

# Scilab Toolbox Hackathon

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23 May 2020

The FOSSEE Team at IIT Bombay is conducting a Scilab Toolbox Hackathon by writing interfaces between established open source software and Scilab. The objectives are the following:

1. To enhance Scilab's capabilities through crowdsourcing
2. To give a platform to students/teachers/professionals who are good in this field to demonstrate their capabilities
3. To make Scilab more acceptable in the minds of students, faculty and industry

This report discusses the history of Scilab and Matlab like software. It then presents FOSSEE's work on Scilab. Some initial thoughts on the proposed hackathon are presented next. The report concludes with a set of criteria to accept proposals and to assess the completed task.

## 1 History of Scilab and Matlab like Software

In 1980, Prof. Cleve Moler of the University of New Mexico described a Fortran implementation of a software called MATLAB in an AFIPS'80 paper, *Design of an Interactive Matrix Calculator* [1]. The Fortran code, developed through funding from NSF and DOE was freely available for download - the concept of open source software was not even known at that time! The author of this write up indeed downloaded, compiled, and used it. As the idea incorporated in this software was excellent, there came commercial software CTRL-C and Matrix<sub>x</sub>, and an open source software Octave, based on similar principles. Prof. Moler started Mathworks in the mid 80s and redeveloped the idea of MATLAB commercially [2].

In a similar way, Scilab [3], earlier called as Blaise and Basile, was developed by INRIA in France [4]. Although Scilab was initially developed as proprietary software, it was released as open source software in 1994. After changing hands a few times, Scilab based professional services are now offered by the ESI group. Scilab is used extensively by many organisations. The extremely successful *The National Centre for Space Studies (CNES)* uses Scilab extensively [5], for example. As Scilab computations are also based on celebrated solvers, such as EISPACK, LINPACK and LAPACK, its computational results are as good as any other established commercial software.

## 2 FOSSEE's work on Scilab

In 2009, the National Mission on Education through ICT, an initiative of the Ministry of Human Resource Development (MHRD), started supporting the promotion of Scilab through the FOSSEE project. Indeed, the Mission Document explicitly mentions the need to replace commercial software, such as Matlab, with open source equivalents. The FOSSEE team chose Scilab for promotion, in preference to Octave [6], as the former has the graphical programming component Xcos, which is somewhat similar to Simulink.

The FOSSEE team has created a large amount of content through Crowdsourcing. It has come up with various models to motivate the contributors and to produce useful content [7, 8]. The FOSSEE team has done particularly well in promoting Scilab. The FOSSEE team has extended the capabilities of Scilab through the following activities:

1. Scilab Textbook Companion [9, 10]
2. Lab Migration [11]
3. Scilab on the Cloud [14]
4. Xcos on the Cloud [15]
5. Scilab Toolboxes [12, 13], explained in more detail next.

The FOSSEE team has succeeded in interfacing external open source routines with Scilab to arrive at Scilab Toolboxes, known as Atoms. Using this method, the following Toolboxes have been created by the FOSSEE team.

1. Scilab-Octave Toolbox: Through this toolbox, all functions of Octave and its toolboxes, except those functions that use the structure are available from Scilab.
2. Scilab Optimization Toolbox: This toolbox makes available many of the functions of the famous COIN-OR repository, including ITOPT.
3. We have now started an effort to interface useful Python functions with Scilab.

## 3 Scilab Toolbox Hackathon

Based on the above experience, we now propose to start a Scilab Toolbox Hackathon. The objective of this Hackathon is to bring useful and well established open source software as toolboxes to Scilab users. This will enhance the functionality of Scilab. Anyone who knows Scilab should be able to access such a software, once it is available as a Scilab Toolbox.

This proposal is based on the observation that there are thousands of useful open source software in the form of Python routines, R routines, C/C++ code, Fortran code, and so on. A team that wants to participate in the Hackathon has the following work elements:

1. Identifying useful open source software - this can be from any domain - sciences, any branch of engineering, etc. This task has to be done by a team member knowledgeable in the domain.

2. Interfacing the chosen software with Scilab. This task has to be done by a team member who is comfortable with interfacing two or more software components with each other. This is someone who has some CS/IT expertise, even though, they may be from application domains also.

A total of up to 4 people can form a team. The team members could be students, teachers, professionals, retired people, and so on.

## 4 Guidelines for a proposal

Teams will have a few days to identify the problem they want to solve, i.e., to identify the open source software (to be referred to simply as a software in the following discussion) to be brought in as a toolbox. The following parameters may be useful to assess a proposal

1. How many people use the target software?
2. For how long has the software been in existence?
3. Is there any published literature like journal article, or a conference paper, etc.?
4. Does the software have a forum?
5. Is the forum active?
6. How many downloads of the software have taken place?
7. How often is the software updated?
8. Is the software stable?
9. How big is the software? For example, how many lines of code does the software have?

We have to come up with some weights for the above to assess the proposals. The objective of the assessment is to eliminate frivolous proposals, and to encourage serious ones.

At the time of completion, we will have to assess the work. At that time also, the above parameters will be helpful. In addition, for assessment purposes, we can add the following parameters:

10. Does it run on operating systems, such as Linux, Windows and Mac OS/X?
11. Does the implementation give the same answer as in the native mode?
12. Is the toolbox stable?
13. How is the speed of computation in comparison with the native mode?
14. Is a sufficient number of examples have been demonstrated using the toolbox?
15. Is there a good documentation?
16. Does the community of the “software” like the implementation?

## References

- [1] C. Moler. Design of an interactive matrix calculator. In *AFIPS '80: Proceedings of the May 19-22, 1980, national computer conference*, pages 363–368. AFIPS, ACM, May 1980. available at <https://doi.org/10.1145/1500518.1500576>.
- [2] Mathworks Inc. Matlab. <https://www.mathworks.com>, Last seen on 15 May 2020.
- [3] ESI. Scilab. <http://www.scilab.org>, Last seen on 15 May 2020.
- [4] Scilab. History of Scilab. <https://www.scilab.org/about/company/history>, last seen on 15 May 2020.
- [5] T. Martin. Use of scilab for space mission analysis. [http://www.teratec.eu/library/pdf/actu\\_teratec/forum\\_2009/Scilab\\_08\\_TMartin\\_ScilabTec.pdf](http://www.teratec.eu/library/pdf/actu_teratec/forum_2009/Scilab_08_TMartin_ScilabTec.pdf). Last seen on 15 May 2020.
- [6] Octave. Gnu octave. <https://www.gnu.org/software/octave/>, Last seen on 15 May 2020.
- [7] K. M. Moudgalya. Crowdsourced Information Technology Content for Education and Employment. In *18th IEEE International Conference on Advanced Learning Technologies (ICALT 2018)*, pages 39–41, IIT Bombay, 2018.
- [8] Kannan M. Moudgalya, Usha Viswanathan, and Vineeta Ghavri. Fossee fellowship 2019: Results of crowdsourcing and performance based selection. In *2019 IEEE Tenth International Conference on Technology for Education (T4E)*, pages 94–101, Goa, 2019. T4E, IEEE.
- [9] R. D. Braatz. Scilab textbook companions. *IEEE Control Systems Magazine*, page 76, June 2014.
- [10] Scilab Team. Completed Scilab TBC, 2020. [https://scilab.in/Completed\\_Books](https://scilab.in/Completed_Books), last seen on 15 May 2020.
- [11] Scilab Team. Lab migration project. [http://www.scilab.in/Lab\\_Migration\\_Project](http://www.scilab.in/Lab_Migration_Project), Last seen on 15 May 2020.
- [12] S. Mohanan, I. Arora, and K. M. Moudgalya. Developing Scilab Toolboxes, A Multi-FOSS Approach. In *Indian Control Conference (ICC)*, pages 176–181. IEEE, 2017.
- [13] Scilab Team. FOSSEE Scilab Toolbox. <https://scilab.in/fossee-scilab-toolbox>, last seen on 15 May 2020.
- [14] FOSSEE. Scilab execution on the cloud, Created in July 2011, Last seen on 15 May 2020. <http://cloud.scilab.in>.
- [15] Scilab Team. Xcos on the cloud. <https://xcos.fossee.in/>, Last seen on 15 May 2020.