Android Application Similarity in Five Minutes

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27.09.2012

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Introduction

Definition

Semantic similarity or semantic **relatedness** is a concept whereby a set of documents or terms within term lists are **assigned a metric** based on the likeness of their meaning / semantic content. - Wikipedia

Motivation

1. IP theft
2. Malware detection
3. Fun

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→ We want to calculate the similarity between Android applications

Objects to deal with

Dex Object Format

- Strings
- Classes/Types
- Fields
- **Methods**
- Some other data

What is a Method?

0x00somerandombinarystring0x00

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0x00somerandombinarystring0x00
$\rightarrow$ We just don't care for now

Distance Metric

Edit/Levenshtein Distance

String 1: abcdefg
String 2: axbgg
Edits: Insertion, Deletion, Substitution

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3. abc**d**gg $\rightarrow$ Insertion
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$\rightarrow$ Distance between String 1 and String 2 is 5 Edits

Distance Metric

Map Distance to similarity value to the interval $[0, 1]$

$$f_{sim}(s_1, s_2) = \frac{edits(s_1, s_2)}{max(|s_1|, |s_2|)}$$ f(abcdefg,axbgg) = 0.7,

$\rightarrow$ 0 would mean equality

Find the global Optimum

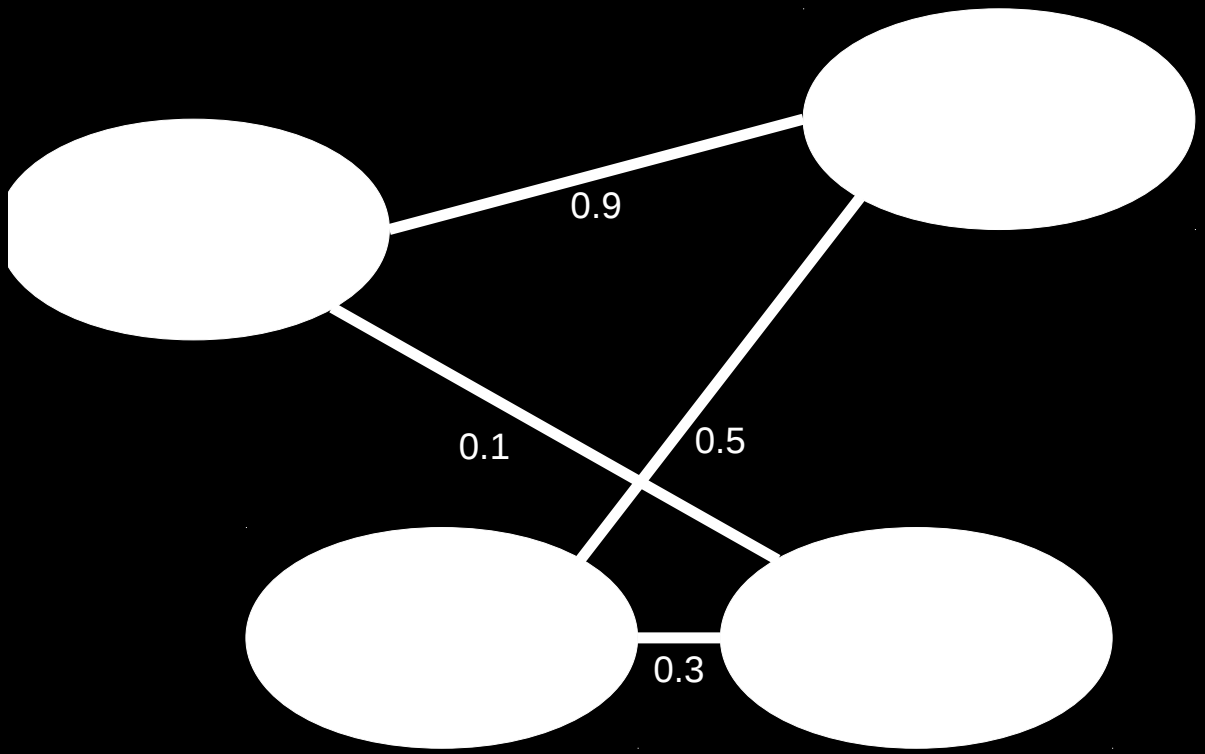
Situation

We got:

1. A set of methods from application 1 (a_1)
2. A set of methods from application 2 (a_2)
3. $f_{sim}(s1, s2) | s1 \in a_1, s2 \in a2$

Naive Approach

Decide locally after minimum cost candidate



Correct Solution^{TM}

- Use munkres algorithm to find global minimum in $O(n^3)$

Conclusion

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We've learned

- *one* way to calculate the similarity of binary strings
- *one* way to find the global optimum between sets of methods

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