

# CNATool - Complex Network Analysis Tool

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## Abstract

CNATool is an online program for analyzing complex and social networks. It was developed using the MaiaScript programming language to allow quick and simplified analysis of graphs of complex networks from any device connected to the Internet. Currently it supports load graphs in Pajek and JSON formats, create artificial graphs (random, scale-free, small world and hybrid), display network graph, layout graph, graph properties (average degree, density, average clustering coefficient, average shortest path, diameter and graph efficiency, display detailed properties of vertices (degrees, clustering and centrality), save graph in Pajek format, export graph in SVG format, save a summary of graphs properties in HTML format.

*Keywords:* graph, network, degree, clustering, centrality, Pajek

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## Code metadata

Nr.	Code metadata description	Please fill in this column
C1	Current code version	1.4.1
C2	Permanent link to code/repository used for this code version	<a href="https://github.com/souzamonteiro/cnatool.git">https://github.com/souzamonteiro/cnatool.git</a>
C3	Web site	<a href="http://www.maiascript.com/maiascript/cnatool">http://www.maiascript.com/maiascript/cnatool</a>
C4	Legal Code License	Apache-2.0 License
C5	Code versioning system used	git
C6	Software code languages, tools, and services used	MaiaScript, JavaScript, HTML & CSS
C7	Compilation requirements, operating environments	Node.js
C8	If available Link to developer documentation/manual	<a href="http://www.maiascript.com/cnatool/doc/cna/1.3.6/in">http://www.maiascript.com/cnatool/doc/cna/1.3.6/in</a>
C9	Support email for questions	<a href="mailto:support@souzamonteiro.com">support@souzamonteiro.com</a>

Table 1: Code metadata

### 1. Motivation and significance

[1] Introduce the scientific background and the motivation for developing the software.

Explain why the software is important, and describe the exact (scientific) problem(s) it solves.

Indicate in what way the software has contributed (or how it will contribute in the future) to the process of scientific discovery; if available, this is to be supported by citing a research paper using the software.

Provide a description of the experimental setting (how does the user use the software?).

Introduce related work in literature (cite or list algorithms used, other software etc.).

### 2. Software description

#### 2.1. Software Architecture

#### 2.2. Software Functionalities

Present the major functionalities of the software.

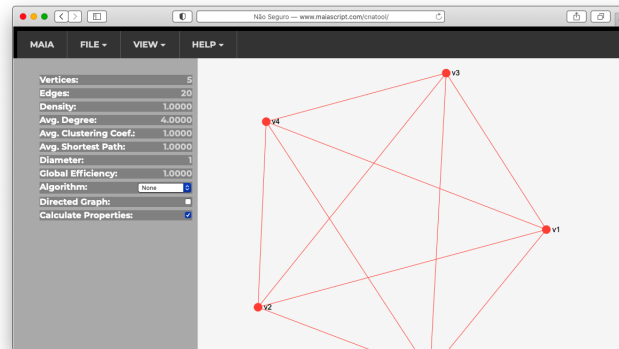


Figure 1: Screen of the CNATool program running on the Safari desktop browser. Source: Author..

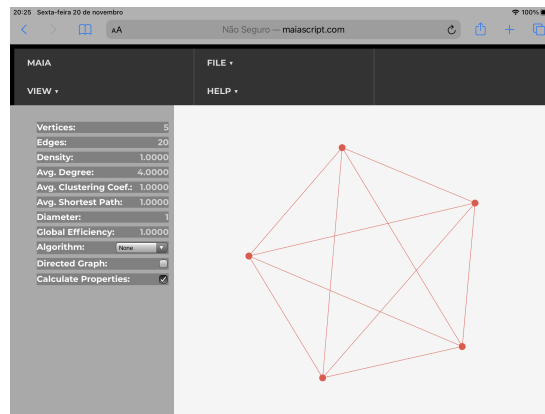


Figure 2: Screen of the CNATool program running on the Safari mobile browser on iPad. Source: Author.

Property	CNATool	Gephi	Pajek	SocNetV
Vertices	50	50	50	50
Edges	140	140	140	140
Density	0.05710000	0.05700000	0.05714286	0.05710000
Average Degree	2.8	2.8	2.8	2.8
Average Clustering Coefficient	0.34430000	0.34400000	0.34431746	0.34400000
Average Shortest Path	2.45140	2.45100	2.45143	2.45140
Diameter	5	5	5	5
Global Efficiency	0.4520			

Table 2: Sample scale-free network properties, calculated by the CNATool, Gephi, Pajek and SocNetV programs. Source Author.

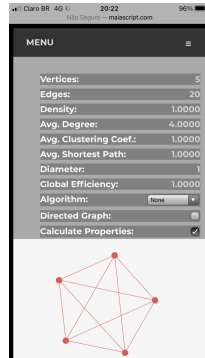


Figure 3: Screen of the CNATool program running on the Safari mobile browser on iPhone.  
Source: Author.

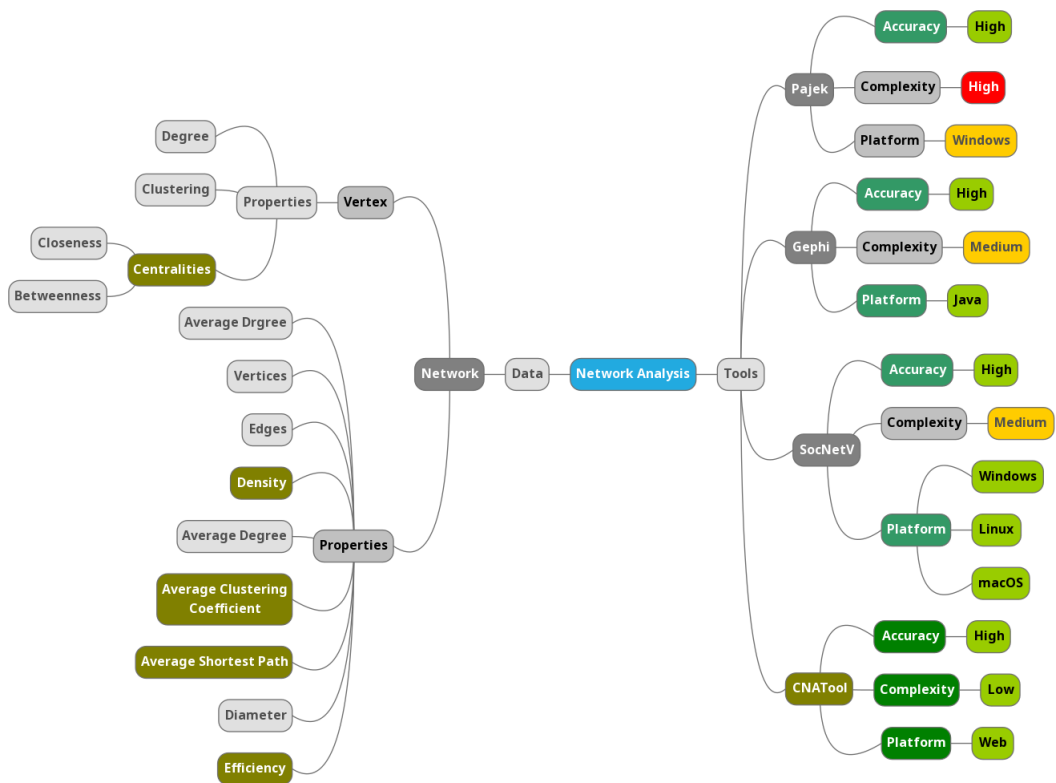


Figure 4: Mind map of the main concepts involved in social and complex network analysis.  
Source: Author.

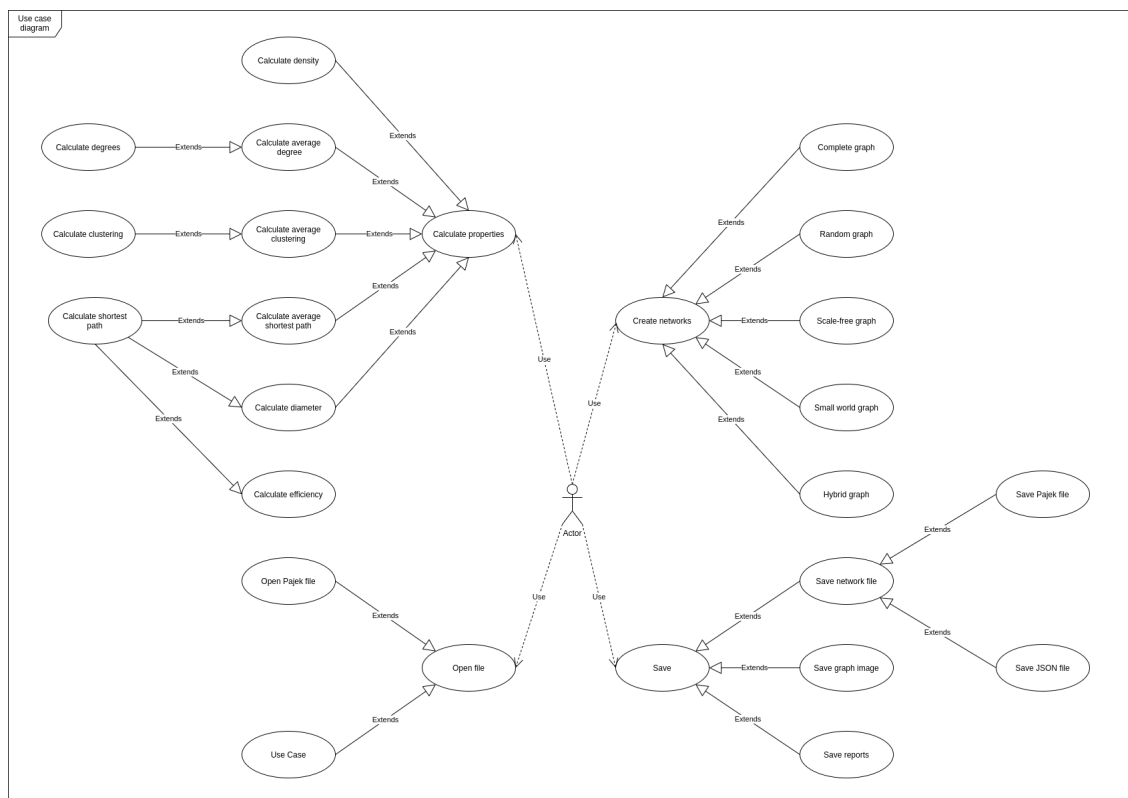


Figure 5: Use cases diagram for the CNATool program. Source: Author.

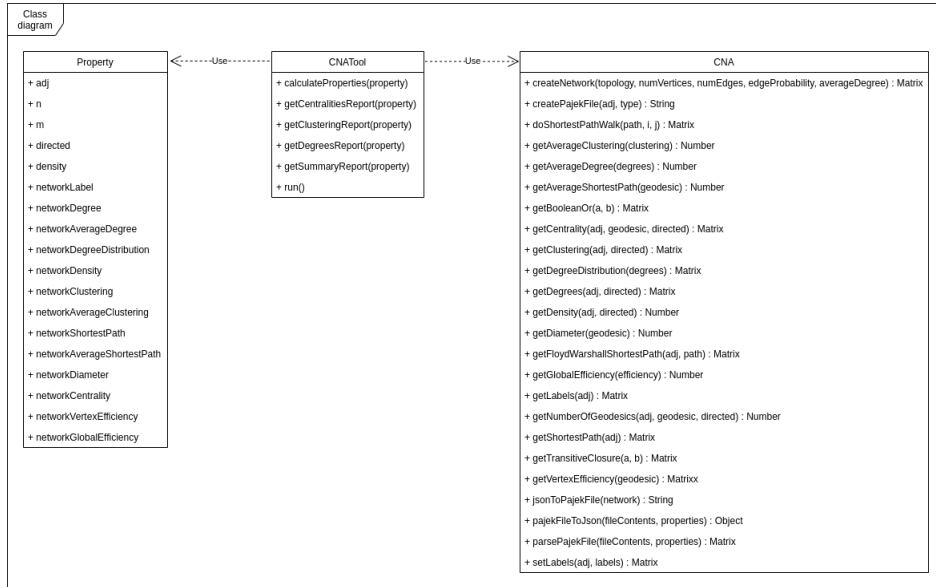


Figure 6: Class diagram for the CNATool program. Source: Author.

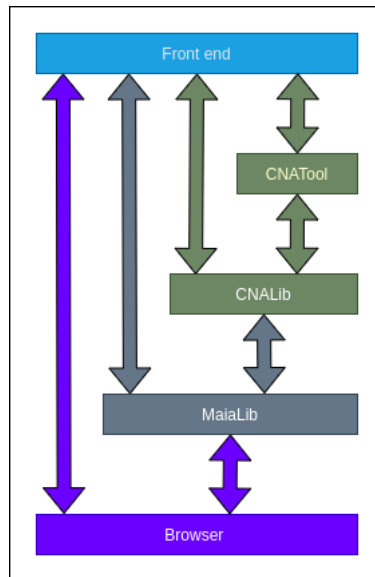


Figure 7: Architecture diagram for the CNATool program. Source: Author.

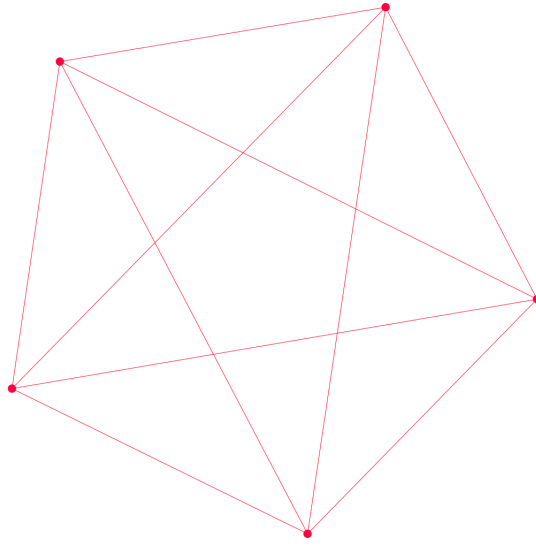


Figure 8: SA complete graph. Source Author.

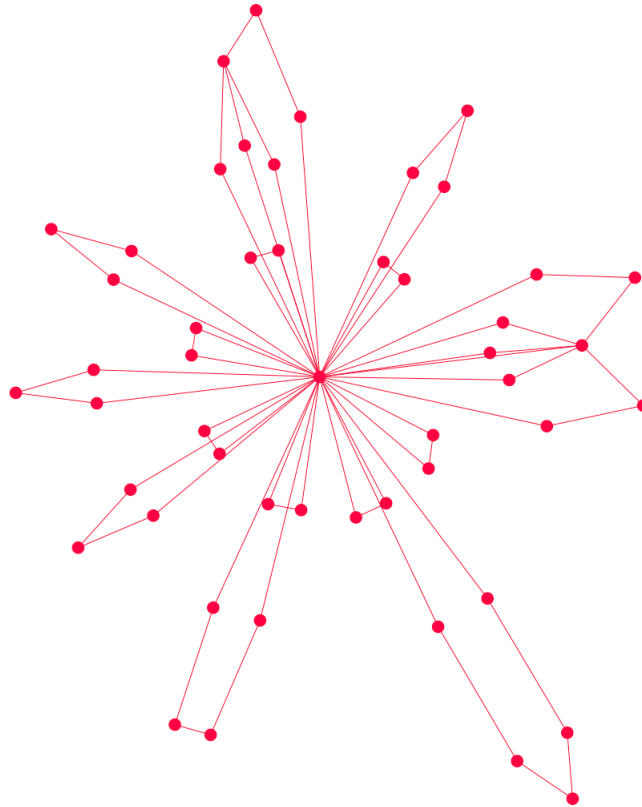


Figure 9: Scale-free network. Source Author.

17 *2.3. Sample code snippets analysis*

### 18 **3. Illustrative Examples**

19 Optional: you may include one explanatory video that will appear next  
20 to your article, in the right hand side panel. (Please upload any video as a  
21 single supplementary file with your article. Only one MP4 formatted, with  
22 50MB maximum size, video is possible per article. Recommended video  
23 dimensions are 640 x 480 at a maximum of 30 frames/second. Prior to  
24 submission please test and validate your .mp4 file at *http : //elsevier –*  
25 *apps.sciverse.com/GadgetVideoPodcastPlayerWeb/verification*. This tool  
26 will display your video exactly in the same way as it will appear on ScienceDi-  
27 rect.).

### 28 **4. Impact**

29 **This is the main section of the article and the reviewers weight**  
30 **the description here appropriately**

31 Indicate in what way new research questions can be pursued as a result  
32 of the software (if any).

33 Indicate in what way, and to what extent, the pursuit of existing research  
34 questions is improved (if so).

35 Indicate in what way the software has changed the daily practice of its  
36 users (if so).

37 Indicate how widespread the use of the software is within and outside the  
38 intended user group.

39 Indicate in what way the software is used in commercial settings and/or  
40 how it led to the creation of spin-off companies (if so).

### 41 **5. Conclusions**

42 Set out the conclusion of this original software publication.

### 43 **6. Conflict of Interest**

44 We wish to confirm that there are no known conflicts of interest associated  
45 with this publication and there has been no significant financial support for  
46 this work that could have influenced its outcome.



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52     preparation of the manuscript.

53 **References**

- 54 [1] A.-L. Barabási, R. Albert, Emergence of scaling in random networks,  
55     Science 286 (5439) (1999) 509–512. doi:10.1126/science.286.5439.509.