# Untangling the Knot: Enabling Rapid Software Evolution

James Ivers

January 11, 2022

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213

This material is based upon work funded and supported by the Department of Defense under Contract No. FA8702-15-D-0002 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center.



DM22-0021

# Knot: an Automated Refactoring Assistant

The SEI has created a prototype refactoring assistant (TRL 4-5) that aims to reduce the time and effort for several common refactoring tasks.

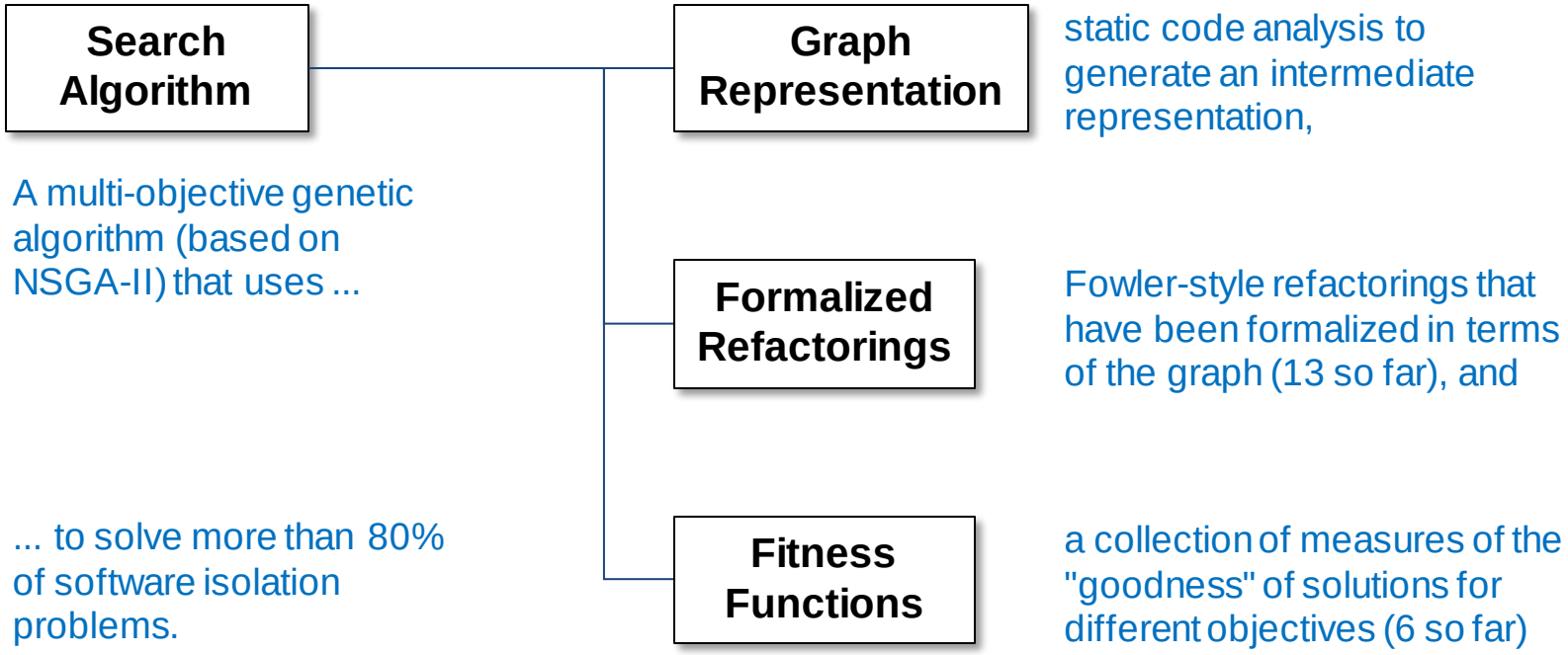
- Works on C# (now) and Java (this quarter) source code
- Scales to at least 1.2M LOC
- Reduces problematic couplings by more than 80%

Many evolution projects start with a common problem – isolating software:

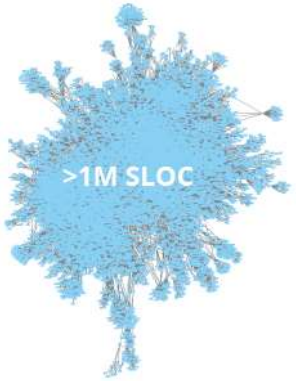
- Reusing capability in a different system or rehosting on a different platform
- Factoring out common capability as a shared asset
- Decomposing a monolith into more modular code
- Migrating capabilities to a cloud or microservice architecture

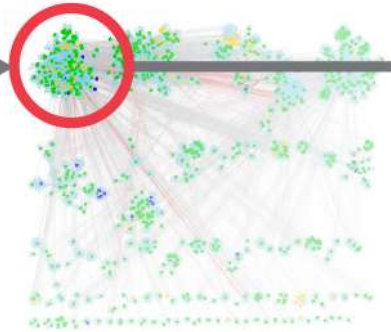
We are looking for collaborators with C# or Java code and suitable challenges.

# SEI's Automated Refactoring Assistant



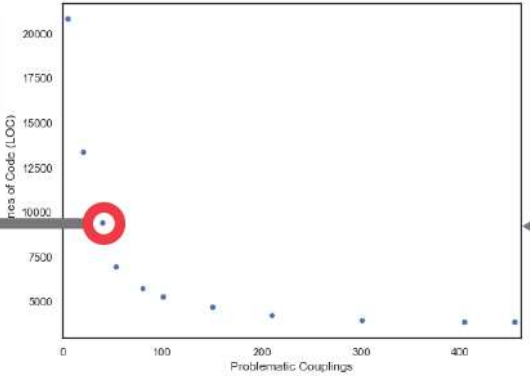
# Generating Refactoring Recommendations



**Select Objectives**
- minimize problematic couplings
- minimize code changes
- maximize code quality
- ...

Our prototype uses a multi-objective genetic algorithm to generate a set of Pareto-optimal solutions (recommendations)




Select and implement a solution that suits your context.