coli-ana

Automatic analysis of the Dewey Decimal Classification
A service of the Verbundzentrale GBV (VZG)

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ELAG conference 2022-07-08

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Agenda

- Project Colibri
- Dewey Decimal Classification (DDC)
- coli-ana: automatic analysis of the DDC numbers
- Challenges
- Workflow
- Use cases
- Technical Aspects

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Initiated by Dr. Ulrike Reiner (2003)

Colibri Project

Funded by the VZG

Context Generator & Linguistic Tools for Bibliographic Retrieval Interface

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Colibri Research Questions

Is it possible to…

Q1. ...**classify automatically** bibliographic title records using DDC?

Q2. …**analyse automatically** molecular DDC notations
into atomic DDC notations?

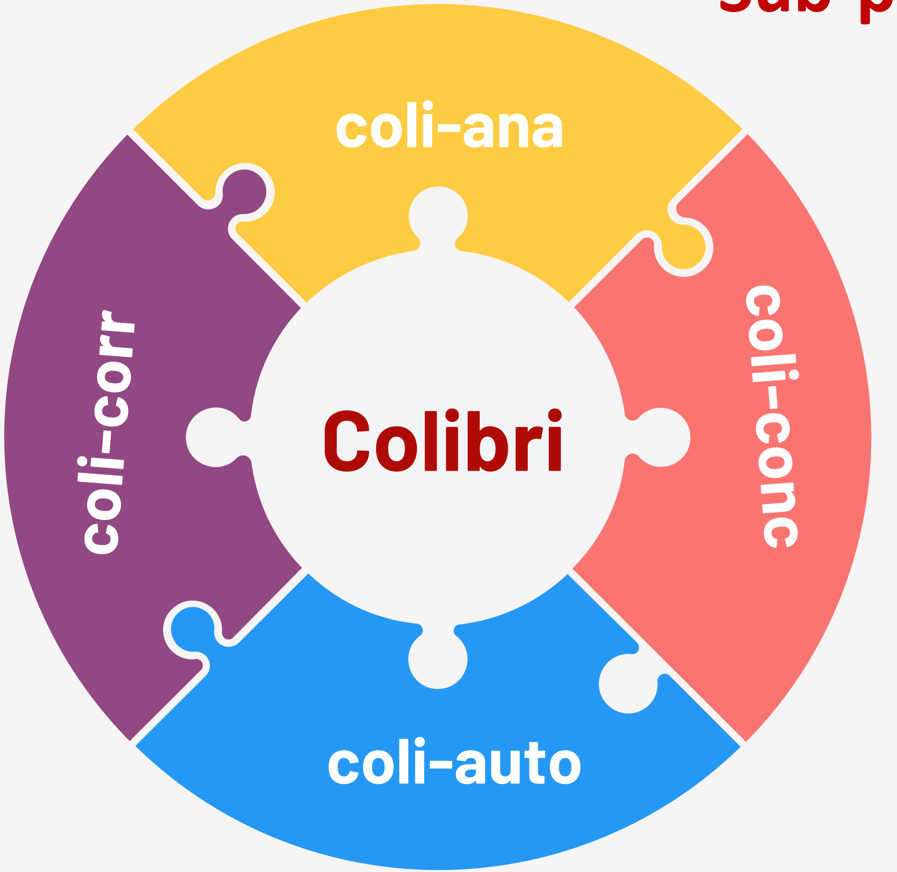
Q3. …**improve automatic classification & retrieval**
by means of atomic DDC notations?

atomic DDC notation: a semantically indecomposable notation that represents a DDC class

molecular DDC notation: a notation that is syntactically decomposable into atomic DDC notations

DDC notation: dno

Sub-projects



coli-ana

coli-corr

Colibri

coli-conc

coli-auto

🟨 coli-ana - automatic analysis

🟥 coli-conc - concordances

🟪 coli-corr - correctness

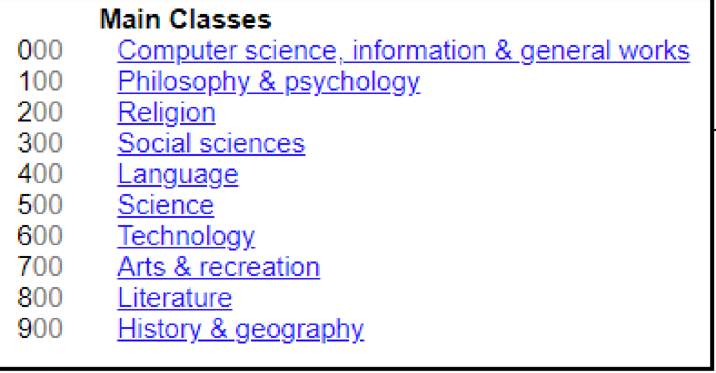
🟦 coli-auto - automatic classification

Template by HiSlide.io

DDC

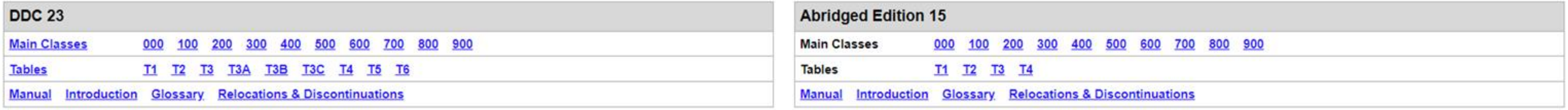
- **Actively in use** over a century
- **Large user community** worldwide
- VZG member of the **Dewey Consortium** in 2000
- **Strong representation** in Europe: EDUG User group
- **Dynamic system**
- **Rich system, precisely structured notations**
- **Huge influx** of Dewey numbers into the K10lus Catalog from external data
- **At least 1 Mio. unique DDC** built numbers in K10plus Catalog

DDC System and numbers



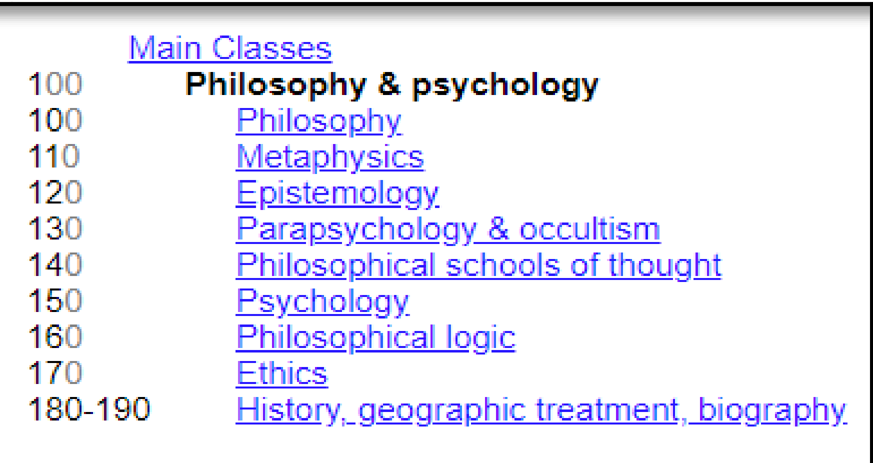
Main Classes

000	Computer science, information & general works
100	Philosophy & psychology
200	Religion
300	Social sciences
400	Language
500	Science
600	Technology
700	Arts & recreation
800	Literature
900	History & geography



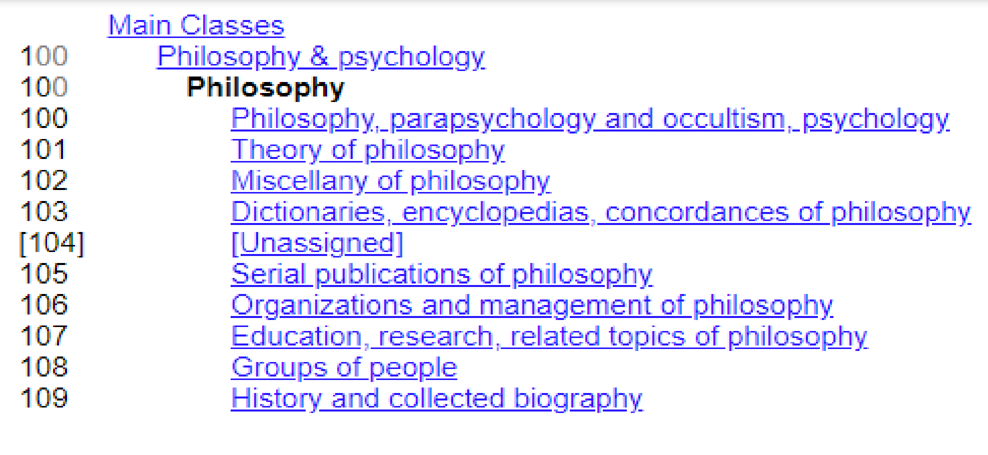
DDC 23	
Main Classes	000 100 200 300 400 500 600 700 800 900
Tables	T1 T2 T3 T3A T3B T3C T4 T5 T6
Manual Introduction Glossary Relocations & Discontinuations	

Abridged Edition 15	
Main Classes	000 100 200 300 400 500 600 700 800 900
Tables	T1 T2 T3 T4
Manual Introduction Glossary Relocations & Discontinuations	



Main Classes

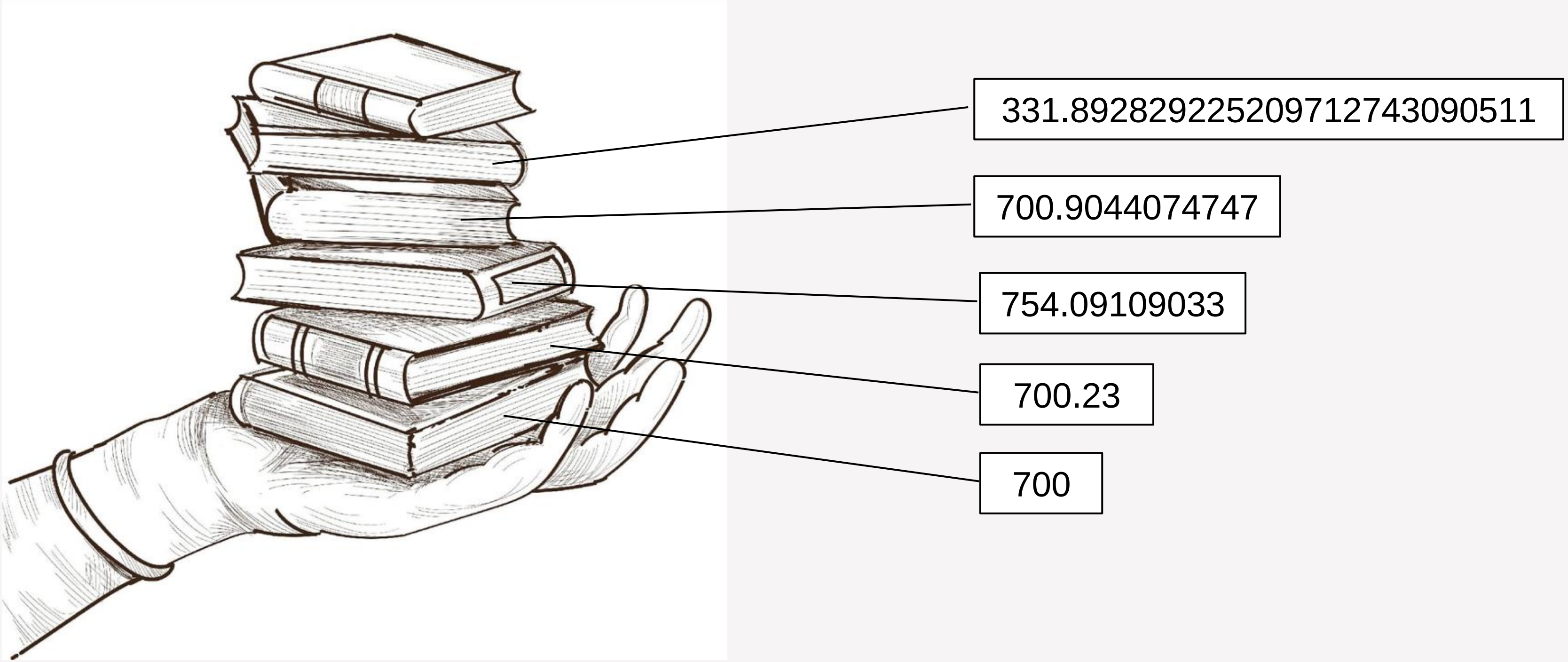
100	**Philosophy & psychology**
100	Philosophy
110	Metaphysics
120	Epistemology
130	Parapsychology & occultism
140	Philosophical schools of thought
150	Psychology
160	Philosophical logic
170	Ethics
180-190	History, geographic treatment, biography



Main Classes

100	Philosophy & psychology
100	**Philosophy**
100	Philosophy, parapsychology and occultism, psychology
101	Theory of philosophy
102	Miscellany of philosophy
103	Dictionaries, encyclopedias, concordances of philosophy
[104]	[Unassigned]
105	Serial publications of philosophy
106	Organizations and management of philosophy
107	Education, research, related topics of philosophy
108	Groups of people
109	History and collected biography

Complexity of the DDC numbers



331.89282922520971274309051 1

700.9044074747

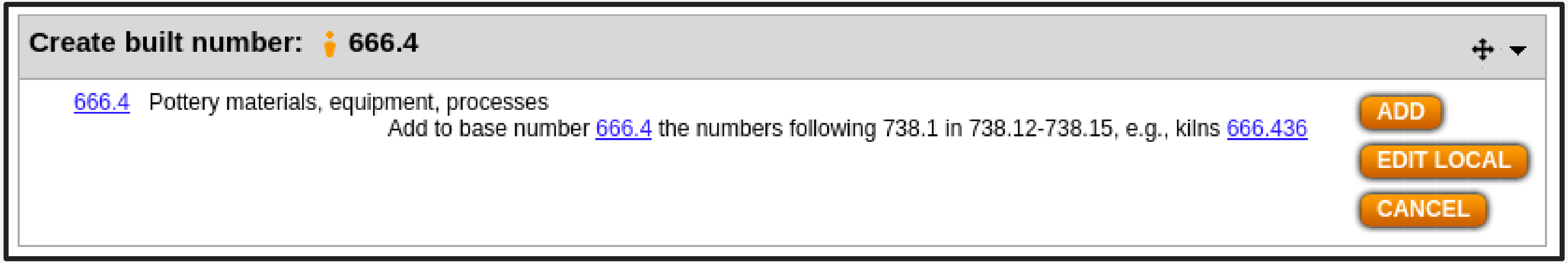
754.09109033

700.23

700

DDC number building

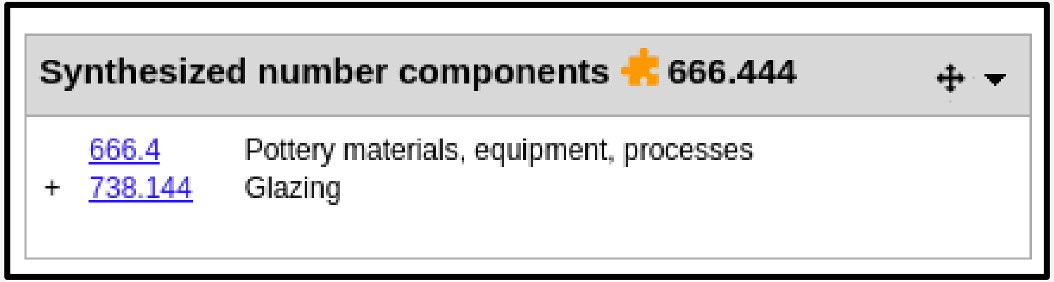
Finely structured and precise numbers can be composed from the multiple parts of the DDC **based on complex rules**



Create built number: 666.4

666.4 Pottery materials, equipment, processes

Add to base number 666.4 the numbers following 738.1 in 738.12-738.15, e.g., kilns 666.436



Synthesized number components 666.444

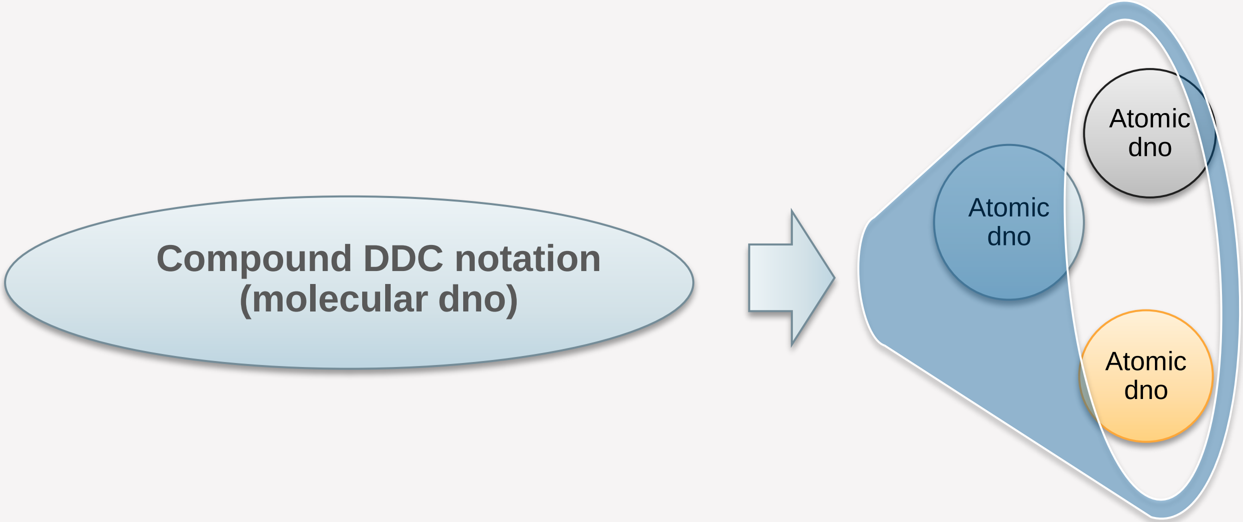
	666.4	Pottery materials, equipment, processes
+	738.144	Glazing

Pottery glazing technology

666.4 + 738.1**44** ⇒ **666.444**

coli-ana

A tool for automatic analysis of synthesized DDC notations



Compound DDC notation (molecular dno)

Objectives

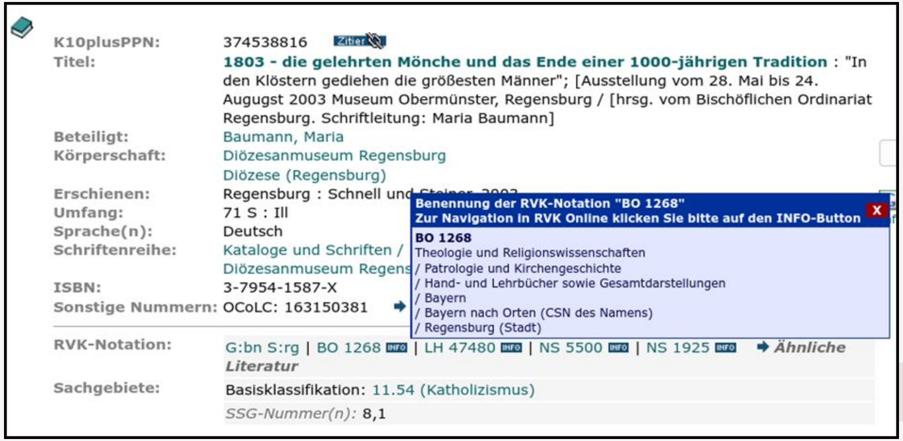
Improve Retrieval

- Support of search terms (atomic dnos) **Example:** T1--09044 (DDf *1940-1949) returns all titles that are in any way related to the 1940s
- Extension to full text search through captions (all captions contained in a sythesized dno)
- Assessment and ranking of similar publications

Analyse & enhance subject indexing

Example: DDC 700 "Arts" and T1--0901-0905:074 "Museums, collections, exhibitions" => BC 20.13 "Art exhibition".

Improve the presentation in the catalogue



K10plusPPN:	374538816 Zitier
Titel:	**1803 - die gelehrten Mönche und das Ende einer 1000-jährigen Tradition** : "In den Klöstern gediehen die größesten Männer"; [Ausstellung vom 28. Mai bis 24. Augugst 2003 Museum Obermünster, Regensburg / [hrsg. vom Bischöflichen Ordinariat Regensburg. Schriftleitung: Maria Baumann]
Beteiligt:	Baumann, Maria
Körperschaft:	Diözesanmuseum Regensburg Diözese (Regensburg)
Erschienen:	Regensburg : Schnell und Steiner, 2003
Umfang:	71 S : Ill
Sprache(n):	Deutsch
Schriftenreihe:	Kataloge und Schriften / Diözesanmuseum Regens
ISBN:	3-7954-1587-X
Sonstige Nummern:	OCoLC: 163150381
RVK-Notation:	G:bn S:rg | BO 1268 INFO | LH 47480 INFO | NS 5500 INFO | NS 1925 INFO ➡ *Ähnliche Literatur*
Sachgebiete:	Basisklassifikation: 11.54 (Katholizismus) *SSG-Nummer(n):* 8,1

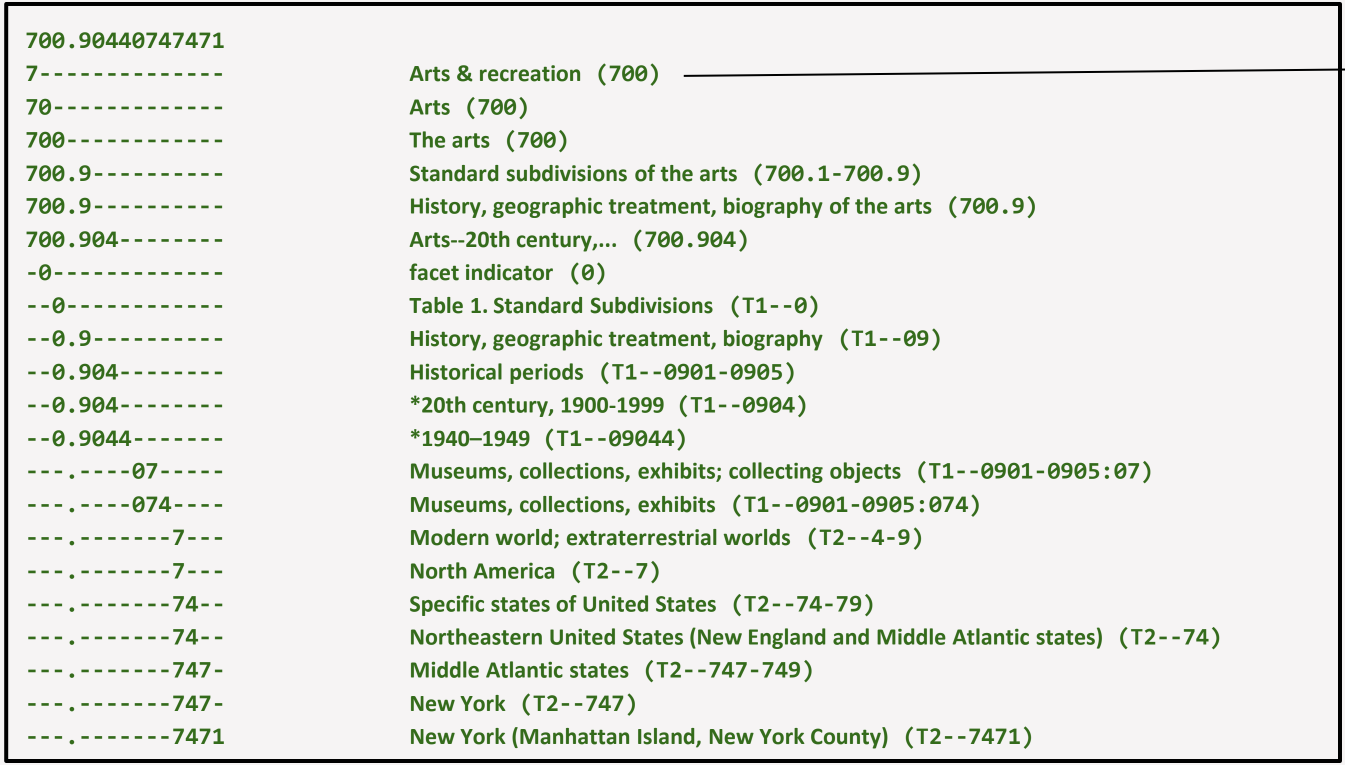
Benennung der RVK-Notation "BO 1268"
Zur Navigation in RVK Online klicken Sie bitte auf den INFO-Button X

BO 1268
Theologie und Religionswissenschaften
/ Patrologie und Kirchengeschichte
/ Hand- und Lehrbücher sowie Gesamtdarstellungen
/ Bayern
/ Bayern nach Orten (CSN des Namens)
/ Regensburg (Stadt)

Challenges in automatic analysis

- **Extensive System** with over **51.700** classes
- **Complex number building** system
  - Main schedule, six tables and other auxillary tables
  - Standard subdivisions, notes
  - **Over 9.987 instructions** (e.g. add note, authorisation, discontinuation, include note, class here, class elsewhere, revision,…)
    - Bundled into 60 rule parts
- **Possibility to build** fine and accurate DDC numbers that can get very lengthy

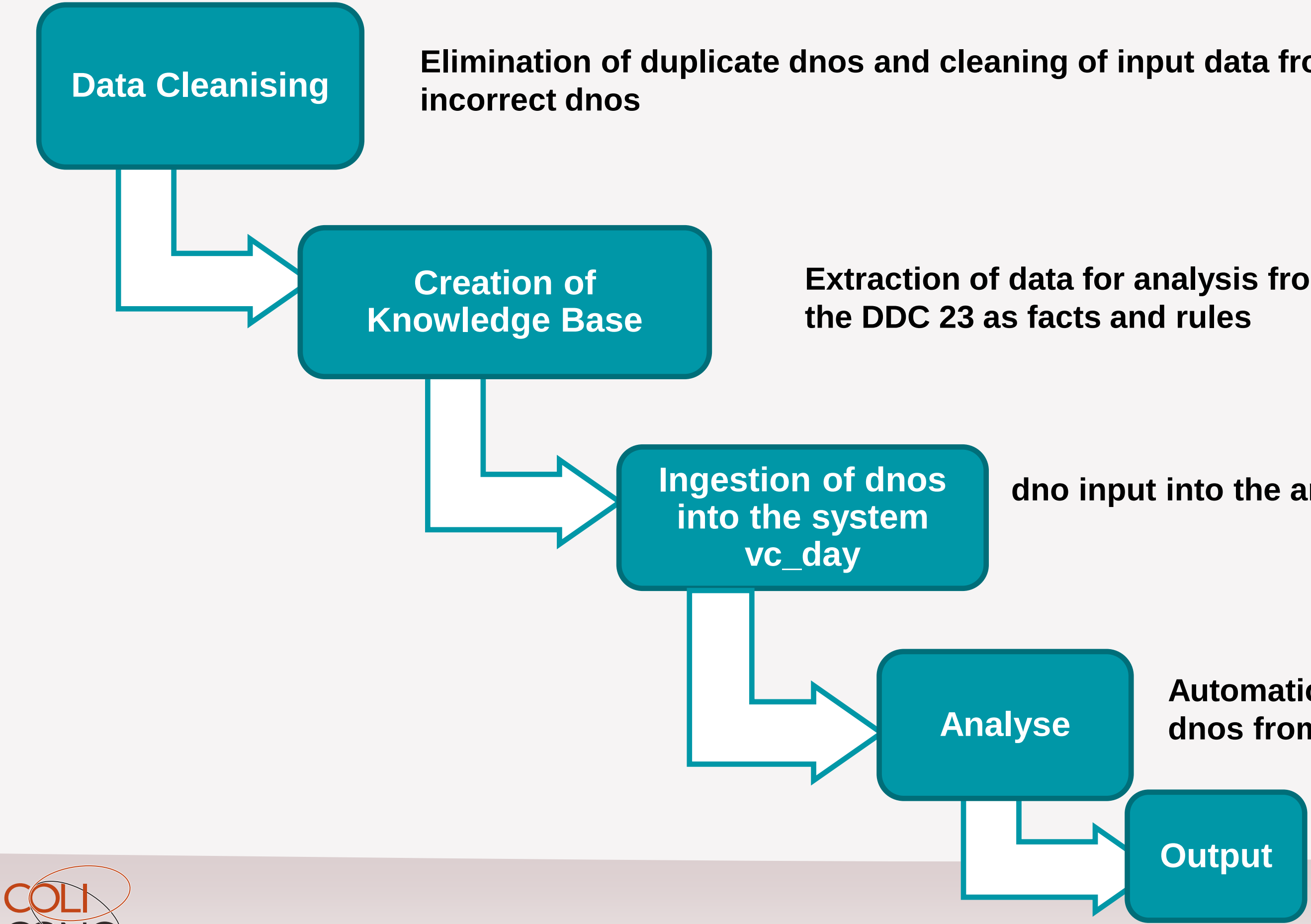
A complete analysis of a rich DDC number



```
700.90440747471
7-------------        Arts & recreation  (700)
70------------        Arts  (700)
700-----------        The arts  (700)
700.9---------        Standard subdivisions of the arts  (700.1-700.9)
700.9---------        History, geographic treatment, biography of the arts  (700.9)
700.904-------        Arts--20th century,...  (700.904)
-0------------        facet indicator  (0)
--0-----------        Table 1. Standard Subdivisions  (T1--0)
--0.9---------        History, geographic treatment, biography  (T1--09)
--0.904-------        Historical periods  (T1--0901-0905)
--0.904-------        *20th century, 1900-1999  (T1--0904)
--0.9044------        *1940–1949  (T1--09044)
---.----07----        Museums, collections, exhibits; collecting objects  (T1--0901-0905:07)
---.----074---        Museums, collections, exhibits  (T1--0901-0905:074)
---.-------7---       Modern world; extraterrestrial worlds  (T2--4-9)
---.-------7---       North America  (T2--7)
---.-------74--       Specific states of United States  (T2--74-79)
---.-------74--       Northeastern United States (New England and Middle Atlantic states)  (T2--74)
---.-------747-       Middle Atlantic states  (T2--747-749)
---.-------747-       New York  (T2--747)
---.-------7471       New York (Manhattan Island, New York County)  (T2--7471)
```

Base number

coli-ana Workflow



Data Cleansing

Elimination of duplicate dnos and cleaning of input data from incorrect dnos

Creation of Knowledge Base

Extraction of data for analysis from electronic version of the DDC 23 as facts and rules

Ingestion of dnos into the system vc_day

dno input into the analyser : vc_day

Analyse

Automatically analyse the molecular dnos from left to right

Output

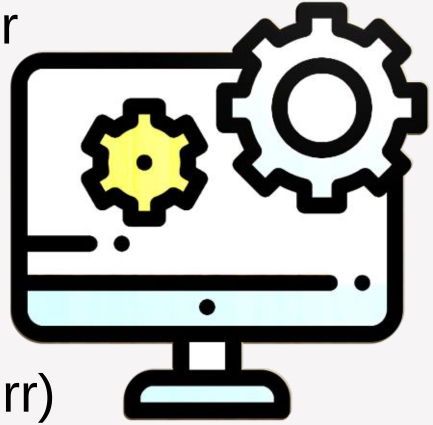
vc_daygram

Example vc_daygram

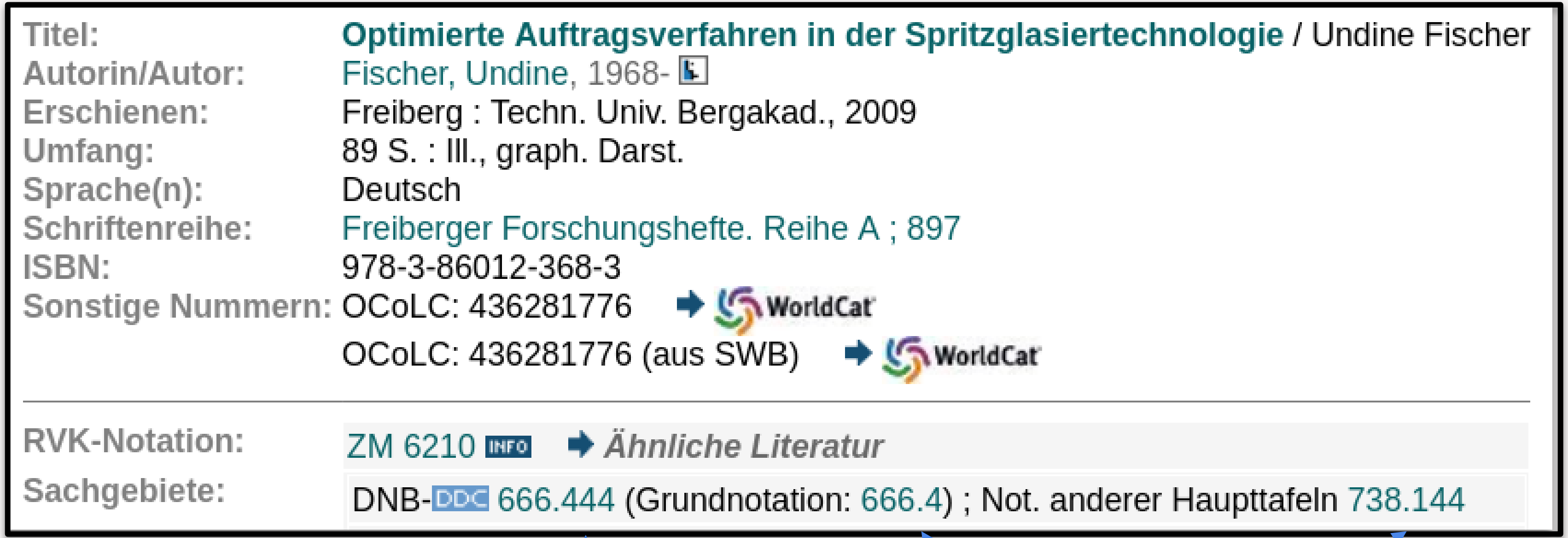
```
700.90440747471 <liu_2_to_analyze; length: 15>
7-------------- Arts & recreation <dno_main>
70------------- Arts <dno_div>
700------------ The arts <dno_sec>
700.9---------- Standard subdivisions of the arts #dno_span_cen# <dno_sub_span:700.1-700.9>
700.9---------- History, geographic treatment, biography of the arts #dno_syn#
700.904-------- Modern arts <RI_bui>
700.904-------- Modern arts <dno_bui>
-0------------- <Facet Indicator> <0>
--0------------ Table 1. Standard Subdivisions <tabno:T1--0>
--0.9---------- History, geographic treatment, biography <tabno:T1--09>
--0.9---------- Regional treatment <RI:T1--09>
--0.904-------- *20th century, 1900-1999 <tabno:T1--0904>
--0.904-------- Historical periods #dno_span_cen# <tabno_span:T1--0901-T1--0905>
--0.904-------- Twentieth century <RI:T1--0904>
--0.9044------- *1940-1949 <tabno:T1--09044>
--0.9044------- World War II, 1939-1945 <RI:T1--09044>
---.----07----- Museums, collections, exhibits; collecting objects <p9->tabno_span_1:T1--0901-T1--0905:07>
---.----074---- Museums, collections, exhibits <p9->tabno_span_1:T1--0901-T1--0905:074>
---.-------7--- North America <p20_5->tabno:T2--7>
---.-------7--- Modern world; extraterrestrial worlds #dno_span_cen# <p20_5->tabno_span:T2--4-T2--9>
---.-------7--- North America <p20_5->RI:T2--7>
---.-------74-- Northeastern United States (New England and Middle Atlantic states) <p20_5->tabno:T2--74>
---.-------74-- Specific states of United States #dno_span_cen# <p20_5->tabno_span:T2--74-T2--79>
---.-------74-- Northeastern States <p20_5->RI:T2--74>
---.-------747- New York <p20_5->tabno:T2--747>
---.-------747- Middle Atlantic states #dno_span_cen# <p20_5->tabno_span:T2--747-T2--749>
---.-------747- New York (State) <p20_5->RI:T2--747>
---.-------7471 New York <p20_5->tabno:T2--7471>
---.-------7471 New York Metropolitan Area <p20_5->RI:T2--7471>
```

Use Cases

- **Entry** into the Catalogues (for e.g. K10plus) and other bibliographic retrieval systems
- **Extend** search functionality
- **Analyse and Re-use** (coli-ana webservice)
- **Map** semantic components (Mapping Tool Cocoda)
- **Quality** Control: detect invalid DDC notations (coli-corr)



coli-ana in K10plus catalog

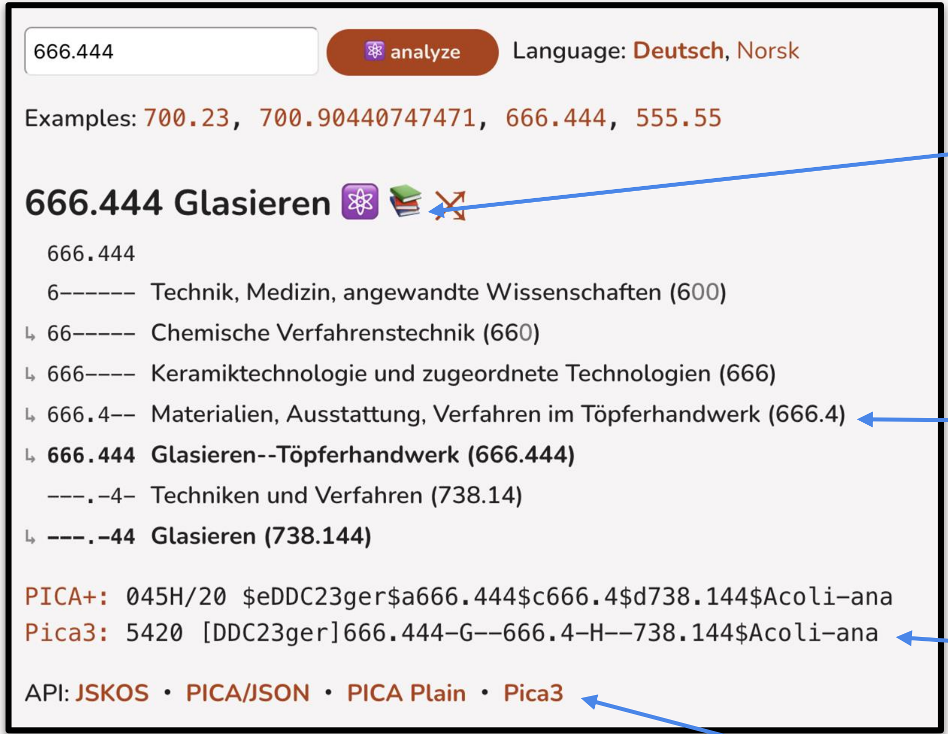


Titel:	**Optimierte Auftragsverfahren in der Spritzglasiertechnologie** / Undine Fischer
Autorin/Autor:	Fischer, Undine, 1968-
Erschienen:	Freiberg : Techn. Univ. Bergakad., 2009
Umfang:	89 S. : Ill., graph. Darst.
Sprache(n):	Deutsch
Schriftenreihe:	Freiberger Forschungshefte. Reihe A ; 897
ISBN:	978-3-86012-368-3
Sonstige Nummern:	OCoLC: 436281776 ➡ WorldCat OCoLC: 436281776 (aus SWB) ➡ WorldCat
RVK-Notation:	ZM 6210 INFO ➡ *Ähnliche Literatur*
Sachgebiete:	DNB-DDC 666.444 (Grundnotation: 666.4) ; Not. anderer Haupttafeln 738.144

molecular DDC notation

atomic DDC notations

coli-ana webservice



Language: Deutsch, Norsk

Examples: 700.23, 700.90440747471, 666.444, 555.55

666.444 Glasieren

```
  666.444
  6------  Technik, Medizin, angewandte Wissenschaften (600)
↳ 66-----  Chemische Verfahrenstechnik (660)
↳ 666----  Keramiktechnologie und zugeordnete Technologien (666)
↳ 666.4--  Materialien, Ausstattung, Verfahren im Töpferhandwerk (666.4)
↳ 666.444  Glasieren--Töpferhandwerk (666.444)
  ---.-4-  Techniken und Verfahren (738.14)
↳ ---.-44  Glasieren (738.144)
```

```
PICA+: 045H/20 $eDDC23ger$a666.444$c666.4$d738.144$Acoli-ana
Pica3: 5420 [DDC23ger]666.444-G--666.4-H--738.144$Acoli-ana
```

API: JSKOS • PICA/JSON • PICA Plain • Pica3

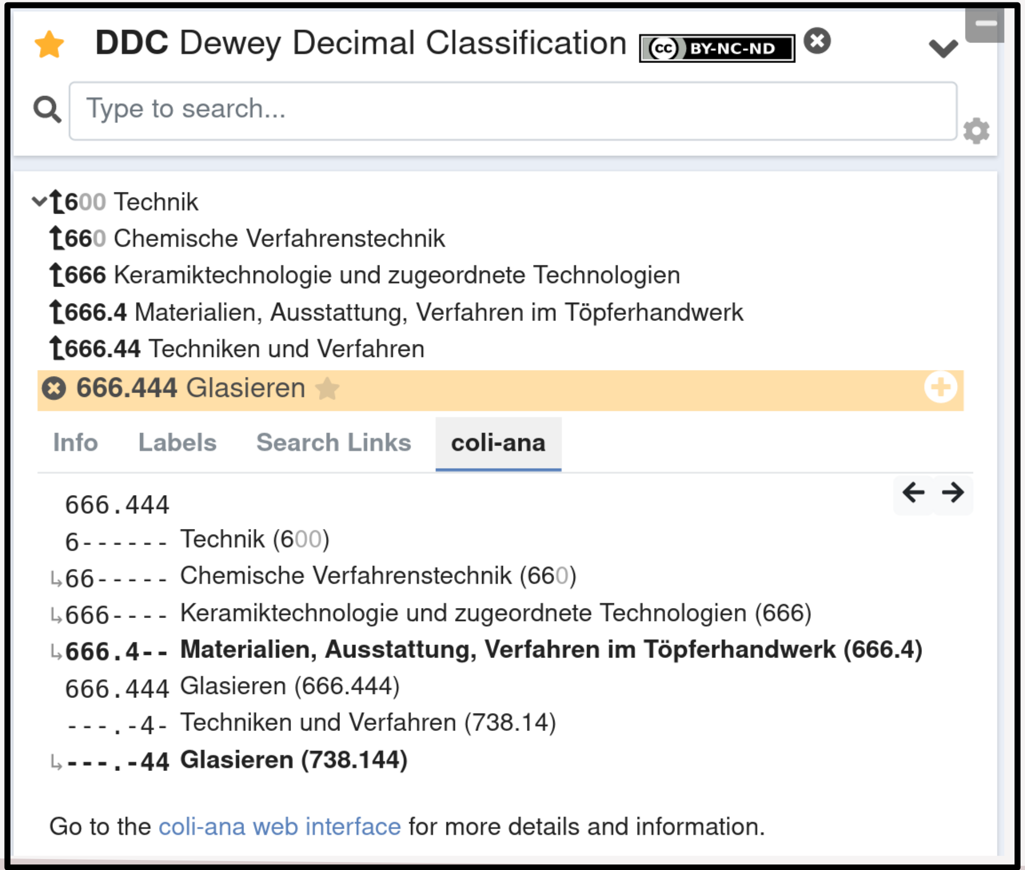
deep link into K10plus catalog

atomic dno

analysis in the catalog record

analysis in machine-readable form (API)

Cocoda mapping tool integration



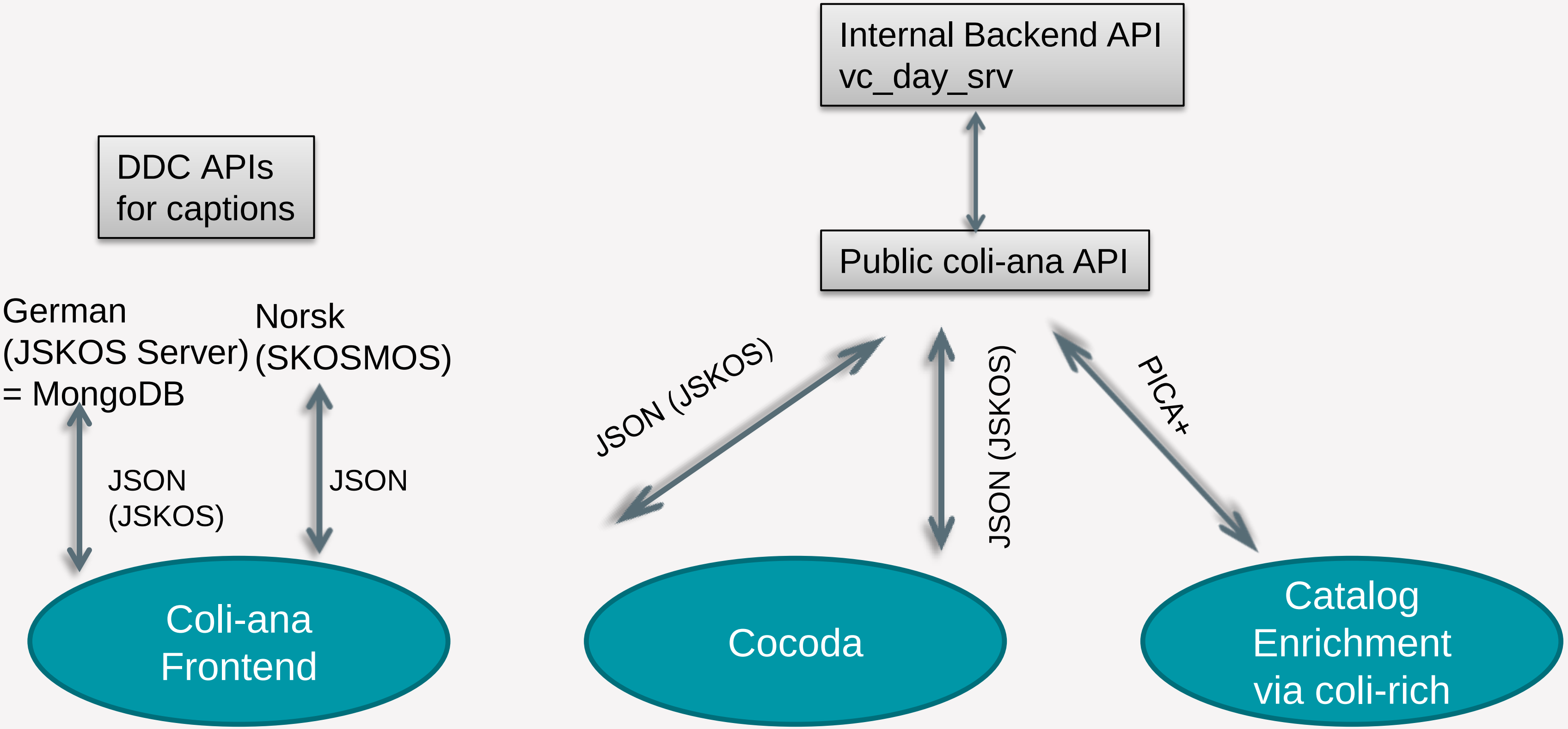
600 Technik
660 Chemische Verfahrenstechnik
666 Keramiktechnologie und zugeordnete Technologien
666.4 Materialien, Ausstattung, Verfahren im Töpferhandwerk
666.44 Techniken und Verfahren
666.444 Glasieren

```
 666.444
 6------  Technik (600)
↳66-----  Chemische Verfahrenstechnik (660)
↳666----  Keramiktechnologie und zugeordnete Technologien (666)
↳666.4--  Materialien, Ausstattung, Verfahren im Töpferhandwerk (666.4)
 666.444  Glasieren (666.444)
 ---.-4-  Techniken und Verfahren (738.14)
↳---.-44  Glasieren (738.144)
```

Go to the coli-ana web interface for more details and information.

Create and manage mappings between atomic DDC notations and entries of other vocabularies (Wikidata, LCSH, GND

APIs /technical implementation



Enrichment of K10plus union catalog

1. Database dump or query result in PICA+ format
2. **Extraction** of existing DDC from records

```
PICA+   045F|045H
MARC21  082
```

3. Query **Analysis** from coli-ana API
4. Create PICA **patch** format

```
 003@    $0600713679
+ 045H/20 $eDDC23ger$a666.444$c666.4$d738.144$Acoli-ana
```

5. **Update** of Union Catalog records (this is still on work mode)

coli-ana API

- Public endpoint at https://coli-conc.gbv.de/coli-ana/app/analyze
- Sources and documentation at https://github.com/gbv/coli-ana
- JSKOS result format (full decomposition)
- PICA+ result format (atomic elements also)

```
$ curl -s 'https://coli-conc.gbv.de/coli-ana/app/analyze?notation=666.444&format=picajson' \
  | jq -r '.[][6:-2][]' | grep [0-9]
666.4
738.144
```

References

https://coli-conc.gbv.de/coli-ana/ coli-ana homepage

https://coli-conc.gbv.de/publications/ publications of project colibri

Reiner (2016): Automatic Analysis of DDC Numbers based on MARC21
https://www.gbv.de/Verbundzentrale/Publikationen/publikationen-der-vzg-2016/pdf/reiner_160425_EDUG_Symposium.pdf

Reiner (2008): Automatic Analysis of Dewey Decimal Classification Notations
https://doi.org/10.1007/978-3-540-78246-9_82
https://www.gbv.de/Verbundzentrale/Publikationen/2008/2008/pdf/pdf_3936.pdf

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Thank You!

Questions?