Polyadic Concept Analysis

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Polyadic Concept Analysis

What is it?

A Python module for polyadic concept analysis

Where can I find it?

- alexandrebazin.com
- github.com/Authary/PCA

What does it do?

Okay so...

	s	vc	mc	s	vc	mc	s	vc	mc
$A : MyManga$	×			×		×			×
$B : MangaStore$	×			×					
$C : MangaHome$	×	×				×		×	×
	$FinalUser$			$Administrator$			$ProductManager$		

n-concepts:

$(\{A, B\}, \{search\}, \{FinalUser, Administrator\}),$

$(\{A, B, C\}, \{search\}, \{FinalUser\})$

$(\{C\}, \{search, viewComment\}, \{FinalUser\})$

...

Polyadic Concept Analysis

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$A : MyManga$	×			×		×			×
$B : MangaStore$	×			×					
$C : MangaHome$	×	×				×		×	×
	$FinalUser$			$Administrator$			$ProductManager$		

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Polyadic Concept Analysis

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...

Input

A formal context in the form (Incidence relation,|Dim 1|, ...,|Dim n|)

Output

A list of the n-concepts (no orders)

Efficiency

Good

Implications

What?

Computes two implication bases

- ▶ Proper premises
- ▶ Canonical base

Efficiency

Okay+: Next Closure for the canonical base, hypergraph dualization through external tool for proper premises

As found in

On Implication Bases in n-Lattices. Alexandre Bazin. Discrete Applied Mathematics 2020.

Association Rules

What?

Computes a base of n-ary association rules

Efficiency

Okay-: Requires ordering the n-concepts by inclusion on their $n - 1$ last components

As found in

Condensed Representations of Association Rules in n-ary Relations. Alexandre Bazin, Nicolas Gros, Aurélie Bertaux, Christophe Nicolle. IEEE Transactions on Knowledge and Data Engineering 2022.

Introducer Concepts

What?

Computes introducer concepts

Efficiency

Good

As found in

Reduction and Introducers in d-contexts. Alexandre Bazin and Giacomo Kahn. ICFCA 2019.

What?

Plants	s	m	t	ℓ	s	m	t	ℓ
Citrus (C)	×	×			×	×		
Alpinia (A)			×	×		×	×	
Pelagonium (P)	×	×				×	×	
Laphangium (L)			×	×			×	×
			Root				Leaf	

Areas	Forests (F)	Desert (D)	Grassland (G)
Europe (Eu)	×	×	
Africa (Af)	×	×	
Asia (As)	×		×
America (Am)	×	×	×

GrowsIn = {(C,Eu),(C,Af),(A,Eu),(A,Am),(P,As),(L,Eu)}

Efficiency

Meh: the scaling part is a bit too naive
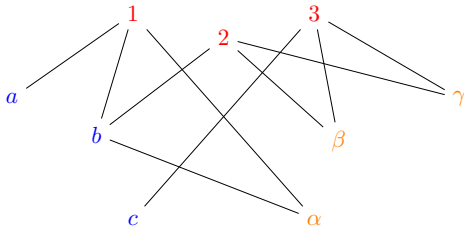
As found in

Polyadic Relational Concept Analysis. Alexandre Bazin, Jessie Galasso-Carbonnel, Giacomo Kahn. International Journal of Approximate Reasoning 2024.

What?

Computes the maximal complete m-partite subgraphs of a k-partitioned graph

Efficiency

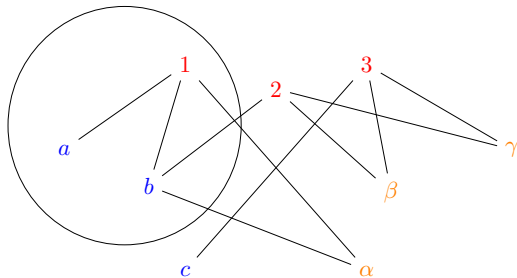Okay but might be bugged

As found in

k-Partite Graphs as Contexts. Alexandre Bazin and Aurélie Bertaux. CLA 2018.

k-partite Graphs as Contexts

What?

Computes the maximal complete m-partite subgraphs of a k-partitioned graph

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Okay but might be bugged

Summary

- n-concepts: Good
- Introducers: Good
- Implications: Okay
- Association rules: Okay
- Graphs: Okay
- Relational: Meh

Coming soon!

- ▶ Performance improvements
- ▶ Better n-dimensional implications
- ▶ Distances between PCA structures

There:

https://alexandrebazin.com