Algorithm Selection for Maximum Common Subgraph

'aulius Dilka

Algorithm selection

Labelling

Algorithms

Doculto

What happens when labelling changes?

Algorithm Selection for Maximum Common Subgraph

Paulius Dilkas

FATA seminar

16th January 2018

Outline

Algorithm Selection for Maximum Common Subgraph

Algorithm selection

Labelling

Algorithms

Random forests

Results

Algorithm selection

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Results

What happens when labelling changes?

Definition (Bischl et al. 2016)

Given a set \mathcal{I} of problem instances, a space of algorithms \mathcal{A} , and a performance measure $m \colon \mathcal{I} \times \mathcal{A} \to \mathbb{R}$, the algorithm selection problem is to find a mapping $s \colon \mathcal{I} \to \mathcal{A}$ that optimises $\mathbb{E}[m(i,s(i))]$.

Algorithm selection

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LLAMA (Kotthoff 2013)



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Result

What happens when labelling

Data from Foggia, Sansone and Vento 2001; Santo et al. 2003

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Data from Foggia, Sansone and Vento 2001; Santo et al. 2003

Definition

A graph G = (V, E) is said to have a p% (vertex) labelling if

$$N = \max\left\{2^n : n \in \mathbb{N}, \, 2^n < \left\lfloor rac{p}{100\%} imes |V|
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- 5% labelling 20 vertices per label (on average)
- 50% labelling 2 vertices per label (on average)

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- 5% labelling 20 vertices per label (on average)
- 50% labelling 2 vertices per label (on average)
- 3 subproblems
 - no labels
 - vertex labels
 - vertex and edge labels

Distribution of vertices per label

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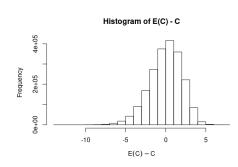
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For each graph and label

- C is the number of vertices with that label
- E(C) is the number we would expect from a (discrete) uniform distribution

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Reculto

Results

- McSplit, McSplit↓
 - (McCreesh, Prosser and Trimble 2017)
- clique encoding
 - (McCreesh, Ndiaye et al. 2016)
- k ↓
 - (Hoffmann, McCreesh and Reilly 2017)

Random forests

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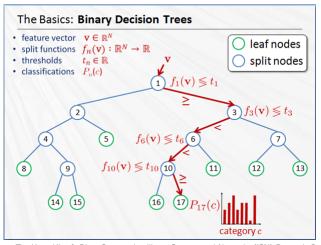
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Algorithm

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forests Results

What happens when labelling changes?



Source: Tae-Kyun Kim & Bjorn Stenger, Intelligent Systems and Networks (ISN) Research Group, Imperial College London

Results

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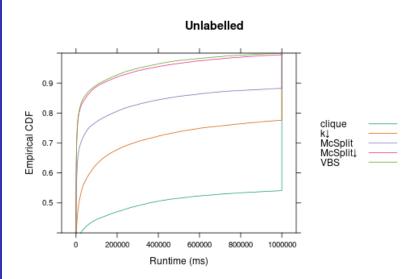
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Random

Results



Results (27%)

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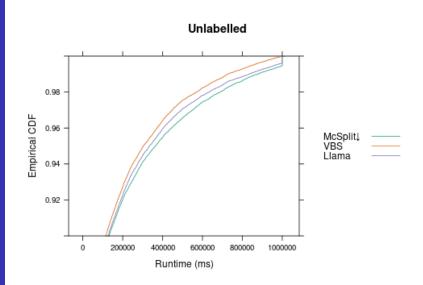
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Results

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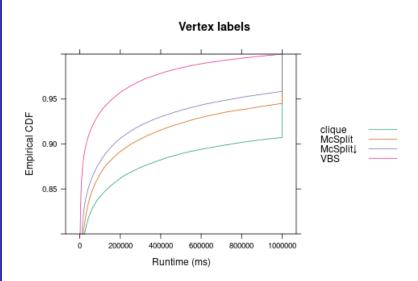
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Results (86%)

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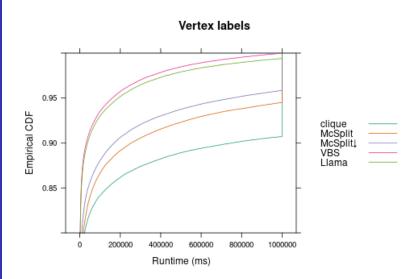
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Results

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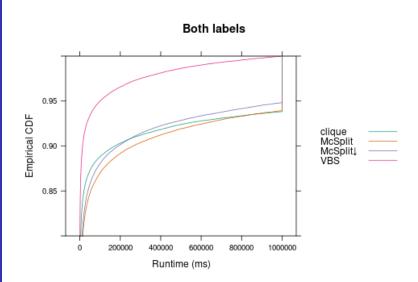
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Results (88%)

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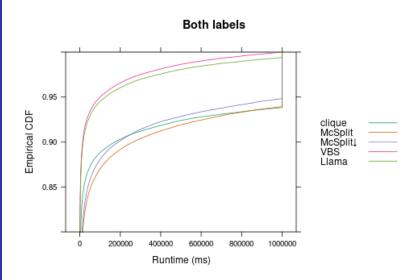
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Results

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Results

- Most important features
 - labelling percentage
 - standard deviation of degrees (for both graphs)

Errors

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What happens when labelling changes?

- Out-of-bag
- ullet (for each algorithm) 1- recall

Definition

For an algorithm A, recall is

the number of instances that were correctly predicted as A the number of instances where A is the correct prediction

Errors (%)

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Error	Labelling		
	no	vertex	both
out-of-bag	17	13	14
clique	30	8	7
McSplit	29	22	29
$McSplit \downarrow$	11	11	11
$k\downarrow$	80		

Convergence of errors for unlabelled graphs

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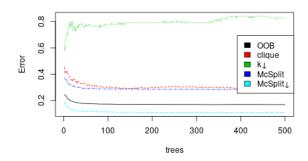
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What happens when labelling



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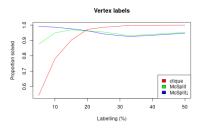
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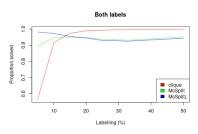
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