

# NetworkGT Toolbox

Version 0.1

Björn Nyberg<sup>1\*</sup>, Casey Nixon<sup>1</sup>, David Sanderson<sup>2</sup>

Department of Earth Sciences, University of Bergen, P.O. Box 7803, 5020 Bergen, Norway.<sup>1</sup>

Faculty of Engineering and the Environment, University of Southampton, Southampton  
SO17 1BJ, UK<sup>2</sup>

\*Corresponding Author: [bjorn.nyberg@uib.no](mailto:bjorn.nyberg@uib.no)

## Contents

1.0	Background.....	2
1.1	License .....	2
2.0	Installation.....	2
2.1	NetworkGT Download .....	2
2.2	Python Installation .....	2
2.3	NetworkGT Toolbox Installation.....	3
3.0	Workflow .....	3
3.1	Digitizing Fracture Network.....	3
3.2	Sampling Strategies .....	3
3.3	Geometrical Analysis .....	4
3.4	Topological Analysis .....	4
3.5	Spatial Visualization.....	4
4.0	Contact Information & Feedback .....	4

## 1.0 Background

The NetworkGT (Network Geometry and Typology) Toolbox is a set of tools designed for the geometric and topological analysis of fracture networks in ArcGIS 10.4 >.

### 1.1 License

The scripts used in this program are written in the Python programming language under a GNU General Public License V3 which states:

“This program is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program. If not, see <<http://www.gnu.org/licenses/>>.”

## 2.0 Installation

### 2.1 NetworkGT Download

Download the latest release of the NetworkGT toolbox  
<https://github.com/BjornNyberg/NetworkGT/releases>

### 2.2 Python Installation

#### 2.2.1 *Python module installation*

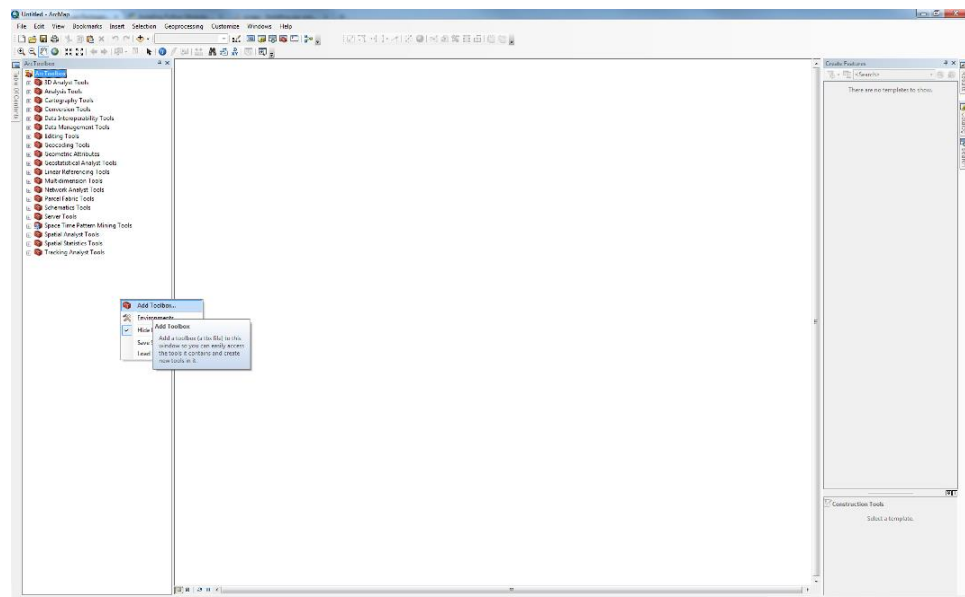
The toolset utilizes a set of scientific third-party modules that are typically not available in a standard ArcGIS installation:

To install these modules **requires admin rights** and the following procedure.

1. Unzip the NetworkGT-version.zip file into a **permanent working directory** that has **read/write** capabilities.
2. Navigate to the Install folder of your working directory (step 1) and find the file Install.py → right click → Edit with IDLE.
3. Press F5 to run the file and wait until a message 'Finished' is returned

## 2.3 NetworkGT Toolbox Installation

1. Open ArcMap
2. Find the ArcToolbox by navigating to the tabs Geoprocessing → ArcToolbox
3. Right click the ArcToolbox icon → Add Toolbox and navigate to the NetworkGT.tbx file in your working directory (Step 1 in section 2.3.1).



4. Right click the ArcToolbox icon → Save Settings → To Default. The toolbox is now saved under the current ArcToolbox settings.  
The toolset is now ready for use!

## 3.0 Workflow

### 3.1 Digitizing Fracture Network

- 3.1.1 Interpretation of Fracture Network
- 3.1.2 Repair Fracture Network

### 3.2 Sampling Strategies

- 3.2.1 Polygon and Full Area Sampling

3.2.2 Line Grid Sampling

3.2.3 Network Grid Sampling

### **3.3 Geometrical Analysis**

3.3.1 Rose Diagrams

3.3.2 Fracture Sets

3.3.3 Spatial Heterogeneity

3.3.4 Length Distributions

### **3.4 Topological Analysis**

3.4.1 Nodes and Branches

3.4.2 Topological Analysis and Plots

3.4.3 Clustering and Block Analysis

### **3.5 Spatial Visualization**

3.5.1 Contour Plots

3.5.2 Contour Analysis

## **4.0 Contact Information & Feedback**

Please report any bugs or requests for enhancements on the GitHub NetworkGT repository issues tab <https://github.com/BjornNyberg/NetworkGT/issues>