

# CityDoctor2 in a nutshell

Weixiao Gao, Giorgio Agugiaro



Last update: 5 March 2026



# License

This presentation is licensed under the [Creative Commons License CC BY-NC-SA 4.0](https://creativecommons.org/licenses/by-nc-sa/4.0/). According to CC BY-NC-SA 4.0 permission is granted to share this document, i.e. copy and redistribute the material in any medium or format, and to adapt it, i.e. remix, transform, and build upon the material under the following conditions:



- **Attribution:** You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
- **NonCommercial:** You may not use the material for commercial purposes.
- **ShareAlike:** If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.
- **No additional restrictions:** You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

# CityDoctor2 - Introduction

## Overview

The use of 3D city models in simulations and spatial analyses has gained interest in recent years. However, practice has shown that geometric city models often contain errors that alter the simulation results. Troubleshooting is usually associated with a high manual effort. In order to reduce or even completely remove this effort, **CityDoctor 2** is one of the tools that can be used. CityDoctor is developed by the HFT Stuttgart, Germany.

## Procedure

Before a repair can take place, the errors and as much information as possible about them must first be identified and documented. With this information a repair can then be started. Two different approaches are available. One approach is to develop complex deterministic algorithms that correct the errors. Furthermore, an evolutionary approach is pursued, which is based on a cyclical repair process. Together with an evaluation function, it comes as close as possible to a perfect repair.

## Resources

Webpage: <https://www.hft-stuttgart.de/forschung/projekte/aktuell/citydoctor-2>

Download: <https://transfer.hft-stuttgart.de/gitlab/citydoctor/citydoctor2/-/releases>

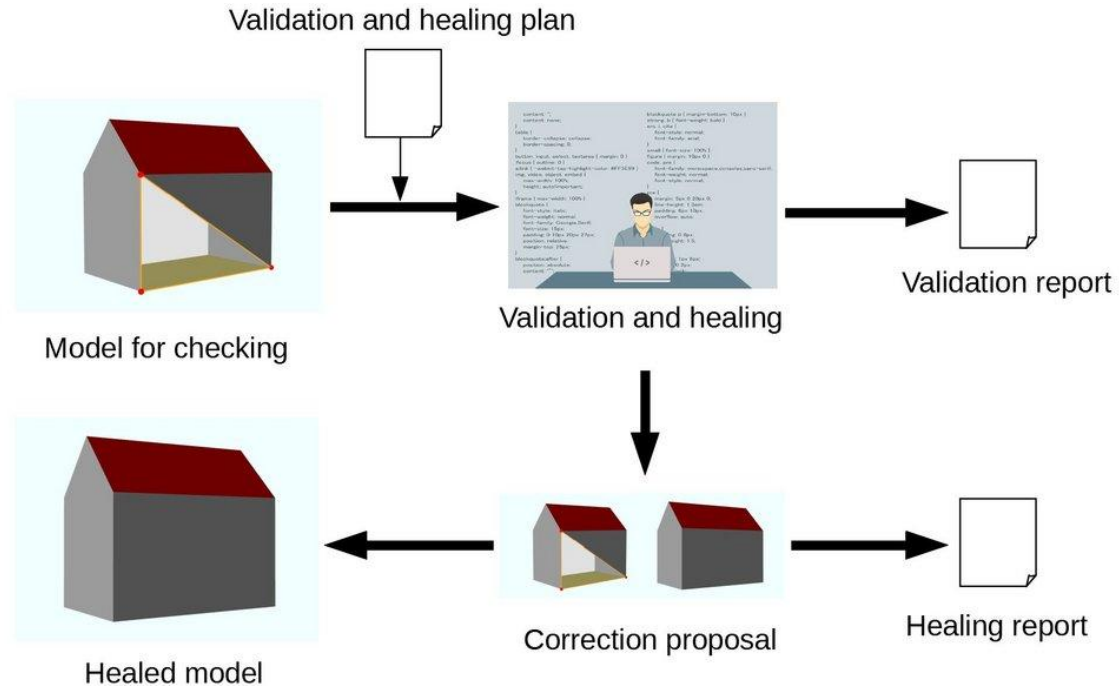
Source code: <https://transfer.hft-stuttgart.de/gitlab/citydoctor/citydoctor2>

# CityDoctor2 - Introduction

## Procedure

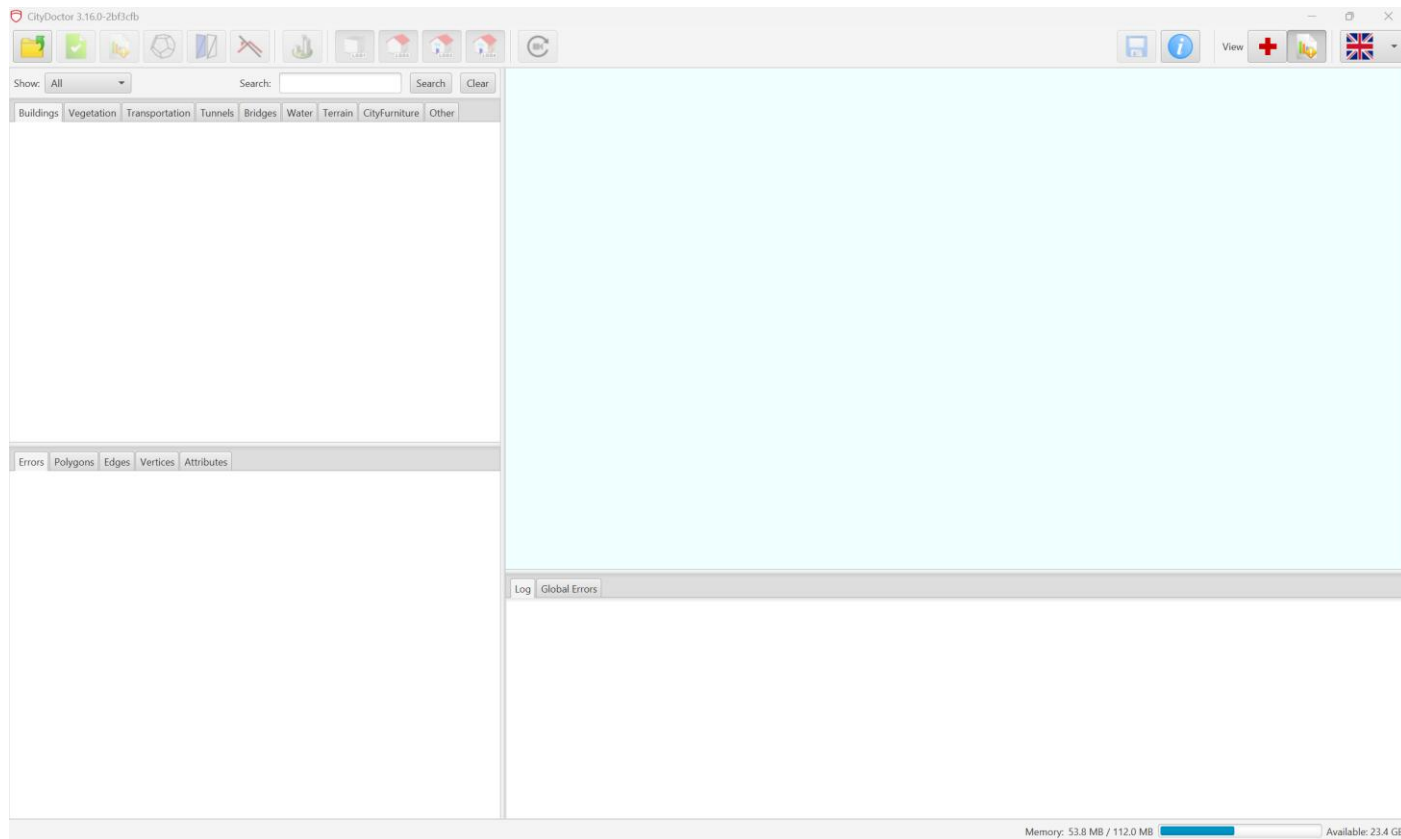
Both error checking and repair should have a high degree of configurability to ensure control over the repair process.

- Introduction
- Model Validation
- Healing
- Healing Validation
- Report Comparison



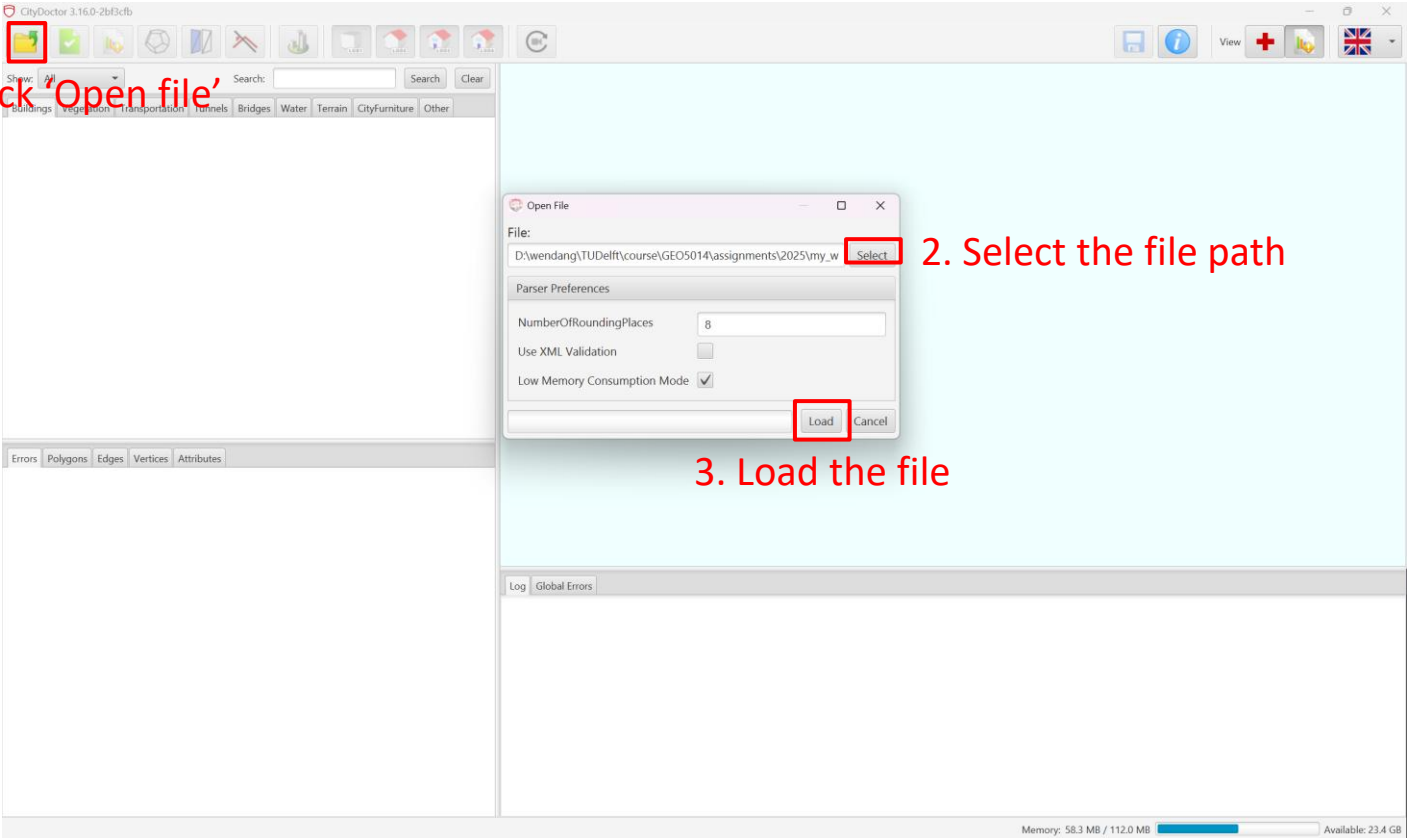
# CityDoctor2 – Model Validation

In Windows, run **citydoctor2\_healer.bat**



# CityDoctor2 – Model Validation

## Load the CityGML file



1. Click 'Open file'

2. Select the file path

3. Load the file

CityDoctor 3.16.0-2b3c1b

File: D:\wendang\TU Delft\course\GEO5014\assignments\2025\my\_w [Select]

Parser Preferences

NumberOfRoundingPlaces: 8

Use XML Validation:

Low Memory Consumption Mode:

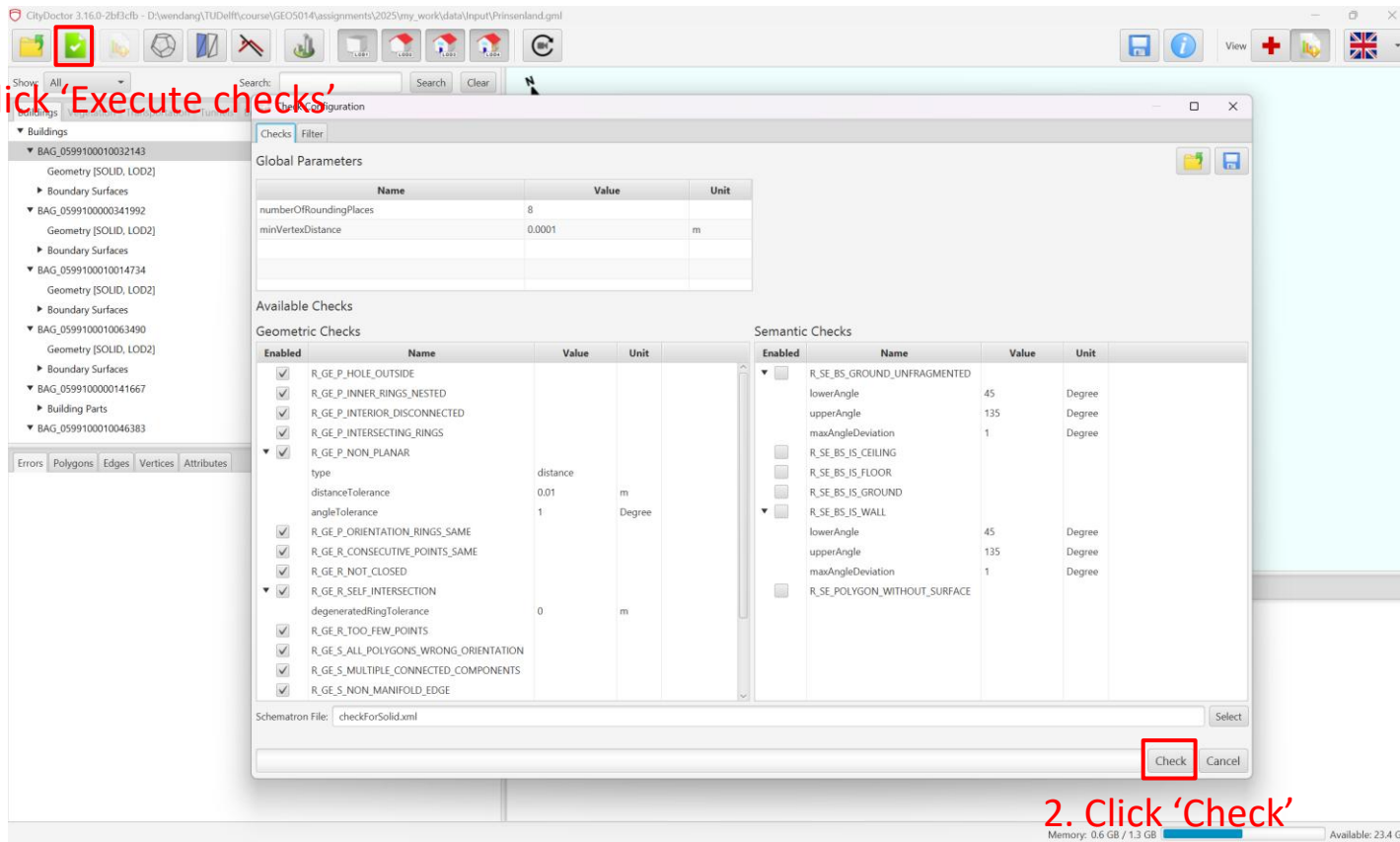
[Load] [Cancel]

Memory: 58.3 MB / 112.0 MB Available: 23.4 GB

# CityDoctor2 – Model Validation

## Execute error checks

1. Click 'Execute checks'



CityDoctor 3.16.0-2b3c1b - D:\wendang\TU Delft\course\GEOS014\assignments\2025\my\_work\data\input\Prinsenland.gml

Show: All Search: Filter

Buildings

- ▼ BAG\_0599100010032143
  - Geometry [SOLID, LOD2]
  - ▶ Boundary Surfaces
- ▼ BAG\_059910000341992
  - Geometry [SOLID, LOD2]
  - ▶ Boundary Surfaces
- ▼ BAG\_0599100010014734
  - Geometry [SOLID, LOD2]
  - ▶ Boundary Surfaces
- ▼ BAG\_0599100010063490
  - Geometry [SOLID, LOD2]
  - ▶ Boundary Surfaces
- ▼ BAG\_0599100000141667
  - ▶ Building Parts
- ▼ BAG\_0599100010046383

Errors Polygons Edges Vertices Attributes

Checks Filter

Global Parameters

Name	Value	Unit
numberOfRoundingPlaces	8	
minVertexDistance	0.0001	m

Available Checks

Geometric Checks

Enabled	Name	Value	Unit
<input checked="" type="checkbox"/>	R_GE_P_HOLE_OUTSIDE		
<input checked="" type="checkbox"/>	R_GE_P_INNER_RINGS_NESTED		
<input checked="" type="checkbox"/>	R_GE_P_INTERIOR_DISCONNECTED		
<input checked="" type="checkbox"/>	R_GE_P_INTERSECTING_RINGS		
<input checked="" type="checkbox"/>	R_GE_P_NON_PLANAR		
	type	distance	
	distanceTolerance	0.01	m
	angleTolerance	1	Degree
<input checked="" type="checkbox"/>	R_GE_P_ORIENTATION_RINGS_SAME		
<input checked="" type="checkbox"/>	R_GE_R_CONSECUTIVE_POINTS_SAME		
<input checked="" type="checkbox"/>	R_GE_R_NOT_CLOSED		
<input checked="" type="checkbox"/>	R_GE_R_SELF_INTERSECTION		
	degeneratedRingTolerance	0	m
<input checked="" type="checkbox"/>	R_GE_R_TOO_FEW_POINTS		
<input checked="" type="checkbox"/>	R_GE_S_ALL_POLYGONS_WRONG_ORIENTATION		
<input checked="" type="checkbox"/>	R_GE_S_MULTIPLE_CONNECTED_COMPONENTS		
<input checked="" type="checkbox"/>	R_GE_S_NON_MANIFOLD_EDGE		

Semantic Checks

Enabled	Name	Value	Unit
<input type="checkbox"/>	R_SE_BS_GROUND_UNFRAGMENTED		
	lowerAngle	45	Degree
	upperAngle	135	Degree
	maxAngleDeviation	1	Degree
<input type="checkbox"/>	R_SE_BS_IS_CEILING		
<input type="checkbox"/>	R_SE_BS_IS_FLOOR		
<input type="checkbox"/>	R_SE_BS_IS_GROUND		
<input type="checkbox"/>	R_SE_BS_IS_WALL		
	lowerAngle	45	Degree
	upperAngle	135	Degree
	maxAngleDeviation	1	Degree
<input type="checkbox"/>	R_SE_POLYGON_WITHOUT_SURFACE		

Schematron File: checkForSolid.xml

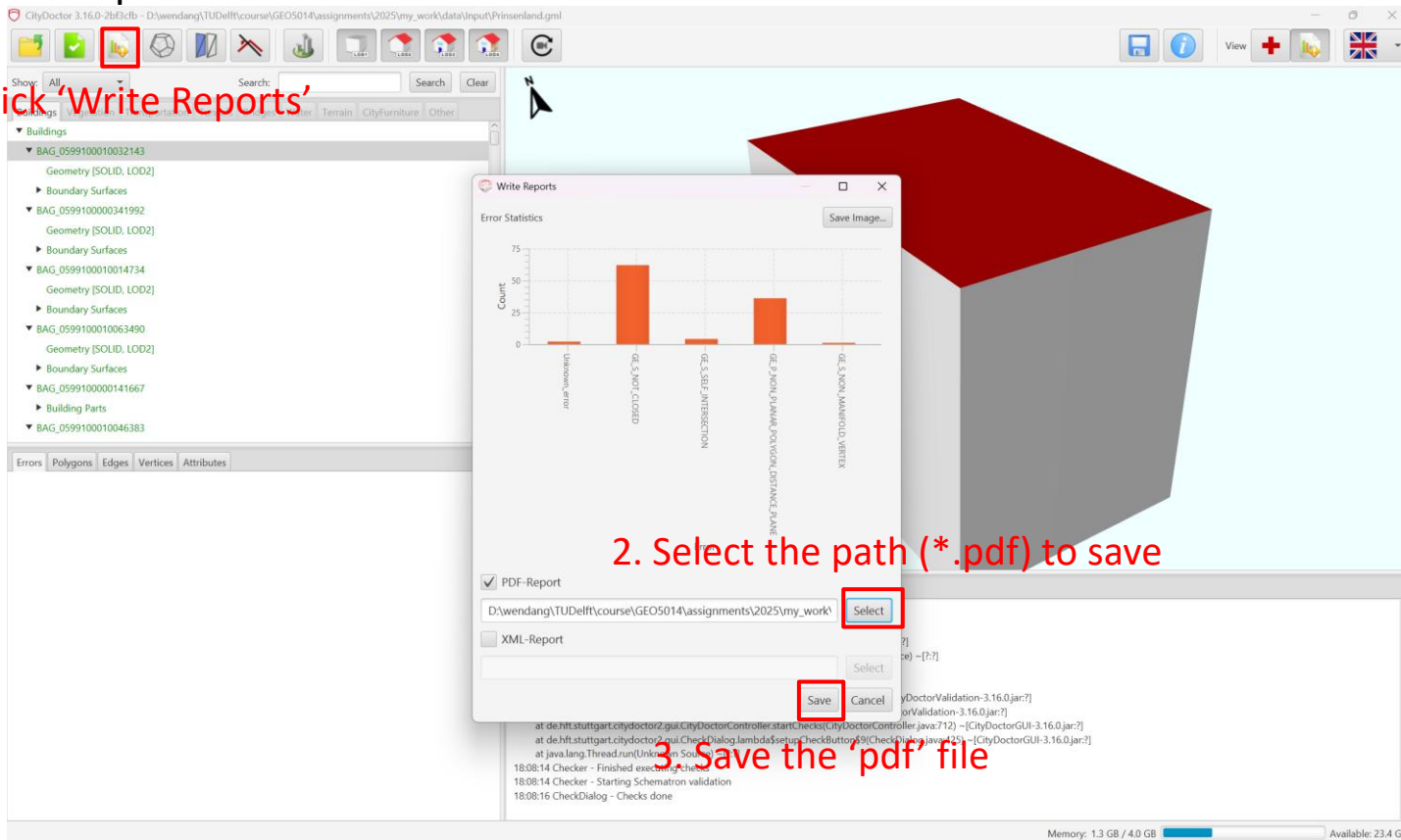
Check Cancel

# CityDoctor2 – Model Validation

## Write reports

Introduction  
 Model Validation  
 Healing  
 Healing Validation  
 Report Comparison

1. Click 'Write Reports'



The screenshot shows the CityDoctor2 interface with a 3D model of a building. A 'Write Reports' dialog box is open, displaying the following error statistics:

Error Type	Count
Unknown error	0
GE.S_NON_CLOSED	65
GE.S_SELF_INTERSECTION	5
GE.P_NON_PLANNED_POSITION_DISTANCE_PLANE	35
GE.S_NON_MANIFOLD_VERTEX	0

The dialog also includes the following options and fields:

- PDF-Report
- XML-Report
- File path: D:\wendang\TUDelft\course\GEO5014\assignments\2025\my\_work\ (with a 'Select' button highlighted in red)
- Buttons: 'Save' (highlighted in red), 'Cancel', 'Select', 'Save Image...'

At the bottom of the dialog, there is a log of system messages:

```

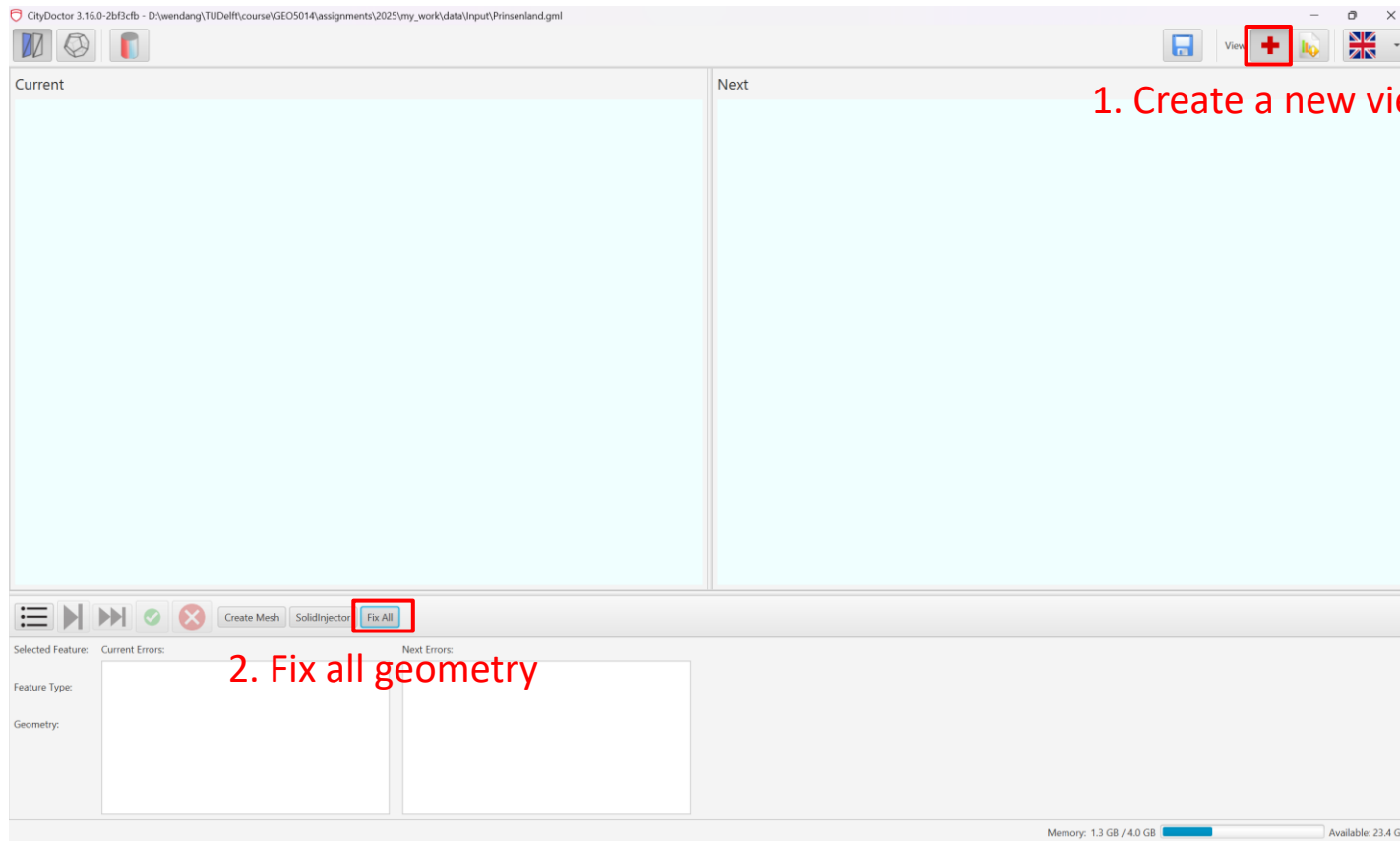
at de.htz.stuttgart.citydoctor2.gui.CityDoctorController.startChecks(CityDoctorController.java:712) - [CityDoctorGUI-3.16.0.jar:]
at de.htz.stuttgart.citydoctor2.gui.CheckDialog.lambda$setCheckButton$9(CheckDialog.java:125) - [CityDoctorGUI-3.16.0.jar:]
at java.lang.Thread.run(Unknown Source)
18:08:14 Checker - Finished executing checks
18:08:14 Checker - Starting Schematron validation
18:08:16 CheckDialog - Checks done
  
```

2. Select the path (\*.pdf) to save

3. Save the 'pdf' file

# CityDoctor2 – Healing

## Fix geometric errors

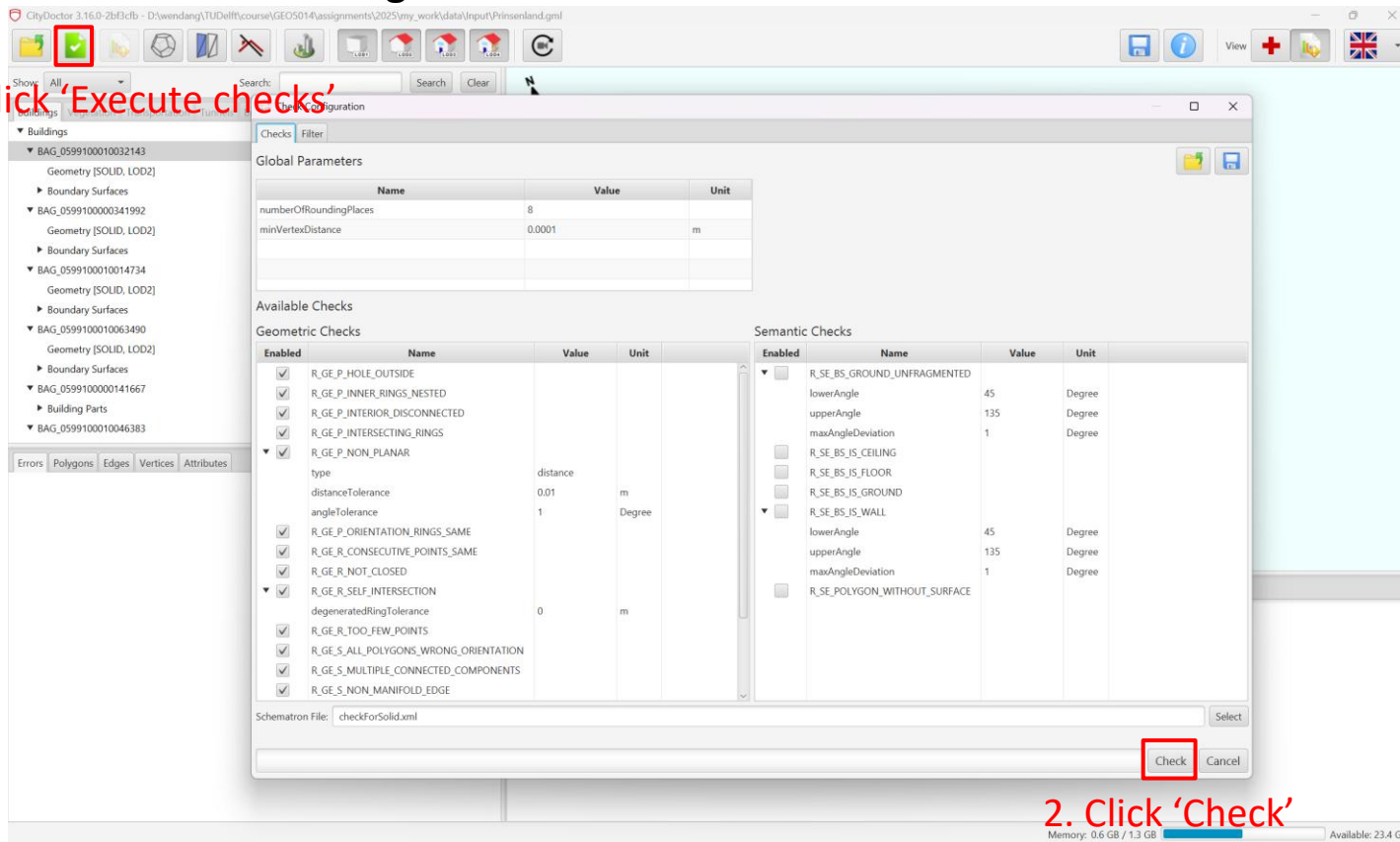


The screenshot shows the CityDoctor2 software interface. The title bar indicates the file path: CityDoctor 3.16.0-2bf3cfb - D:\wendang\TU Delft\course\GEO5014\assignments\2025\my\_work\data\input\Prinsenland.gml. The interface is divided into two main panels: 'Current' on the left and 'Next' on the right. Both panels are currently empty. In the top right corner of the 'Next' panel, there is a red text annotation: "1. Create a new view". In the bottom toolbar, the 'Fix All' button is highlighted with a red box. Below the toolbar, there are two columns for 'Current Errors' and 'Next Errors', each with a 'Feature Type' and 'Geometry' label. A red text annotation "2. Fix all geometry" is placed over these columns. At the bottom right, a system tray shows memory usage: "Memory: 1.3 GB / 4.0 GB" and "Available: 23.4 GB".

# CityDoctor2 – Healing Validation

Execute error checks again

1. Click 'Execute checks'



CityDoctor 3.16.0-2b3c1b - D:\wendang\TU Delft\course\GEOS014\assignments\2025\my\_work\data\input\Prinsenland.gml

Checks Filter

Global Parameters

Name	Value	Unit
numberOfRoundingPlaces	8	
minVertexDistance	0.0001	m

Available Checks

Geometric Checks

Enabled	Name	Value	Unit
<input checked="" type="checkbox"/>	R_GE_P_HOLE_OUTSIDE		
<input checked="" type="checkbox"/>	R_GE_P_INNER_RINGS_NESTED		
<input checked="" type="checkbox"/>	R_GE_P_INTERIOR_DISCONNECTED		
<input checked="" type="checkbox"/>	R_GE_P_INTERSECTING_RINGS		
<input checked="" type="checkbox"/>	R_GE_P_NON_PLANAR		
	type	distance	
	distanceTolerance	0.01	m
	angleTolerance	1	Degree
<input checked="" type="checkbox"/>	R_GE_P_ORIENTATION_RINGS_SAME		
<input checked="" type="checkbox"/>	R_GE_R_CONSECUTIVE_POINTS_SAME		
<input checked="" type="checkbox"/>	R_GE_R_NOT_CLOSED		
<input checked="" type="checkbox"/>	R_GE_R_SELF_INTERSECTION		
	degeneratedRingTolerance	0	m
<input checked="" type="checkbox"/>	R_GE_R_TOO_FEW_POINTS		
<input checked="" type="checkbox"/>	R_GE_S_ALL_POLYGONS_WRONG_ORIENTATION		
<input checked="" type="checkbox"/>	R_GE_S_MULTIPLE_CONNECTED_COMPONENTS		
<input checked="" type="checkbox"/>	R_GE_S_NON_MANIFOLD_EDGE		

Semantic Checks

Enabled	Name	Value	Unit
<input type="checkbox"/>	R_SE_BS_GROUND_UNFRAGMENTED		
	lowerAngle	45	Degree
	upperAngle	135	Degree
	maxAngleDeviation	1	Degree
<input type="checkbox"/>	R_SE_BS_IS_CEILING		
<input type="checkbox"/>	R_SE_BS_IS_FLOOR		
<input type="checkbox"/>	R_SE_BS_IS_GROUND		
<input type="checkbox"/>	R_SE_BS_IS_WALL		
	lowerAngle	45	Degree
	upperAngle	135	Degree
	maxAngleDeviation	1	Degree
<input type="checkbox"/>	R_SE_POLYGON_WITHOUT_SURFACE		

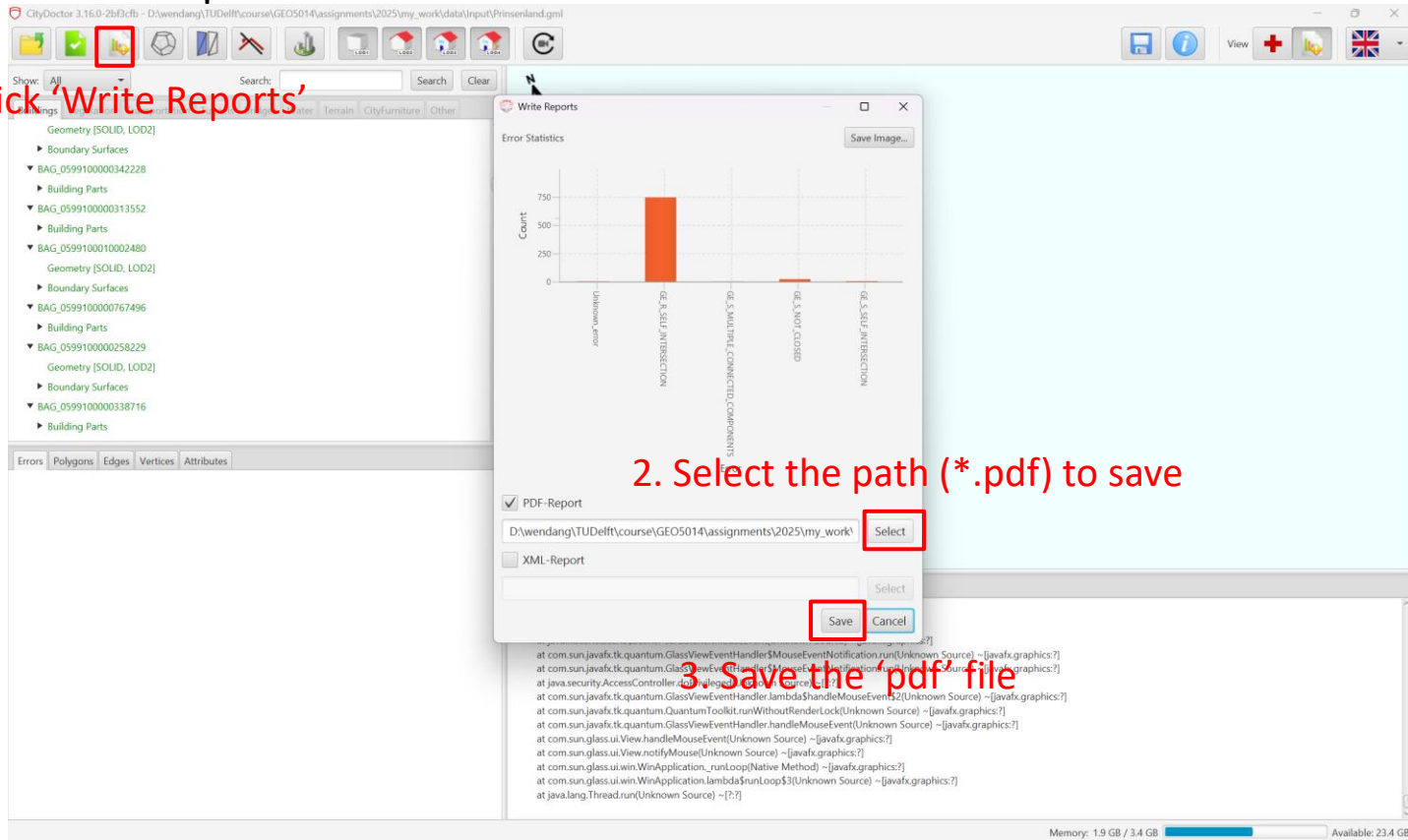
Schematron File: checkForSolid.xml

Check Cancel

# CityDoctor2 – Healing Validation

## Write new reports

1. Click 'Write Reports'



The screenshot shows the CityDoctor 3.16.0-2b19cfb application window. The top toolbar contains various icons, with the 'Write Reports' icon (a document with a green checkmark) highlighted by a red box. A red arrow points to this icon. The main window displays a tree view of the model's geometry and a 'Write Reports' dialog box. The dialog box has a title bar and a 'Save Image...' button. Below the title bar is a bar chart titled 'Error Statistics' showing the count of various error types. The x-axis labels are 'Unknown error', '0G\_3\_SELF\_INTERSECTION', '0G\_3\_MULTIPLE\_CONNECTED\_COMPONENTS', '0G\_3\_NOT\_CLOSED', and '0G\_3\_SELF\_INTERSECTION'. The y-axis is labeled 'Count' and ranges from 0 to 750. The bar for '0G\_3\_SELF\_INTERSECTION' is the tallest, reaching approximately 750. Below the chart are two sections: 'PDF-Report' (checked) and 'XML-Report' (unchecked). The 'PDF-Report' section has a text field containing the path 'D:\wendang\TUDelft\course\GEO5014\assignments\2025\my\_work\' and a 'Select' button highlighted by a red box. Below this is another 'Select' button. At the bottom of the dialog are 'Save' and 'Cancel' buttons, with the 'Save' button highlighted by a red box. A red arrow points to the 'Save Image...' button in the chart area. The background of the main window shows a 3D model of a building with various error markers. The bottom status bar shows 'Memory: 1.9 GB / 3.4 GB' and 'Available: 23.4 GB'.

2. Select the path (\*.pdf) to save

3. Save the pdf file

# CityDoctor2 – Report Comparison

## Check reports and compare differences Statistics

Object distribution:

Buildings (972):



Error Statistics:

- GE\_R\_SELF\_INTERSECTION: 1
- GE\_S\_NOT\_CLOSED: 19
- GE\_S\_SELF\_INTERSECTION: 3
- GE\_P\_NON\_PLANAR\_POLYGON\_DISTANCE\_PLANE: 35
- GE\_S\_NON\_MANIFOLD\_EDGE: 2

## Statistics

Object distribution:

Buildings (972):



Error Statistics:

- GE\_R\_SELF\_INTERSECTION: 254
- GE\_S\_NOT\_CLOSED: 2
- GE\_S\_SELF\_INTERSECTION: 4
- GE\_P\_INTERSECTING\_RINGS: 1
- GE\_P\_NON\_PLANAR\_POLYGON\_DISTANCE\_PLANE: 1

## Check Report



For File: Prinsenland.gml

Created on Sun, 6 Jul 2025 20:42:50 +0200

# Thank you for your attention!



**Dr. Weixiao Gao**

[w.gao-1@tudelft.nl](mailto:w.gao-1@tudelft.nl)

3D Geoinformation Group

TU Delft

The Netherlands

<https://3d.bk.tudelft.nl/weixiao/>



**Dr. Giorgio Agugiaro**

[g.agugiaro@tudelft.nl](mailto:g.agugiaro@tudelft.nl)

3D Geoinformation Group

TU Delft

The Netherlands

<https://3d.bk.tudelft.nl/gagugiaro/>