An Analysis of Risk in Open-Source Project Dependencies

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Introduction

- Popularity of Open Source Software has shown a steady increase over time
  - 3.6 million repos depend on the top 50 open-source projects
- The use comes with the risk of software vulnerabilities
  - Attackers can exploit these
- Prediction of risk is important for this
  - Software metrics
  - Project Activity
  - Vulnerability Data

Research Questions

Question 1:

Are there feature combinations that can be made from risk prediction methods that could provide developers with a more effective risk measure that allows them to minimise risk when choosing between multiple candidate open-source components?

Question 2:

Can a visual dependency tree be created for a project consisting of colour-coded nodes based on the predicted risks?

Background Research

Vulnerability Propagation

Project Metadata Analysis

Vulnerability CVE Data Analysis

Case Studies

Log4j Vulnerability

- ➔ Discovered in November 2021 in popular logging library
- ➔ Gateway to gain control of the machine
- ➔ Many projects unaware they were affected

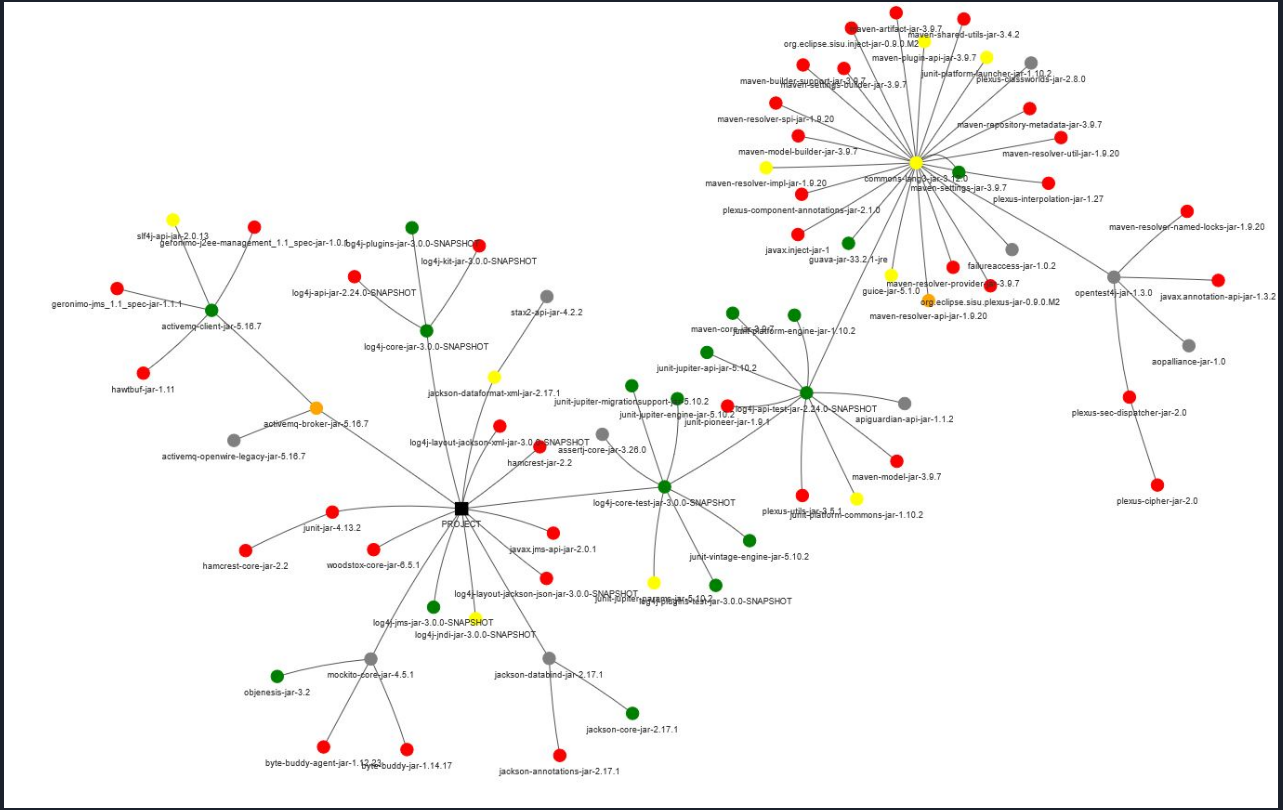
Heartbleed Vulnerability

- ➔ Discovered in April 2014 in popular cryptography library
- ➔ Receive private information after crafting similar messages
- ➔ Many servers unaware they were affected

Methodology

Results

Example Final Graph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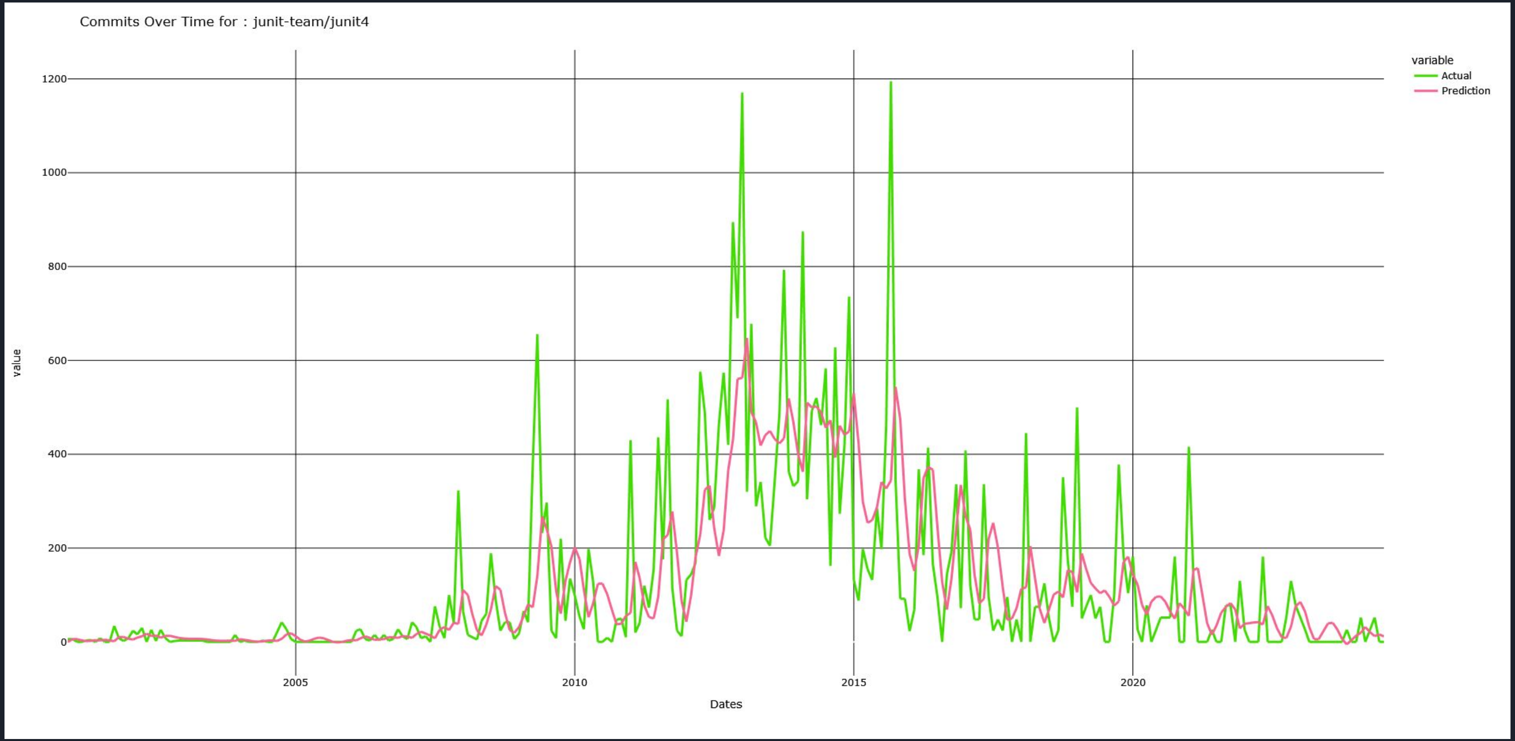
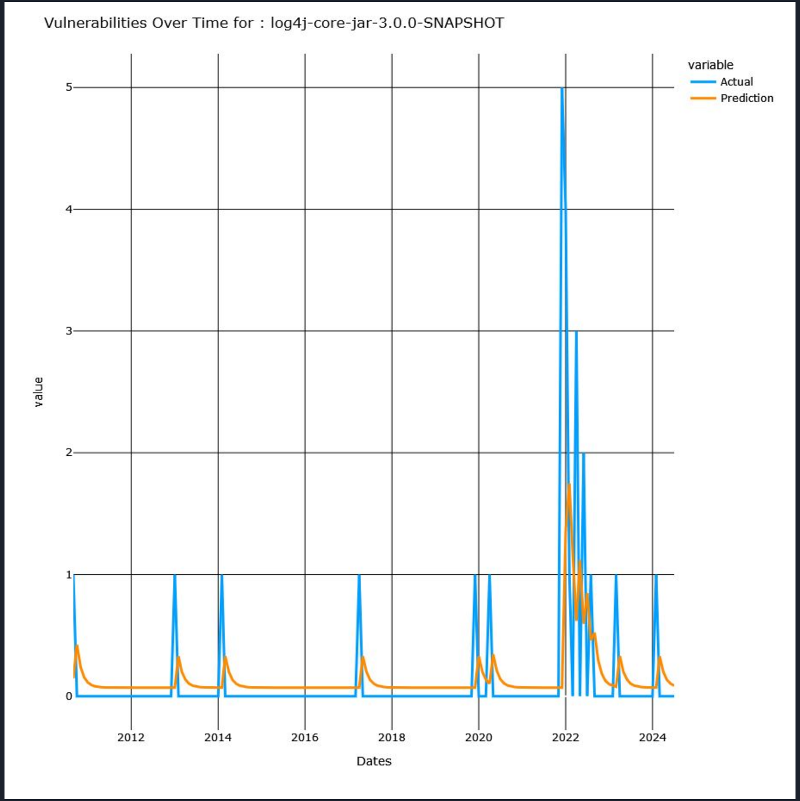
Example Graph of Project Activity Risk Prediction



Example Graph of Vulnerability Risk Prediction



Technical Challenges

Student Contribution

Róisín Ní Bhriain

➔ Gitlab setup + Issues

➔ Literature Review

➔ Software

➔ Practicum Paper First + Second Draft

Sneha Dechamma Mallengada Suresh

➔

Conclusion

References

Thank You For Listening!