**Title** : SOFTWARE MAINTENANCE AT COMMIT-TIME

**Student**: Mathieu Nayrolles (7164602), Electrical & Computer Engineering

**Abstract :**Software maintenance activities such as debugging and feature enhancement are known to be challenging and costly, which explains an ever growing line of research in software maintenance areas including mining software repository, default prevention, clone detection, and bug reproduction. The main goal is to improve the productivity of software developers as they undertake maintenance tasks. Existing tools, however, operate in an offline fashion, i.e., after the changes to the systems have been made. Studies have shown that software developers tend to be reluctant to use these tools as part of a continuous development process. This is because they require installation and training, hindering their integration with developers’ workflow, which in turn limits their adoption. In this thesis, we propose novel approaches to support software developers at commit-time. As part of the developer's workflow, a commit marks the end of a given task. We show how commits can be used to catch unwanted modifications to the system, and prevent the introduction of clones and bugs, before these modifications reach the central code repository. We also propose a bug reproduction technique that is based on model checking and crash traces. Furthermore, we propose a new way for classifying bugs based on the location of fixes that can serve as the basis for future research in this field of study. The techniques proposed in this thesis have been tested on over 400 open and closed (industrial) systems, resulting in high levels of precision and recall. They are also scalable and non-intrusive.