Abstract

The first OSS was designed in 1983 by Richard Stallman, who launched the GNU Project, a significant technical breakthrough that laid the foundation for the free software movement. Ever since then, this term pops up everywhere, but do people really know what it means? Well, according to Richard Stallman, the essence of free software is not about the software being free of charge but about the freedom it grants to users. Stallman defines free software the following way:

Definition 1 *"software that respects users' freedom and community," which means users have the freedom to run, copy, distribute, study, change and improve the software [1].*

A more technical approach to understand the physical concept of open source software can be found on *https://opensource.com/resources/what-open-source*, which is the following:

Definition 2 *Open source software is software with source code that anyone can inspect, modify, and enhance. "Source code" is the part of software that most computer users don't ever see; it's the code computer programmers can manipulate to change how a piece of software, a "program" or "application" works. Programmers who have access to a computer program's source code can improve that program by adding features to it or fixing parts that don't always work correctly.*

While the importance of OSS is well-documented and much is known about the growth patterns of individual projects, there remains a significant gap in understanding how OSS ecosystems of interdependent software projects develop and evolve. This thesis aims to bridge this gap by describing a mathematical model to analyze the dynamics of OSS ecosystems. The model will focus on interactions within the ecosystem, such as how projects influence one another. By leveraging data from major OSS repositories and applying system dynamics and network analysis techniques, this study seeks to offer novel insights into the scalable growth and interconnectivity of OSS ecosystems, thus providing a comprehensive framework for both academic researchers and industry practitioners to better understand and foster the development of open source projects.