse engineer the Runtime. You shall not alter or remove any proprietary or other legal notices on or in copies of the Runtime. Unless used to run Application Software, you shall not rent, lease, or loan the Runtime, time share the Runtime, provide service bureau use or use the Runtime for supporting any other party's use of the Runtime. You shall not			
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matRad requires MATLAB Runtime R2019b.		
MATLAB Runtime R2019b will be installed in: /home/mirhat/MATLAB/MATLAB_Runtime/v97		
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	In the following directions, replace MR/v97 by the directory on the target machine where MATLAB is installed, or MR by the directory where the MATLAB Runtime is installed.		
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L	MR/v97/X11/app-defaults	=	
	(2) If the environment variable LD_LIBRARY_PATH is undefined, set it to the following:		
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	If it is defined, set it to the following:	•	matRad
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<u>CONTACT</u>

For any questions or any problem, feel free to contact Aris Mamaras in the following mail:

amamaras@physics.auth.gr

I will be glad to help you in your journey to particle therapy knowledge!