Toward a Reliability Measurement Framework Automated Using Deep Learning

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Goal

• Most sophisticated reliability and vulnerability software measurement models and frameworks require a heavy amount of manual tasks to produce valid results.

• We hope to use deep learning to automate these manual tasks to make such models and frameworks practical.

Word Embeddings

• We are unable to perform deep learning tasks directly on code elements as they are text with no meaningful underlying numerical representation.

• We created word embeddings to represent code elements with real-valued vectors.

• Given source code, it is first transformed to an abstract syntax tree (AST) representation, then the AST is walked with Word2Vec (an algorithm based on skip-gram) performed for each node.

• Word embeddings were performed for JDK8 (15,355 unique code elements) and achieved a lowest loss of 2.69 and perplexity of 14.80.

Future Work

• While the word embeddings achieved seem adequate, we will continue to refine them since all learning tasks are heavily affected by the quality of the word embeddings.

• We will begin to perform learning tasks to automate our framework: detection of semantic vulnerabilities, enforcement of natural language policies, classification of bugs to abstract quality aspects, and bug detection.