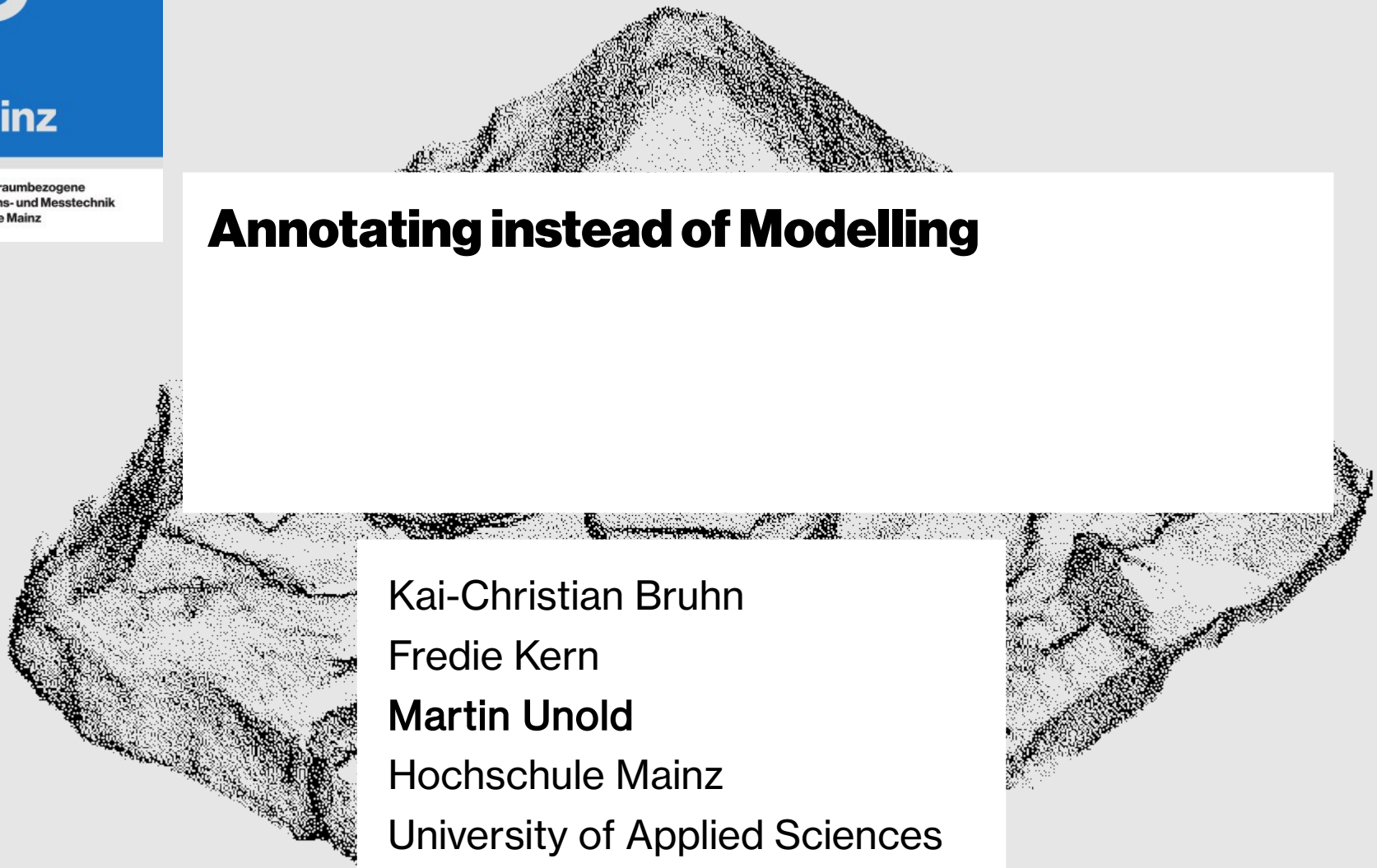
i3 mainz

Institut für raumbezogene Informations- und Messtechnik
Hochschule Mainz

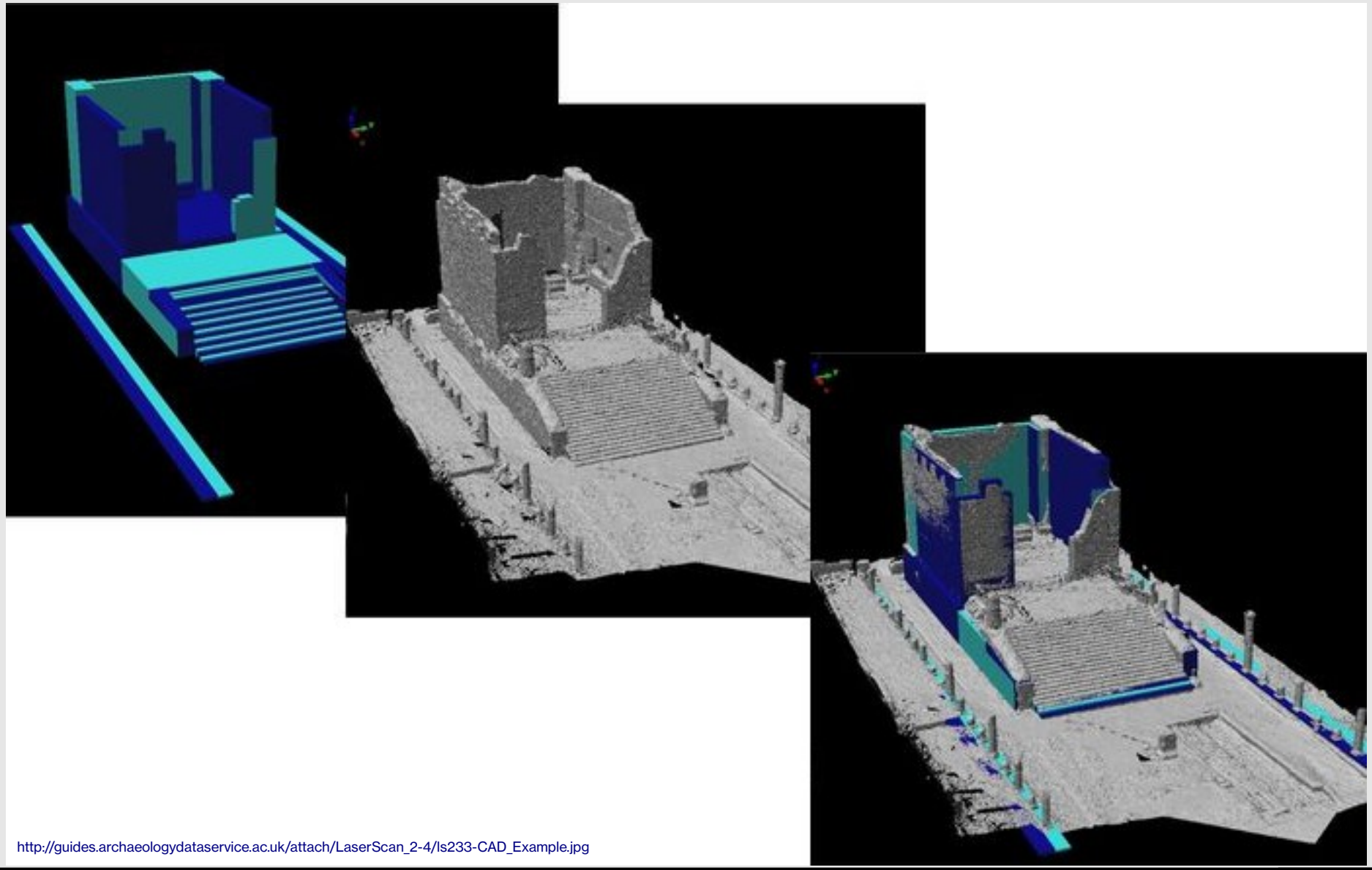
Annotating instead of Modelling



Kai-Christian Bruhn
Fredie Kern
Martin Unold
Hochschule Mainz
University of Applied Sciences

@kaischi

3D-Model vs Pointcloud



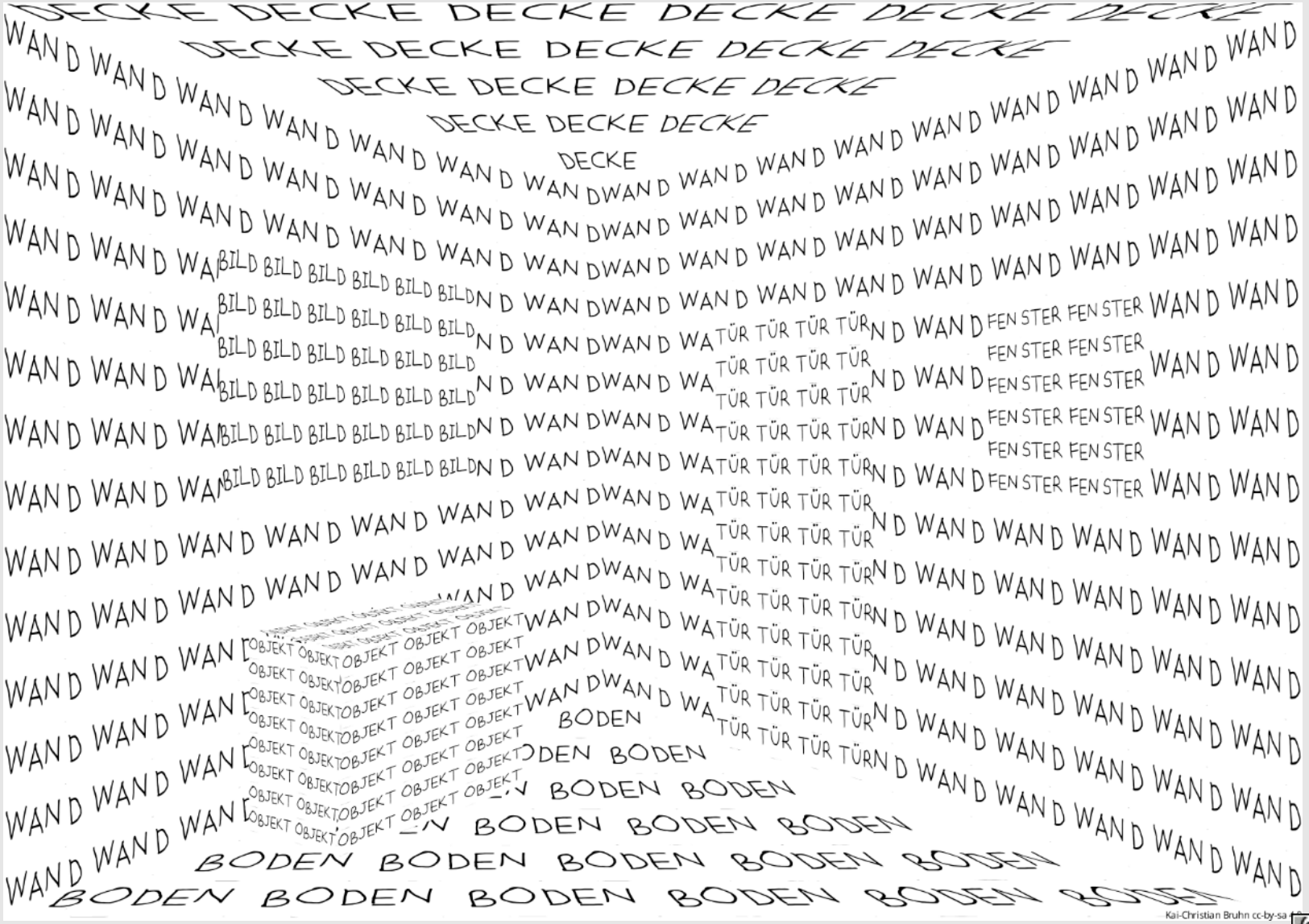
http://guides.archaeologydataservice.ac.uk/attach/LaserScan_2-4/ls233-CAD_Example.jpg

3D-Model vs Pointcloud

- 3D-Model
  - man-made
    - subjective construction
    - time consuming
    - former or future status possible
  - surfaces
    - only corners need to be stored
    - restricted to sketchy structure

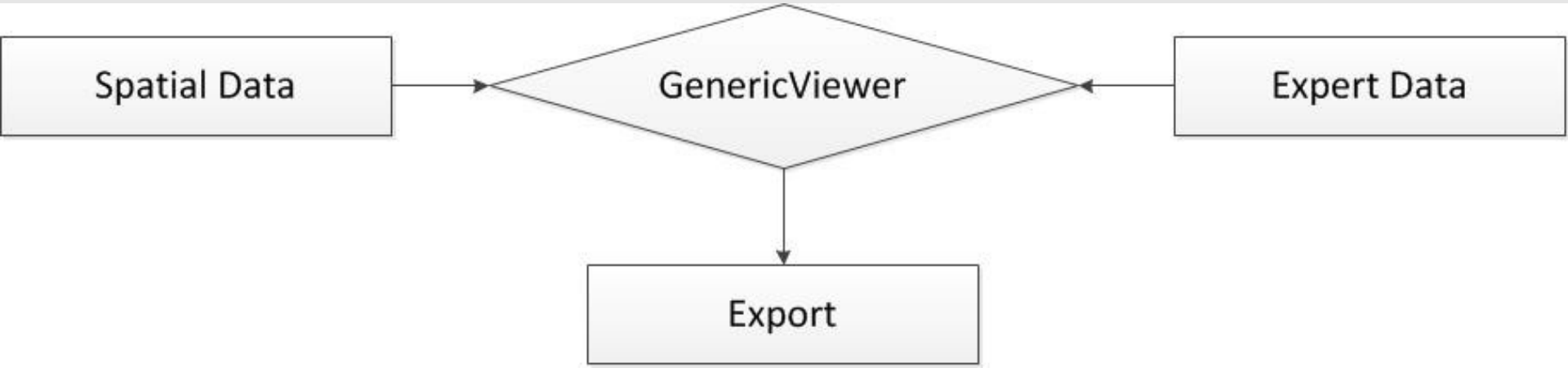
- Pointcloud
  - real survey
    - free of interpretation
    - rather cheap
    - representation of current status
  - points
    - require a lot of disk space
    - very detailed

Visualization of Annotations: Objects in a Room

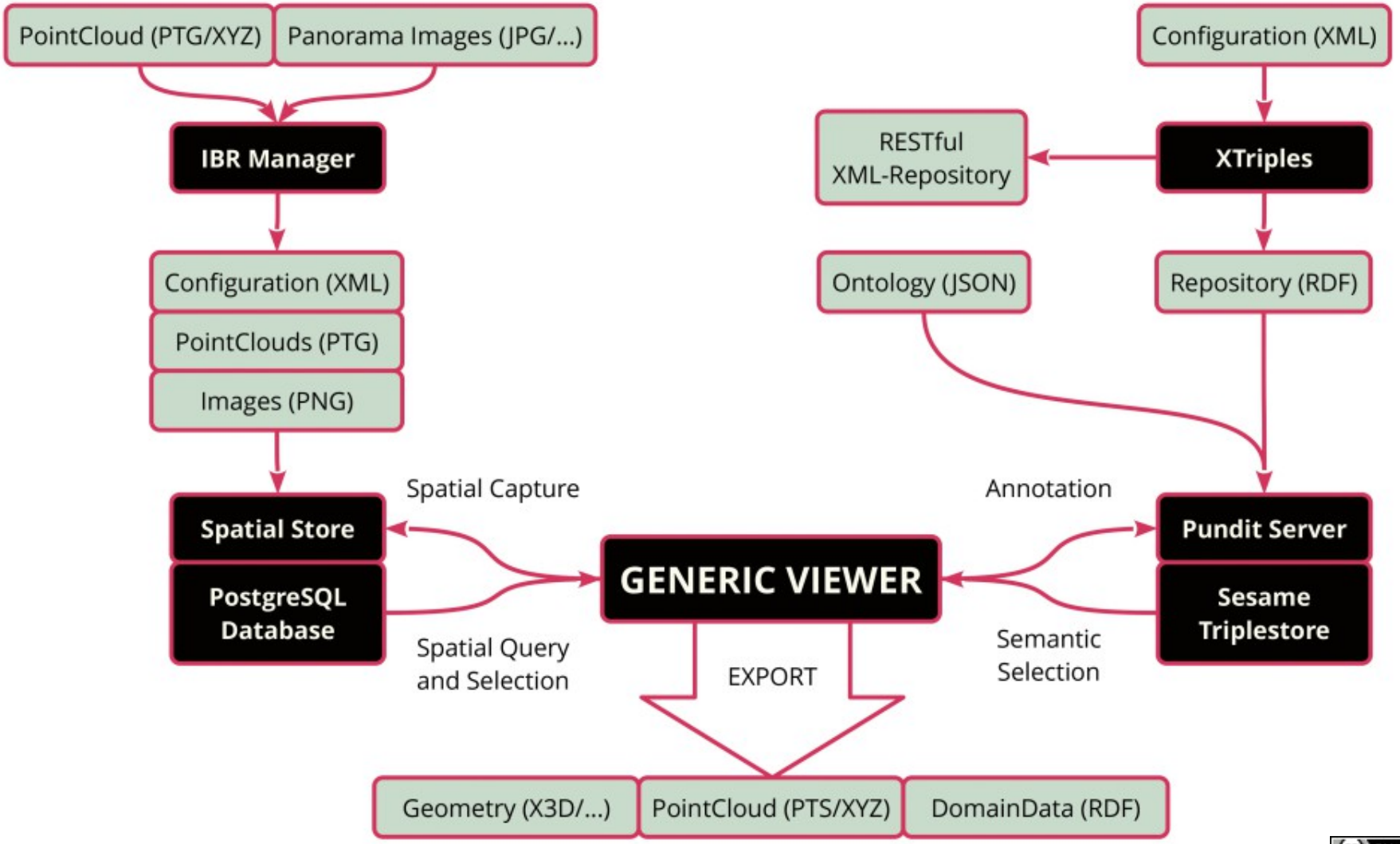


Kai-Christian Bruhn cc-by-sa
(cc) BY-SA

GenericViewer: General Workflow



GenericViewer: Detailed Workflow



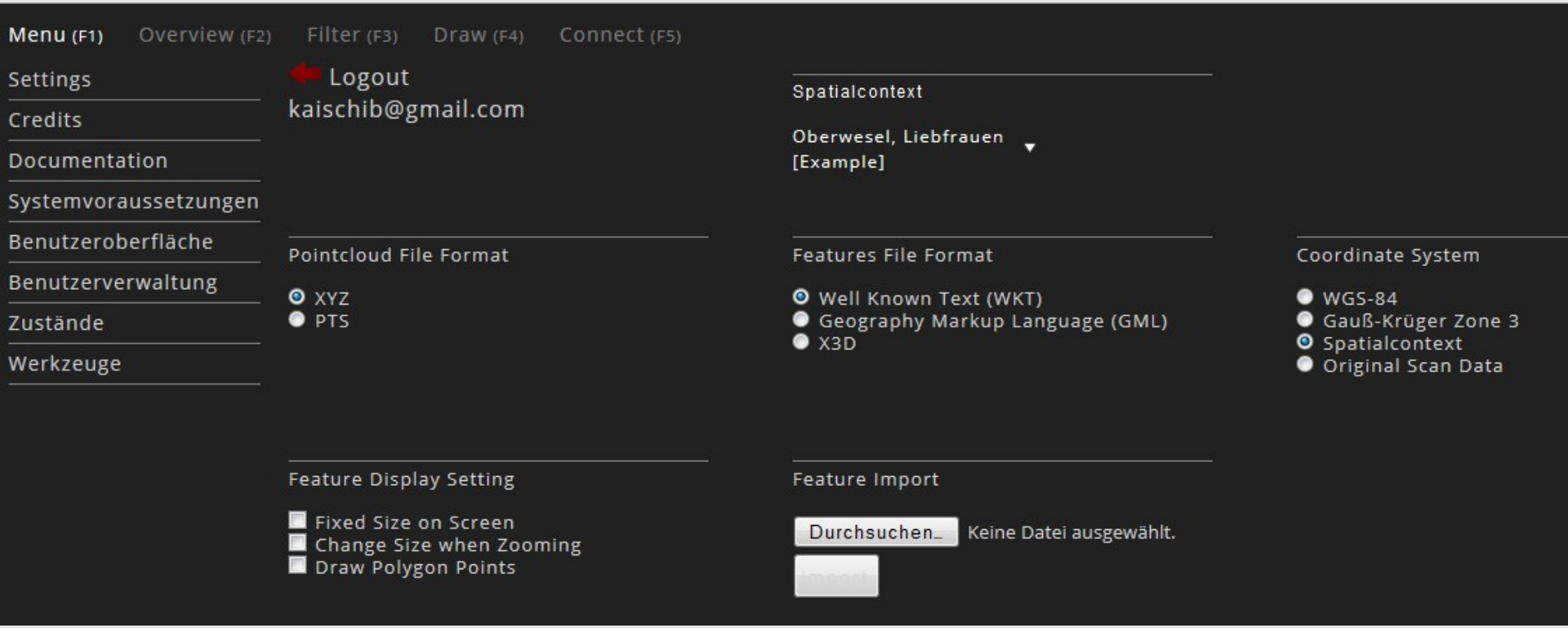
(cc) BY-SA

Web-Frontend: Draw



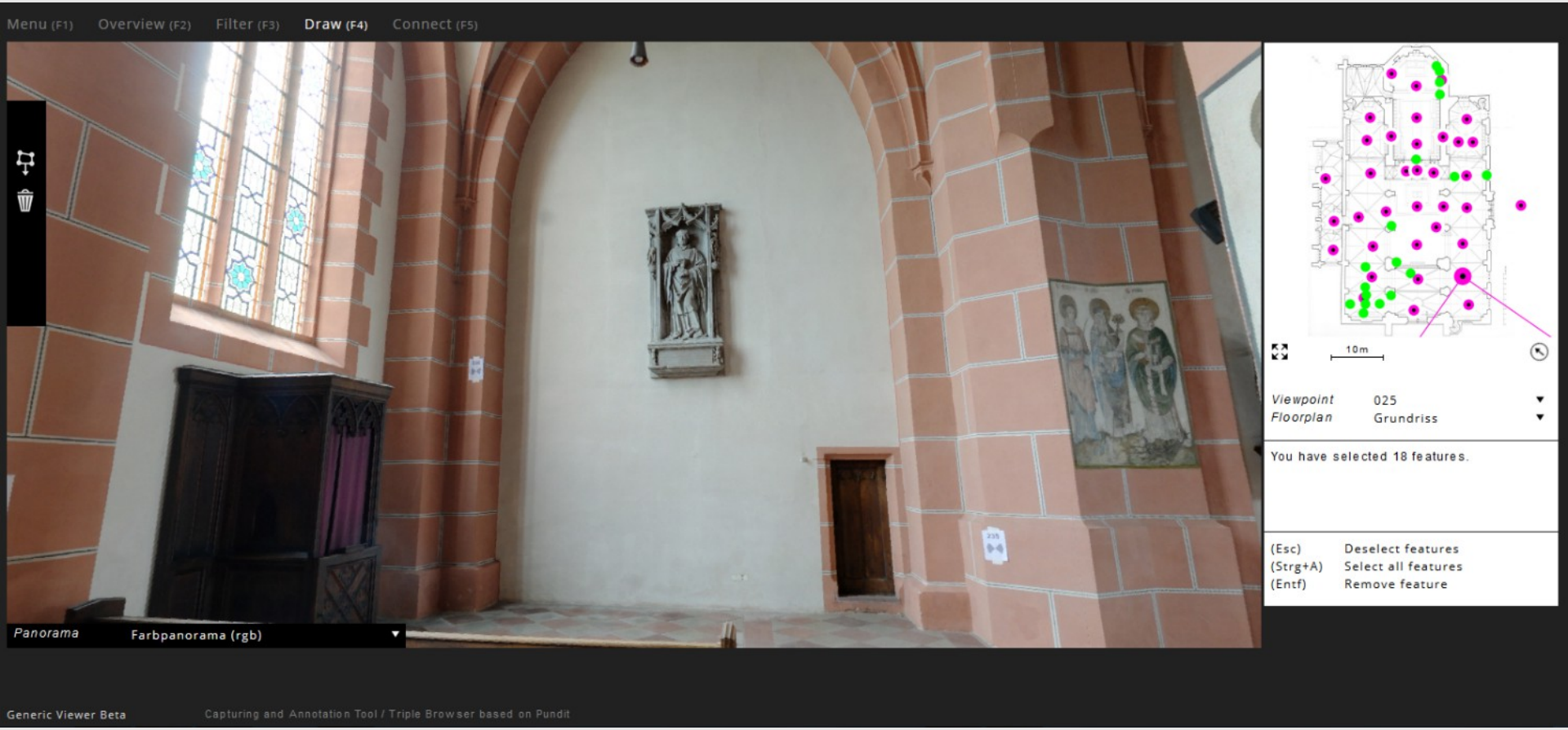
(cc) BY-SA

Web-Frontend: Menu



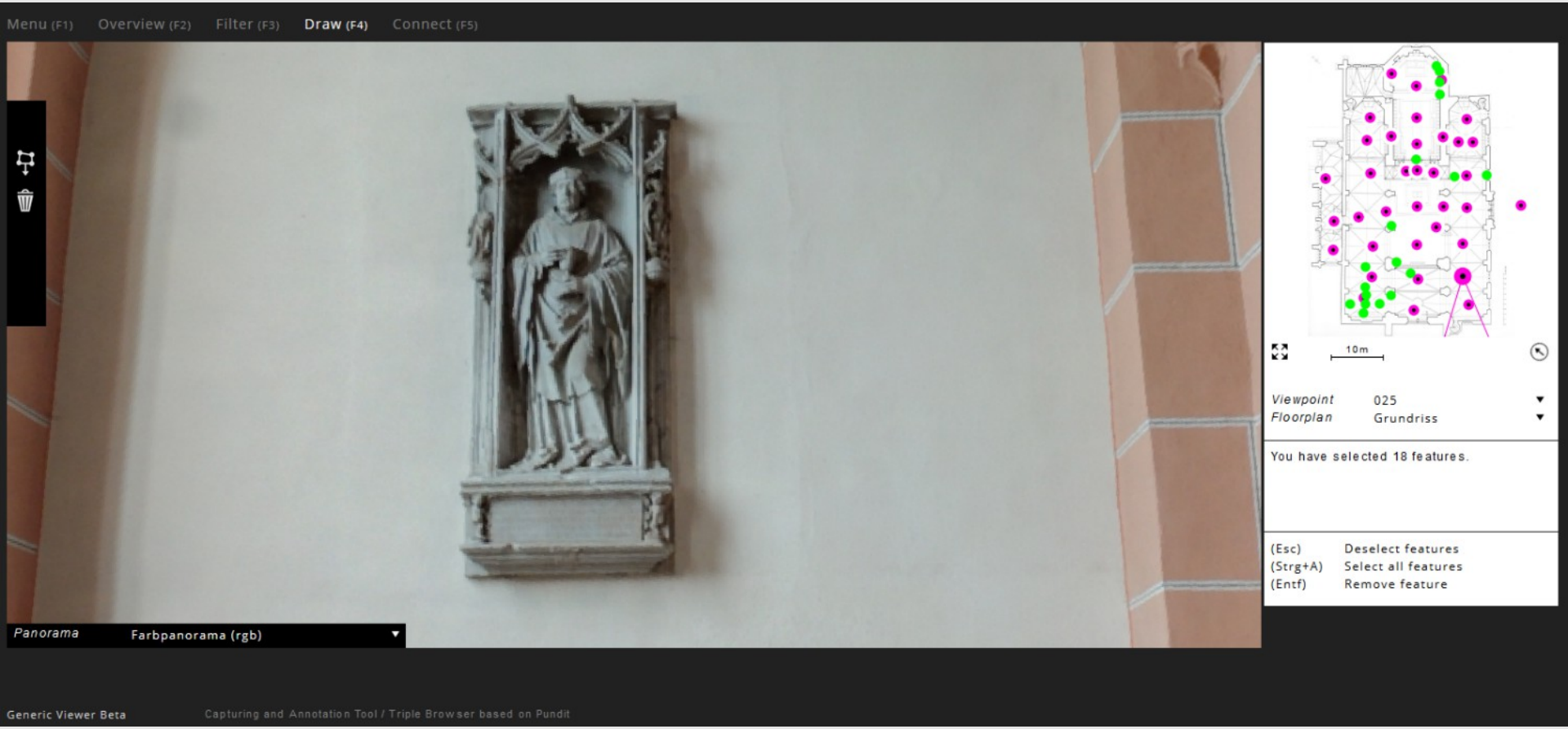
(cc) BY-SA

Web-Frontend: Draw



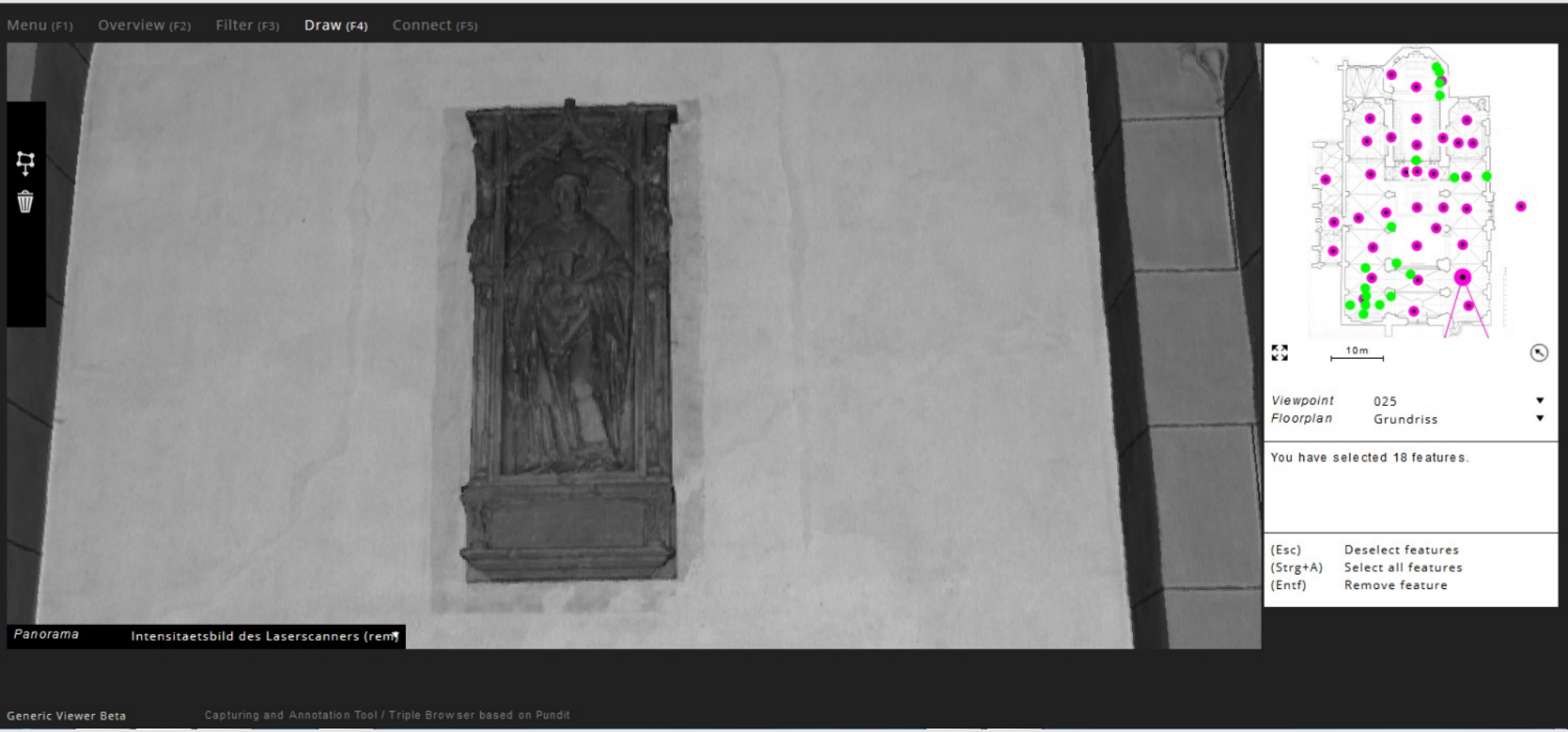
(cc) BY-SA

Web-Frontend: Draw



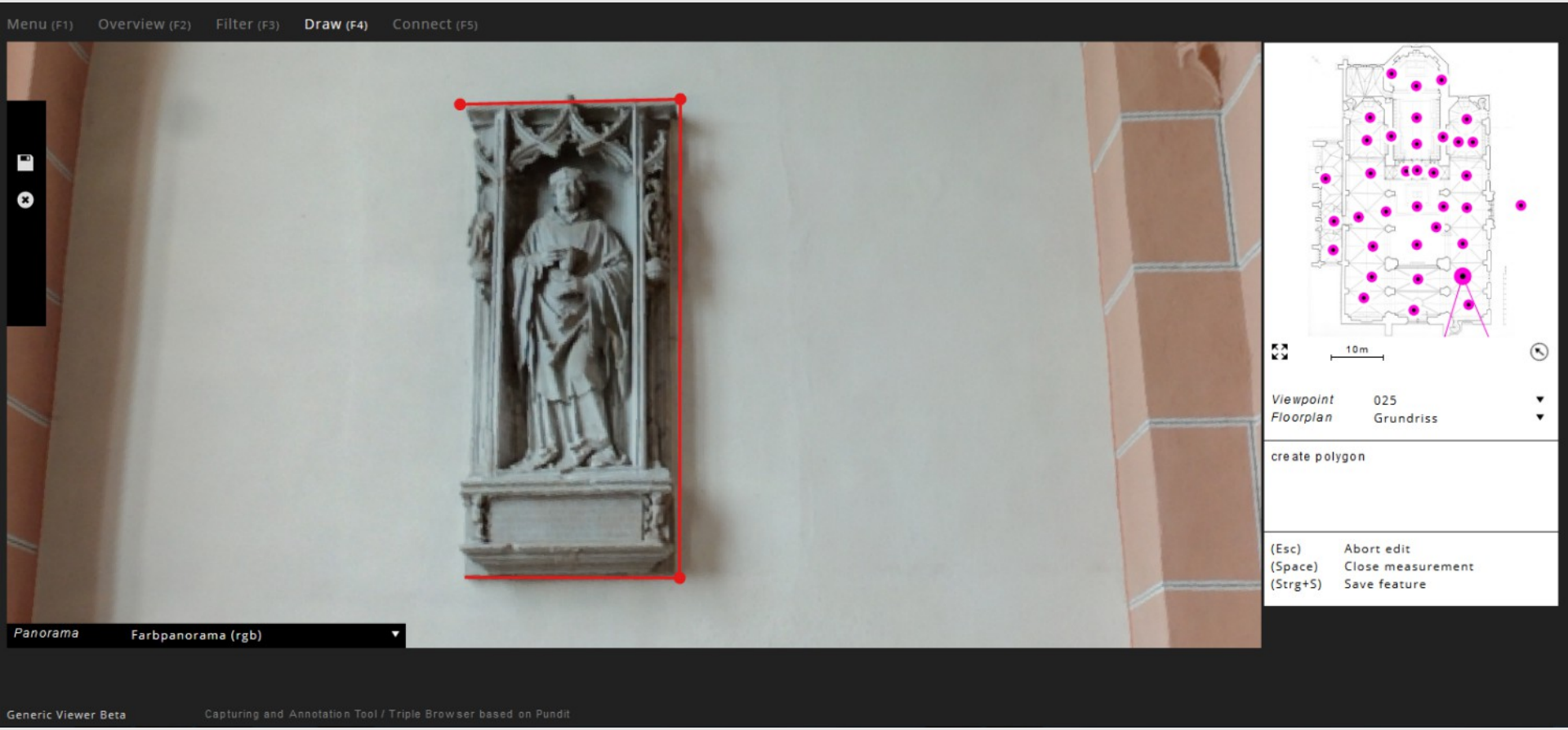
(cc) BY-SA

Web-Frontend: Draw



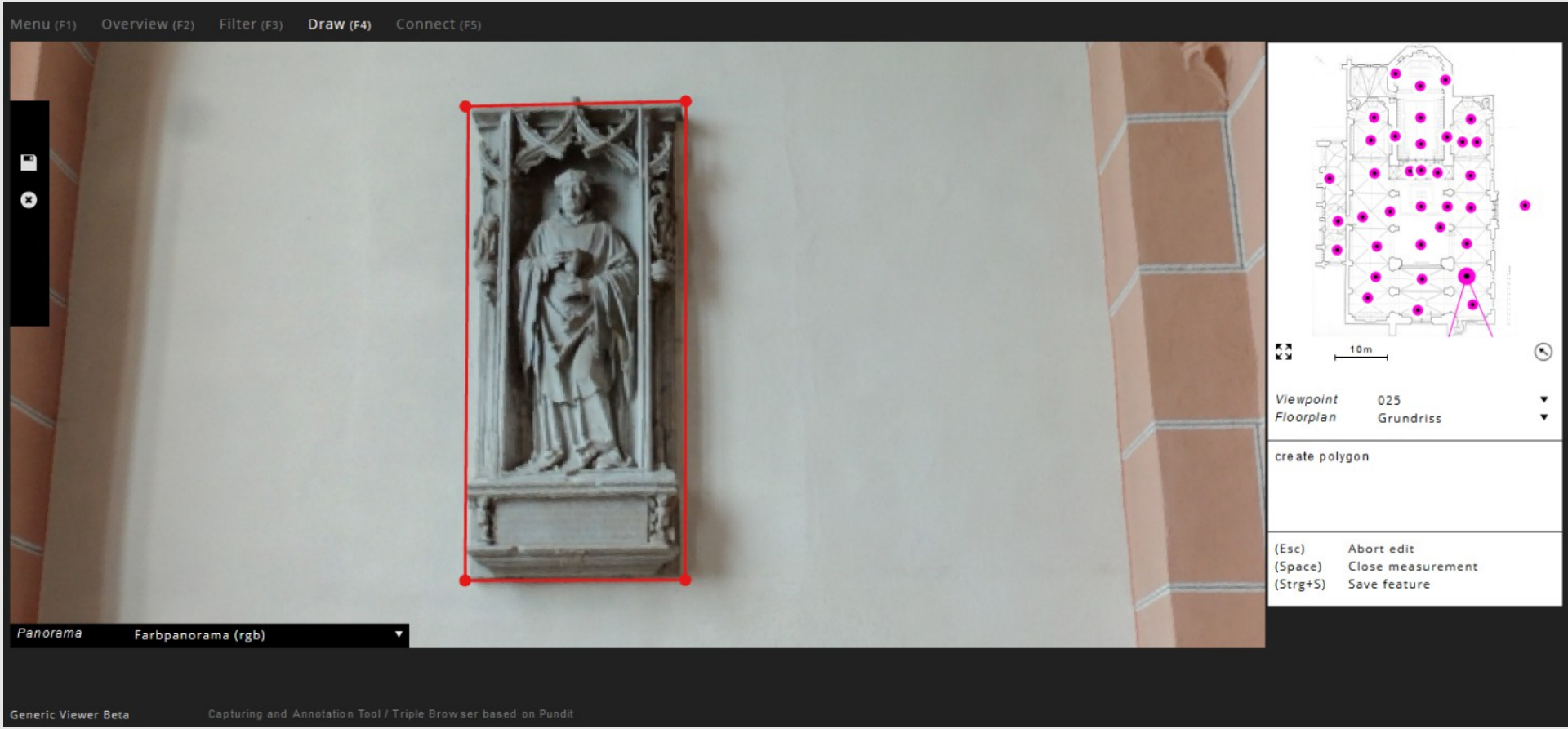
(cc) BY-SA

Web-Frontend: Draw



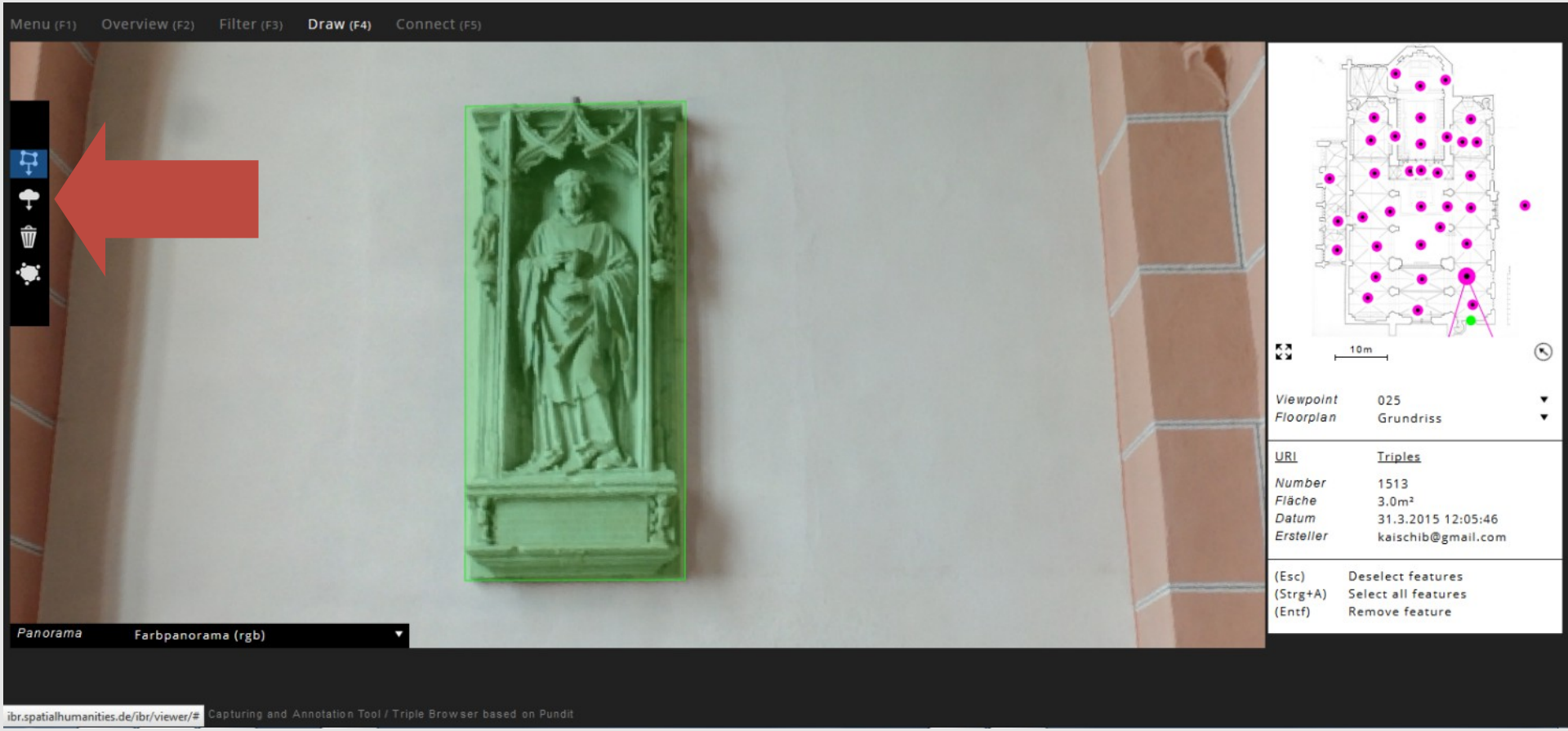
(cc) BY-SA

Web-Frontend: Draw



(cc) BY-SA

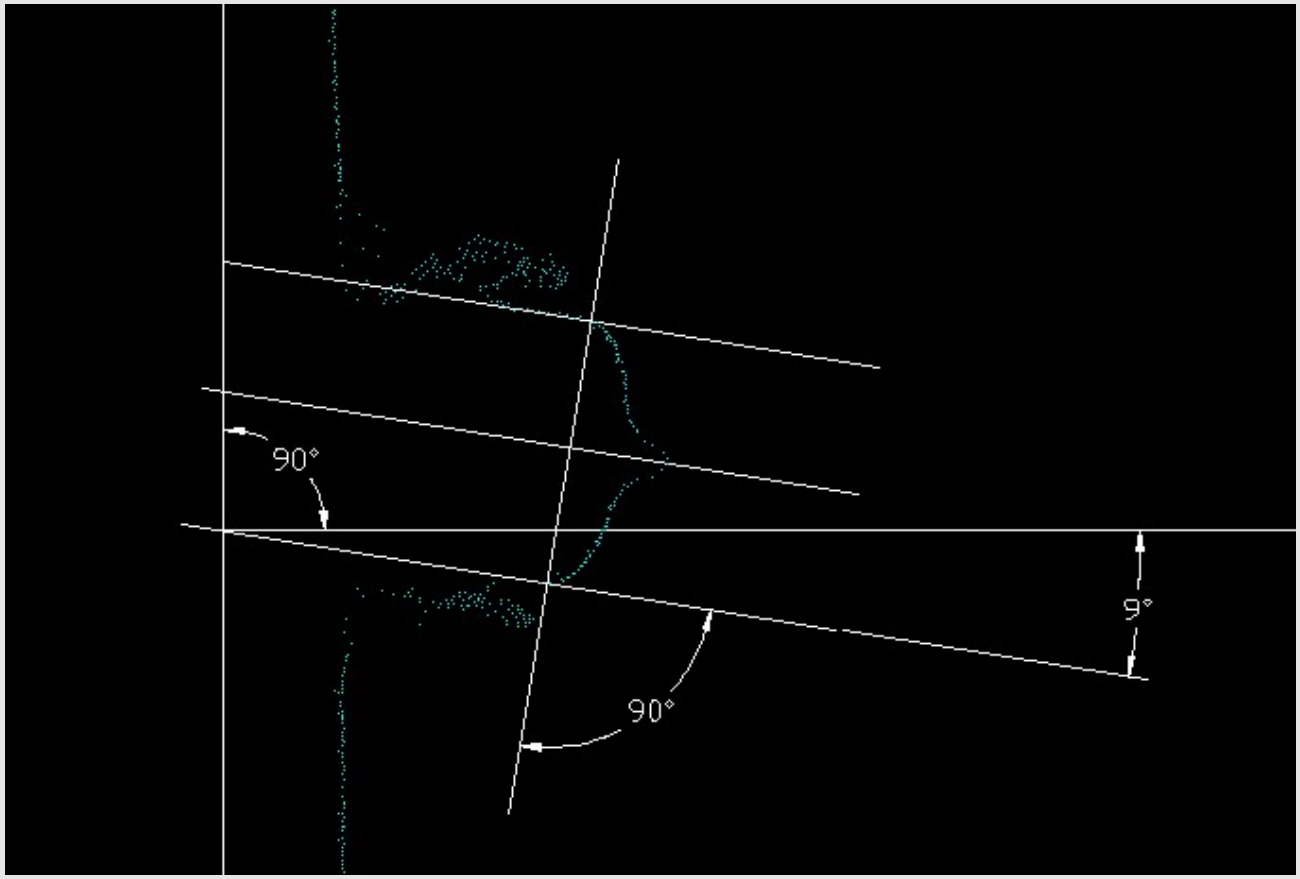
Web-Frontend: Export (xyz, obj)



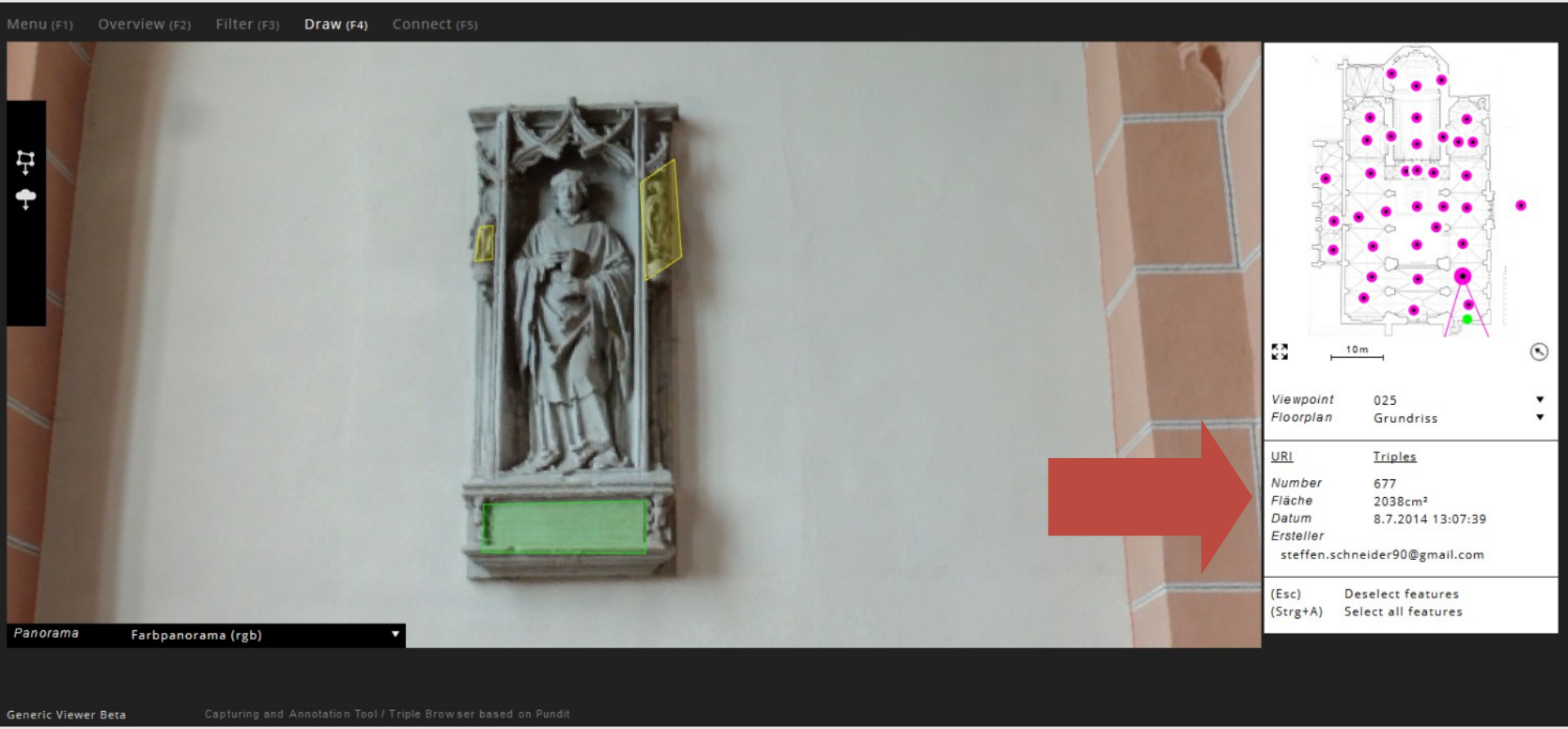
(cc) BY-SA

GenericViewer: Export and Analysis





Web-Frontend: URI and Triples



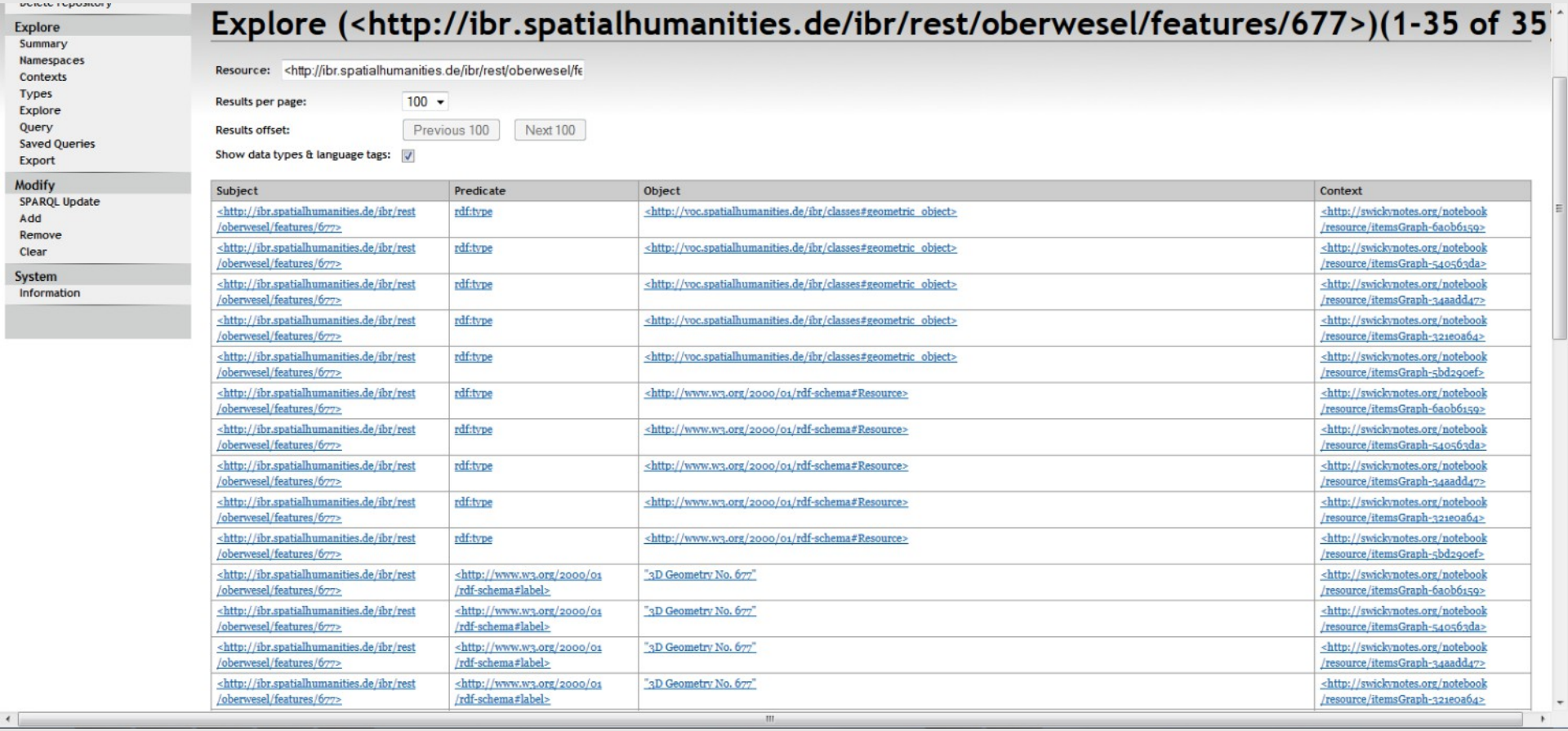
(cc) BY-SA

Web-Frontend: Geometry URI

```
<?xml version="1.0" encoding="UTF-8" ?>
<spatialstore>
<spatialcontext id="oberwesel" href="http://ibr.spatialhumanities.de/ibr/rest/oberwesel"
place="Oberwesel, Liebfrauen [Example]" date="2013-05-24">
<resource id="features">
<feature id="1513" href="http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/1513">
<geom>MULTIPOLYGON(((-19.8194476667183 -10.7303237671199 3.22178576660156,-19.8432875632151
-9.62107028377977 3.21446154785156,-19.8388488445137 -9.59724864272478
5.81758044433594,-19.8194476667183 -10.7303237671199 3.22178576660156)),((-19.8194476667183
-10.7303237671199 3.22178576660156,-19.8388488445137 -9.59724864272478
5.81758044433594,-19.8206148797062 -10.8025005565538 5.82252429199219,-19.8194476667183
-10.7303237671199 3.22178576660156)))</geom>
<size>3.0114563575080187</size>
<unit>m²</unit>
<creator>kaischib@gmail.com</creator>
<lastModify>2015-03-31 12:05:46.41</lastModify>
<viewpoint id="025" href="http://ibr.spatialhumanities.de/ibr/rest/oberwesel/viewpoints/025"/>
</feature>
</resource>
</spatialcontext>
</spatialstore>
```

(cc) BY-SA

Web-Frontend: Triples



Explore
Summary
Namespaces
Contexts
Types
Explore
Query
Saved Queries
Export
Modify
SPARQL Update
Add
Remove
Clear
System
Information

Explore (<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>)(1-35 of 35

Resource: <http://ibr.spatialhumanities.de/ibr/rest/oberwesel/fe

Results per page: 100

Results offset: Previous 100 Next 100

Show data types & language tags:

Subject	Predicate	Object	Context
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://voc.spatialhumanities.de/ibr/classes#geometric_object>	<http://swickynotes.org/notebook/resource/itemsGraph-6a0b6159>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://voc.spatialhumanities.de/ibr/classes#geometric_object>	<http://swickynotes.org/notebook/resource/itemsGraph-540563da>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://voc.spatialhumanities.de/ibr/classes#geometric_object>	<http://swickynotes.org/notebook/resource/itemsGraph-34aadd47>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://voc.spatialhumanities.de/ibr/classes#geometric_object>	<http://swickynotes.org/notebook/resource/itemsGraph-321e0a64>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://voc.spatialhumanities.de/ibr/classes#geometric_object>	<http://swickynotes.org/notebook/resource/itemsGraph-5bd29oef>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://www.w3.org/2000/01/rdf-schema#Resource>	<http://swickynotes.org/notebook/resource/itemsGraph-6a0b6159>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://www.w3.org/2000/01/rdf-schema#Resource>	<http://swickynotes.org/notebook/resource/itemsGraph-540563da>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://www.w3.org/2000/01/rdf-schema#Resource>	<http://swickynotes.org/notebook/resource/itemsGraph-34aadd47>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://www.w3.org/2000/01/rdf-schema#Resource>	<http://swickynotes.org/notebook/resource/itemsGraph-321e0a64>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	rdf:type	<http://www.w3.org/2000/01/rdf-schema#Resource>	<http://swickynotes.org/notebook/resource/itemsGraph-5bd29oef>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	<http://www.w3.org/2000/01/rdf-schema#label>	"3D Geometry No. 677"	<http://swickynotes.org/notebook/resource/itemsGraph-6a0b6159>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	<http://www.w3.org/2000/01/rdf-schema#label>	"3D Geometry No. 677"	<http://swickynotes.org/notebook/resource/itemsGraph-540563da>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	<http://www.w3.org/2000/01/rdf-schema#label>	"3D Geometry No. 677"	<http://swickynotes.org/notebook/resource/itemsGraph-34aadd47>
<http://ibr.spatialhumanities.de/ibr/rest/oberwesel/features/677>	<http://www.w3.org/2000/01/rdf-schema#label>	"3D Geometry No. 677"	<http://swickynotes.org/notebook/resource/itemsGraph-321e0a64>

(cc) BY-SA

Web-Frontend: Linked Data

PETRVS · LVTERN · VIR · INTEGER · DIVI · MARTINI · ECCL(ESI)E · P(RE)POSITVS / HVIVSQVE · EDIS · CANO(NI)CVS · POST · ALIA · PROBITATIS · OFFICIA · / SACELLV(M) · ISTVD [a] · SVIS · SVMPTIBVS · AD · LAVDE(M) · DEI · ET · HONORE(M) · DIVE · / MARTHE · HOSPITE · CHRISTI · DICARE · CVRAVIT · TANDEM · / FELICITER · OBYT · ANNO · SALVTIS · M · D · XV · NONAS · MARCIAS [b]

Übersetzung:
Petrus Lutern, ein unbescholtener Mann, Propst der Kirche des heiligen Martin und Kanoniker dieser Kirche, hat - nach anderen Werken der Freigiebigkeit - auf seine Kosten diese Kapelle zum Lobe Gottes und zu Ehren der heiligen Martha, der Gastgeberin Christi, weihen lassen. Schließlich starb er glückselig im Jahr des Heils 1515 an den Nonen des März (7. März) [4].

Wappen:

Lutern

Kommentar

Die sorgfältig mit deutlicher Linksschrägenverstärkung und Schattenachse bei *O* ausgeführte Kapitalis vermittelt durch ihre ausgewogene Gestaltung einen nahezu klassisch-römischen Eindruck, der durch die Verwendung dreiecksförmiger Worttrenner und langer waagerechter Striche als Kürzungszeichen noch verstärkt wird. Lediglich kleine unauffällige Merkmale wie etwa der deutlich verlängerte untere Balken des *E*, der etwas gedrückte Bogen des *G*, das durchgehend geschlossene *P* und die am unteren Scheitel des Buchstabens ansetzende, kurze hakenförmige Cauda des *Q* verweisen auf die renaissancezeitliche Entstehung dieser Inschrift. Weitere zeittypische Zeichen sind die deutlichen Hinweise auf die Stiftungstätigkeit des Verstorbenen, die antikisierende Wortwahl und die Datumsformel.

Der vermutlich aus dem rechtsrheinischen Bornich (Rhein-Lahn-Kreis) [5] stammende Petrus Lutern [6] ist seit 1475 als Kanoniker von Liebfrauen bezeugt, 1508 erhält er dort



www.inschriften.net/suchergebnis/treffer/ansichten/medien/tx_hisodat_sources_158/0.html

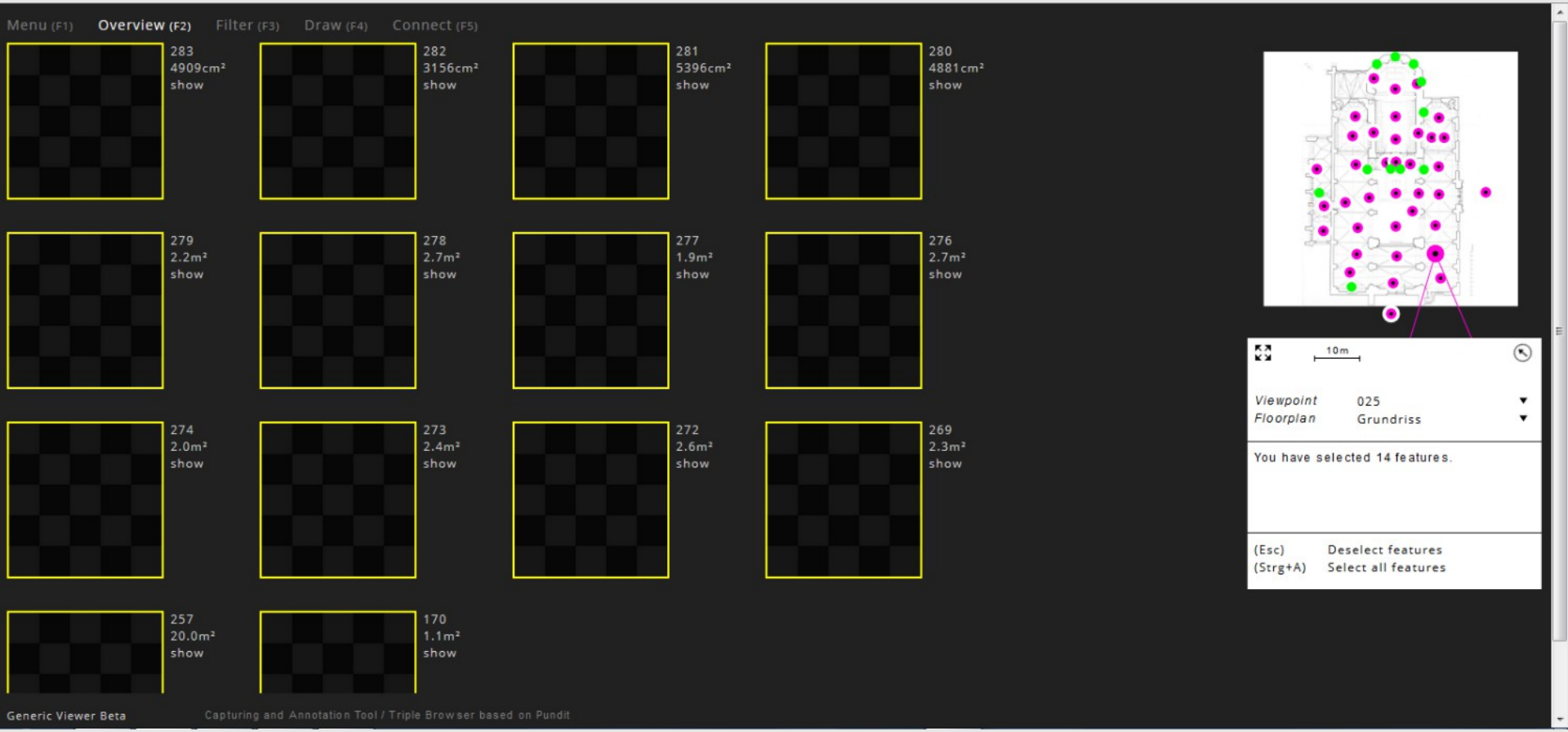
http://www.inschriften.net/rest/di060/articles/di060-0159

(cc) BY-SA

Examplary SPARQL-Query

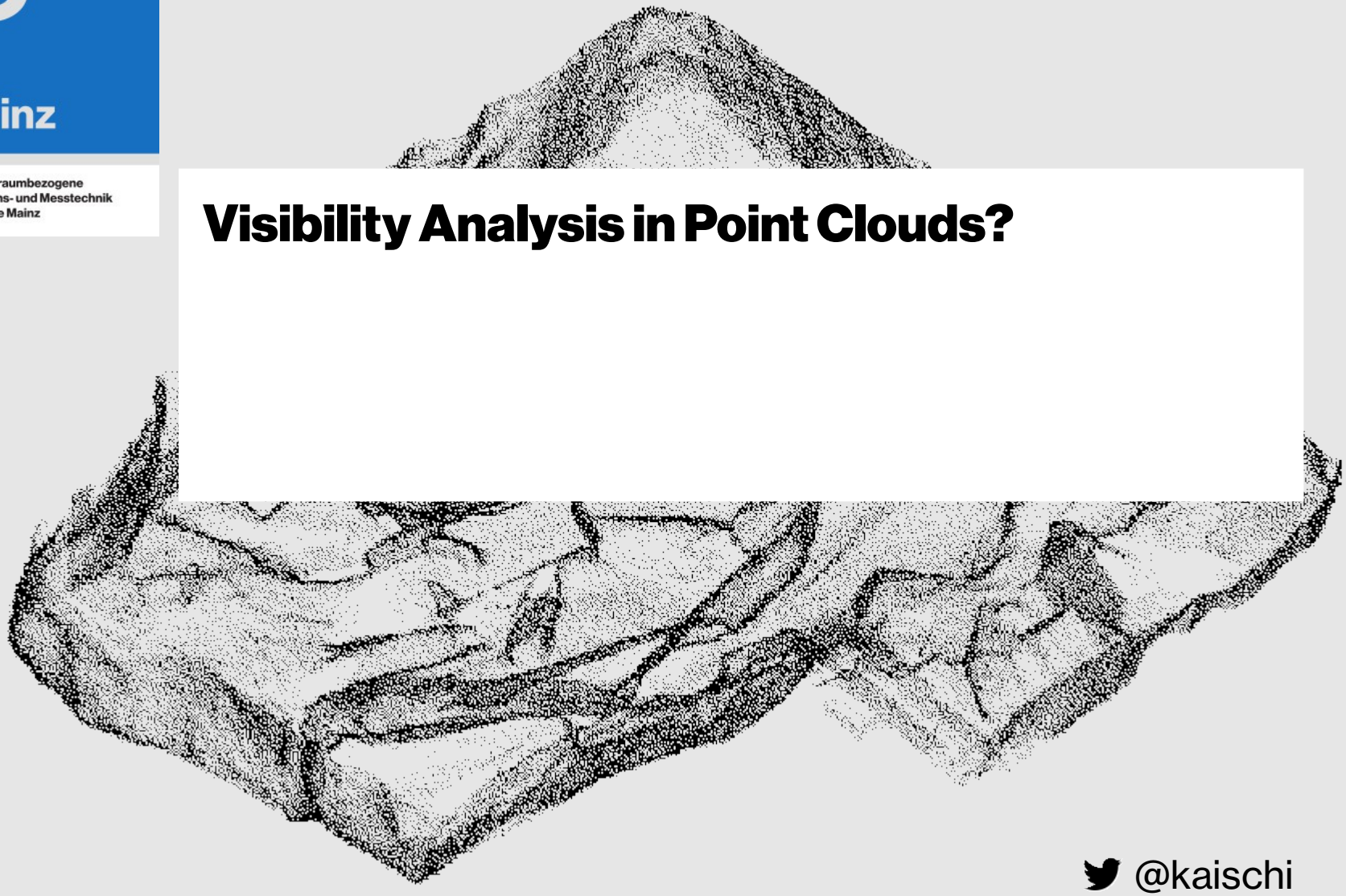
```
SELECT ?feature WHERE {
   ?inscription skos:relatedMatch ?feature .
   ?inscription cdwa:typeface ?font .
   FILTER regex(?font,”Gothic Majuscule”) .
}
```

Web-Frontend: SPARQL



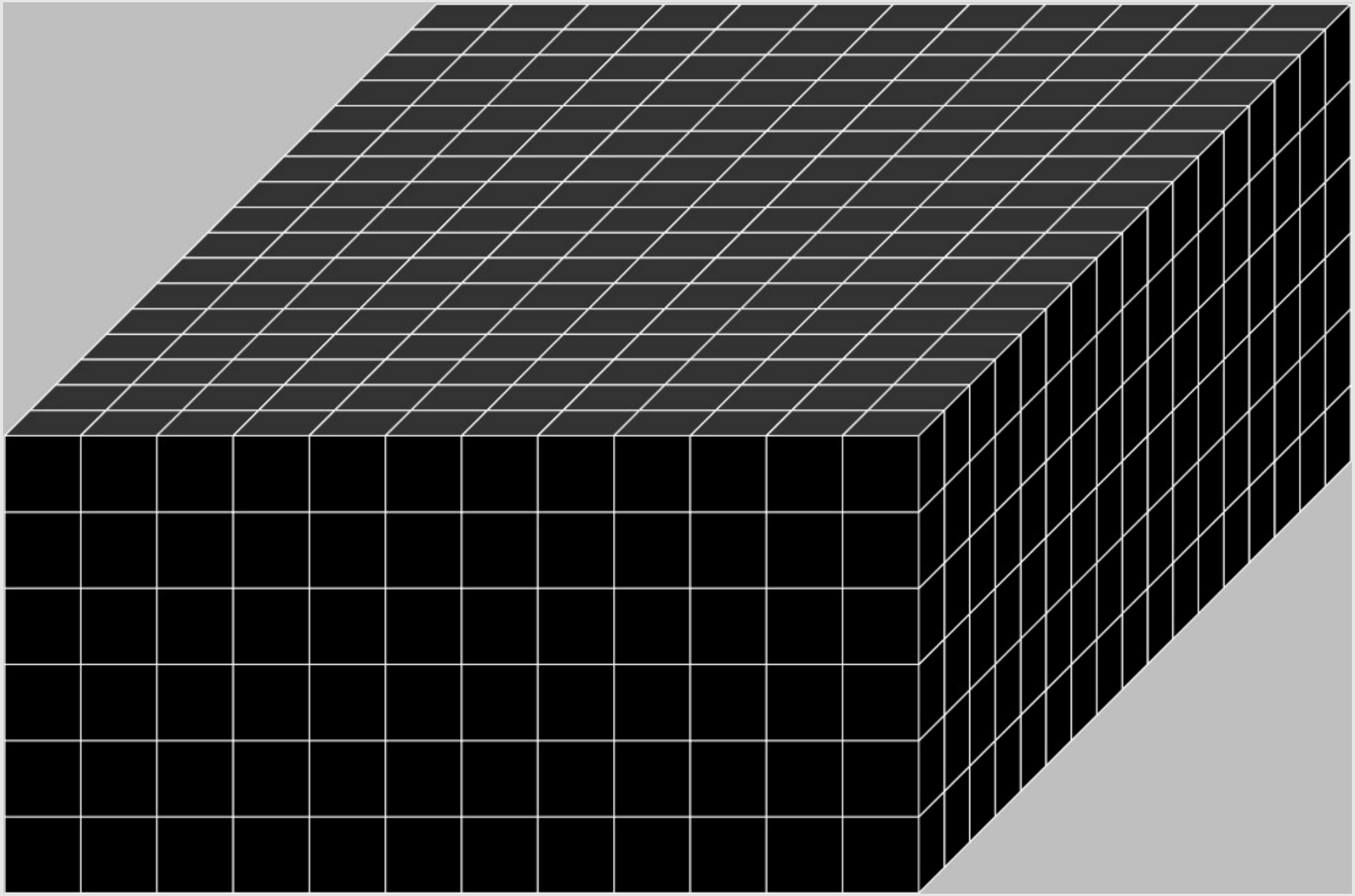
i3
mainz
Institut für raumbezogene
Informations- und Messtechnik
Hochschule Mainz

Visibility Analysis in Point Clouds?



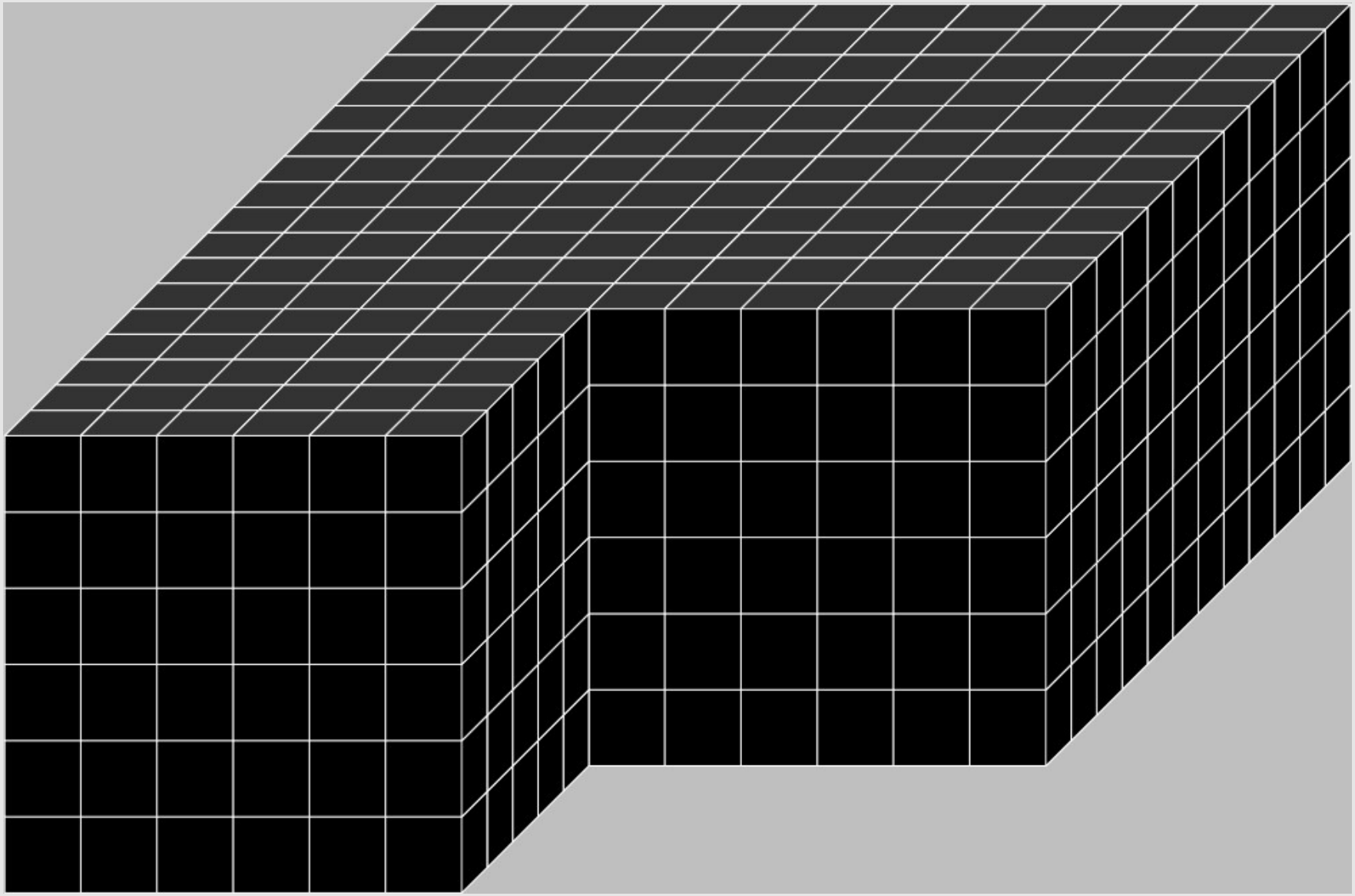
@kaischi

Export and Analysis: Matrix of 3D visibility at 1.8 m



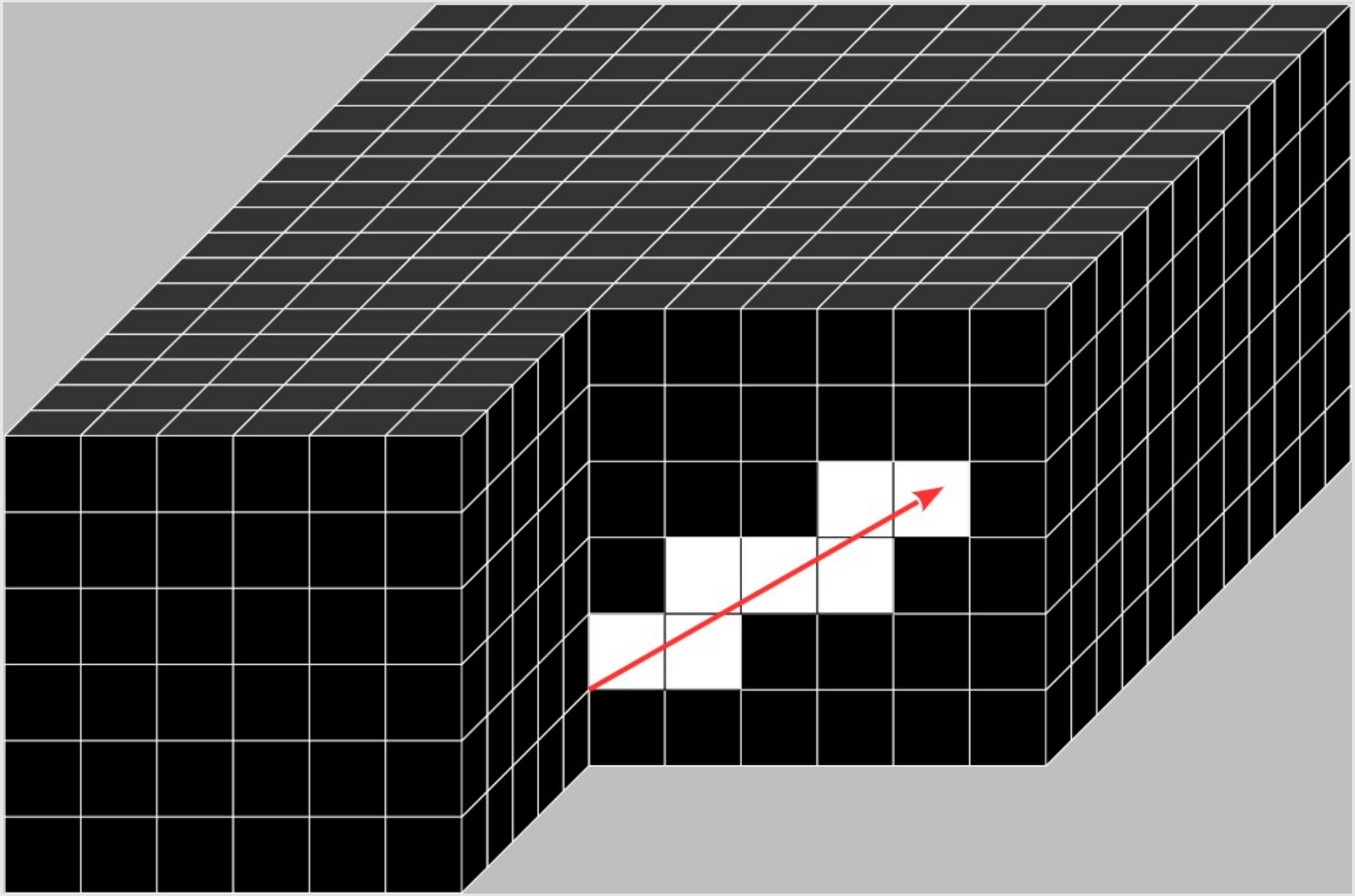
i3 mainz

Voxel-based model of the Church



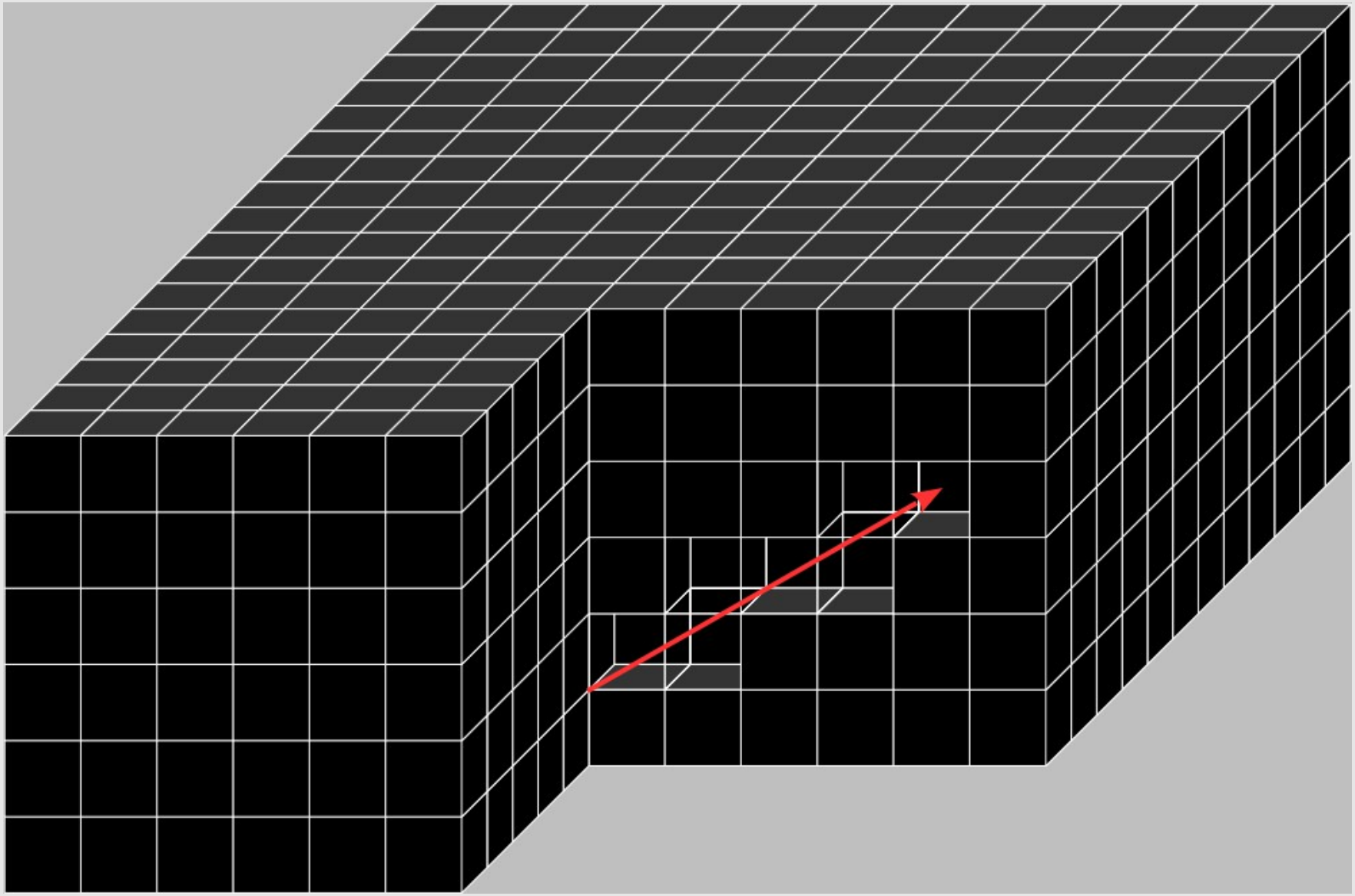
i3 mainz

Voxel-based model of the Church

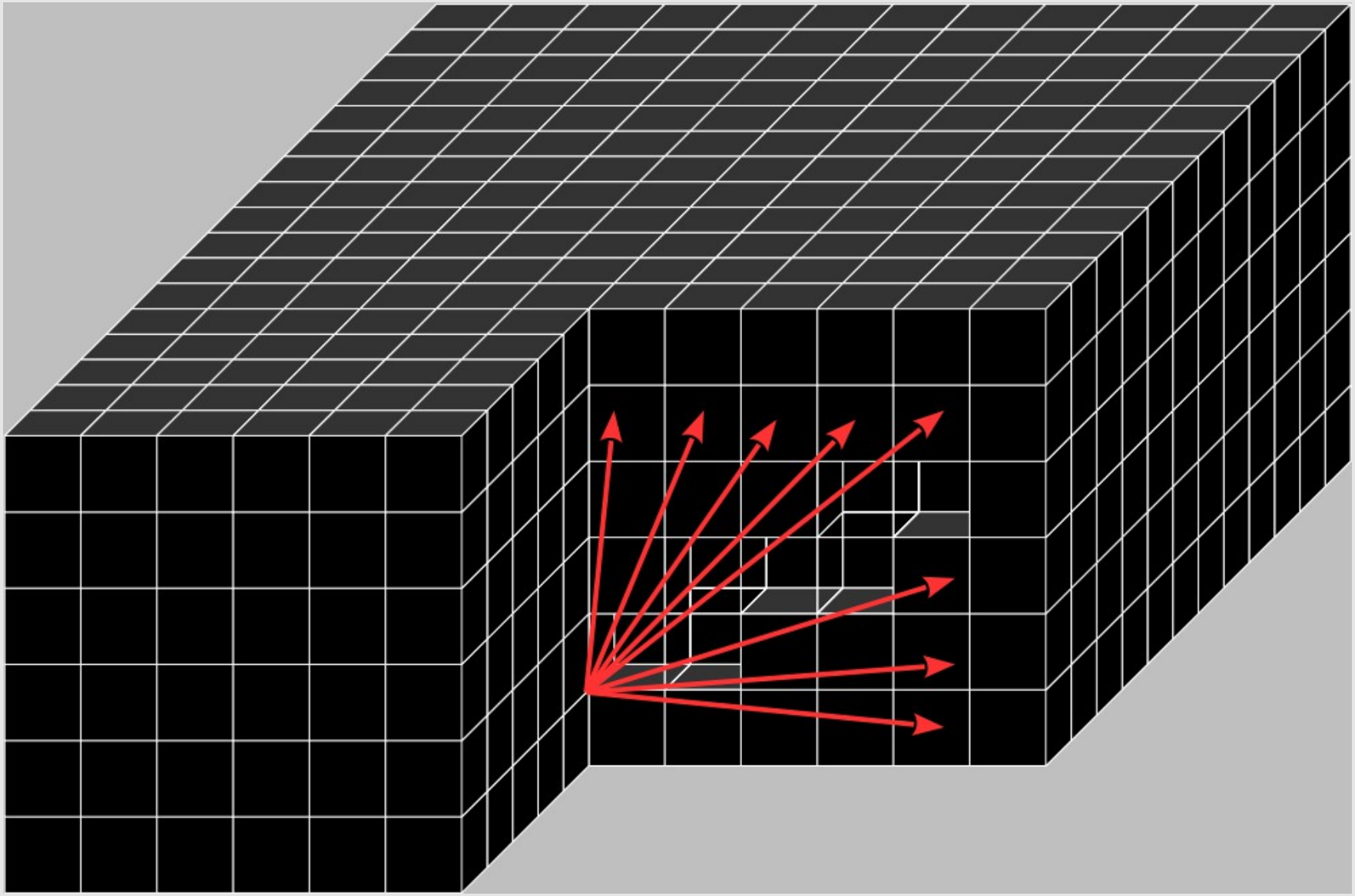


i3 mainz

Voxel-based model of the Church

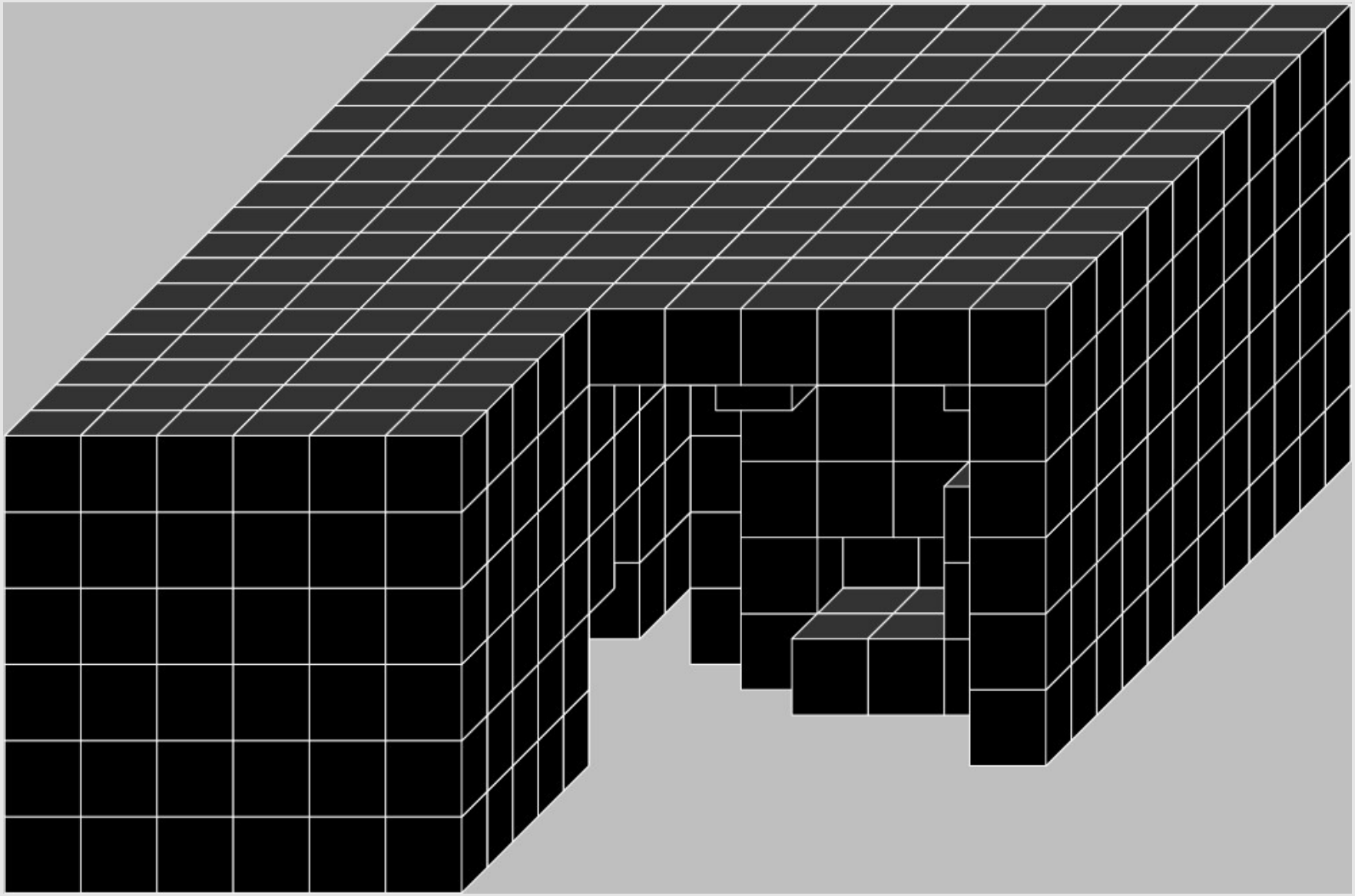


Voxel-based model of the Church



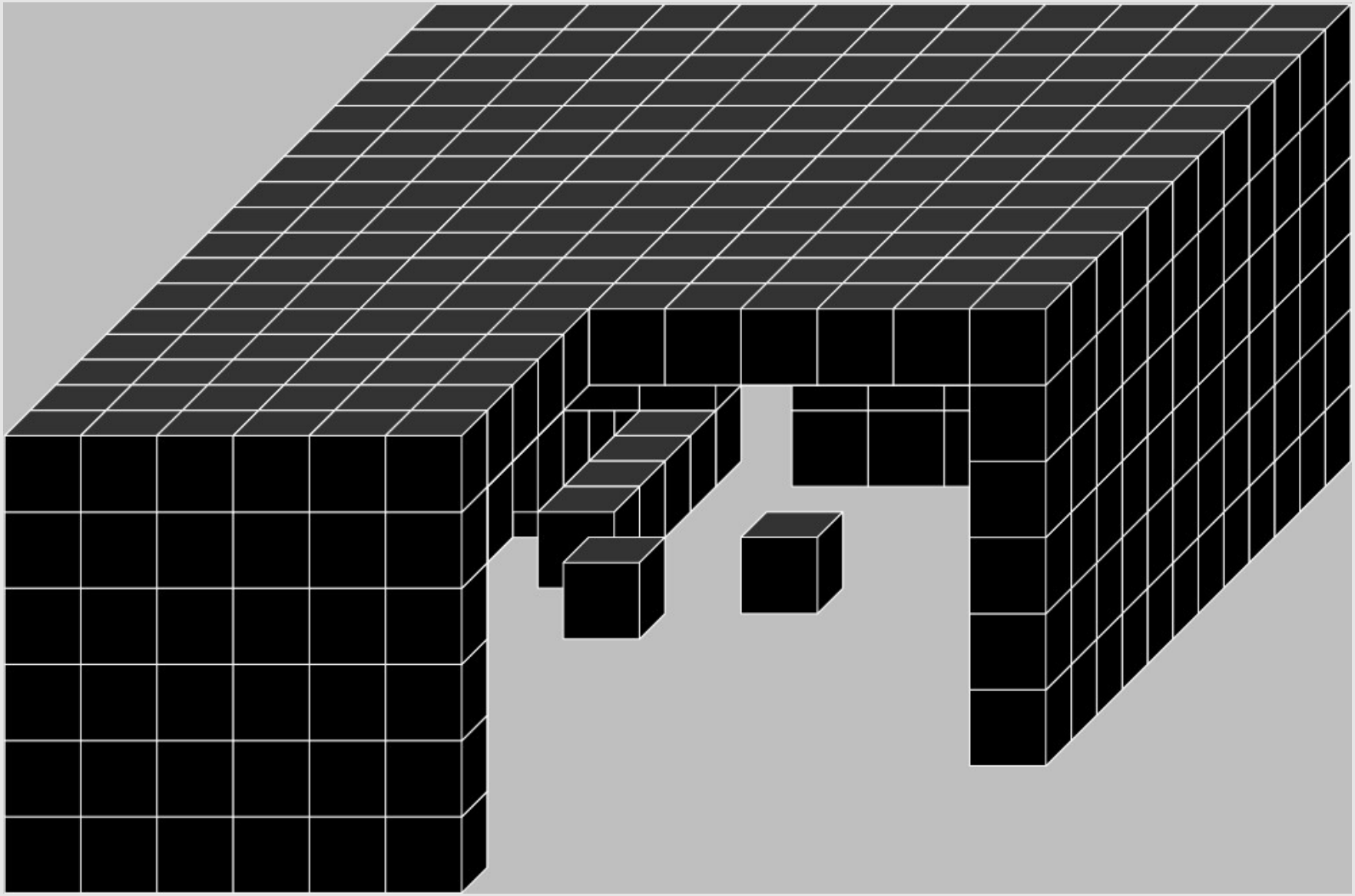
i3 mainz

Voxel-based model of the Church

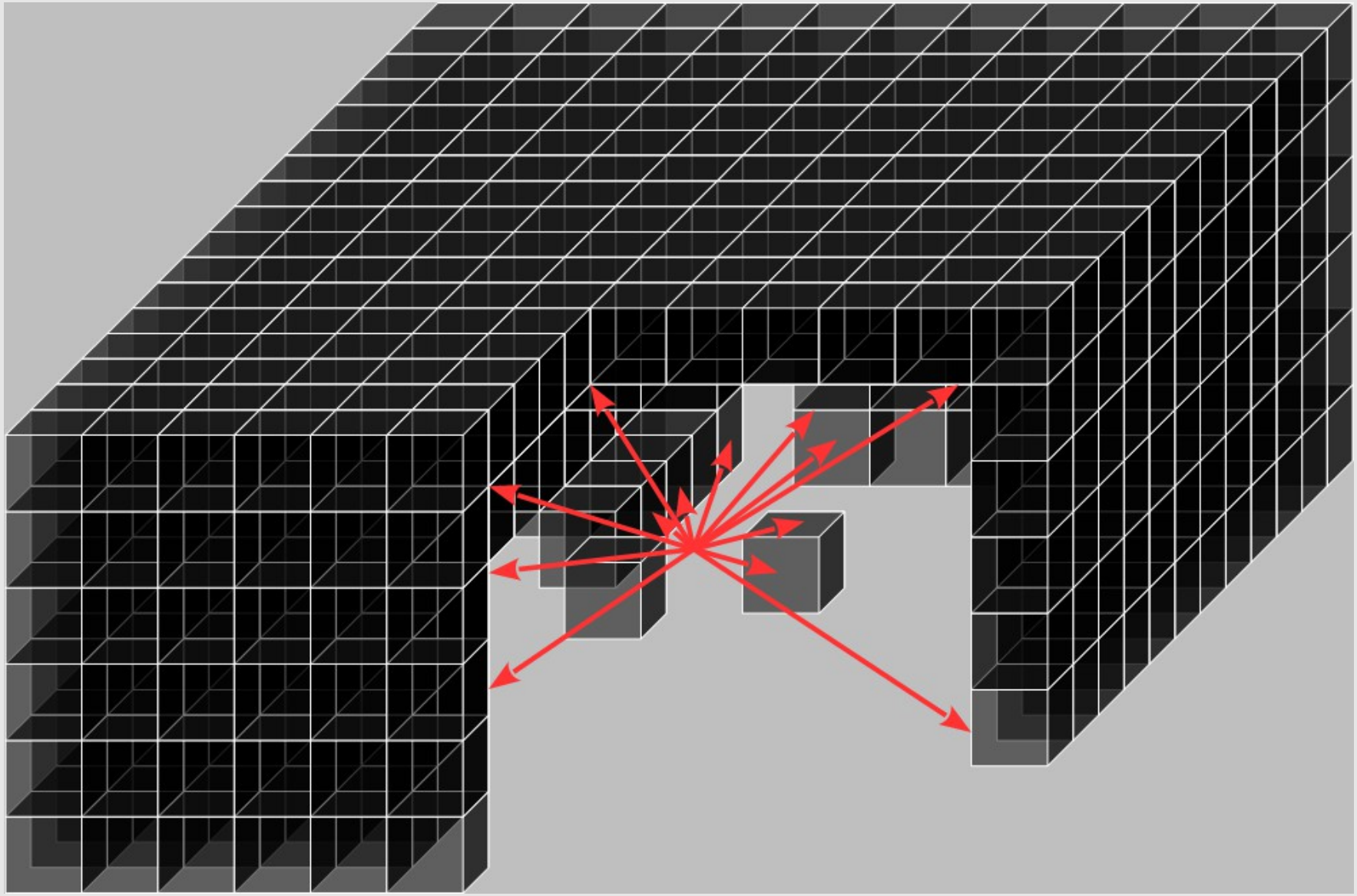


i3 mainz

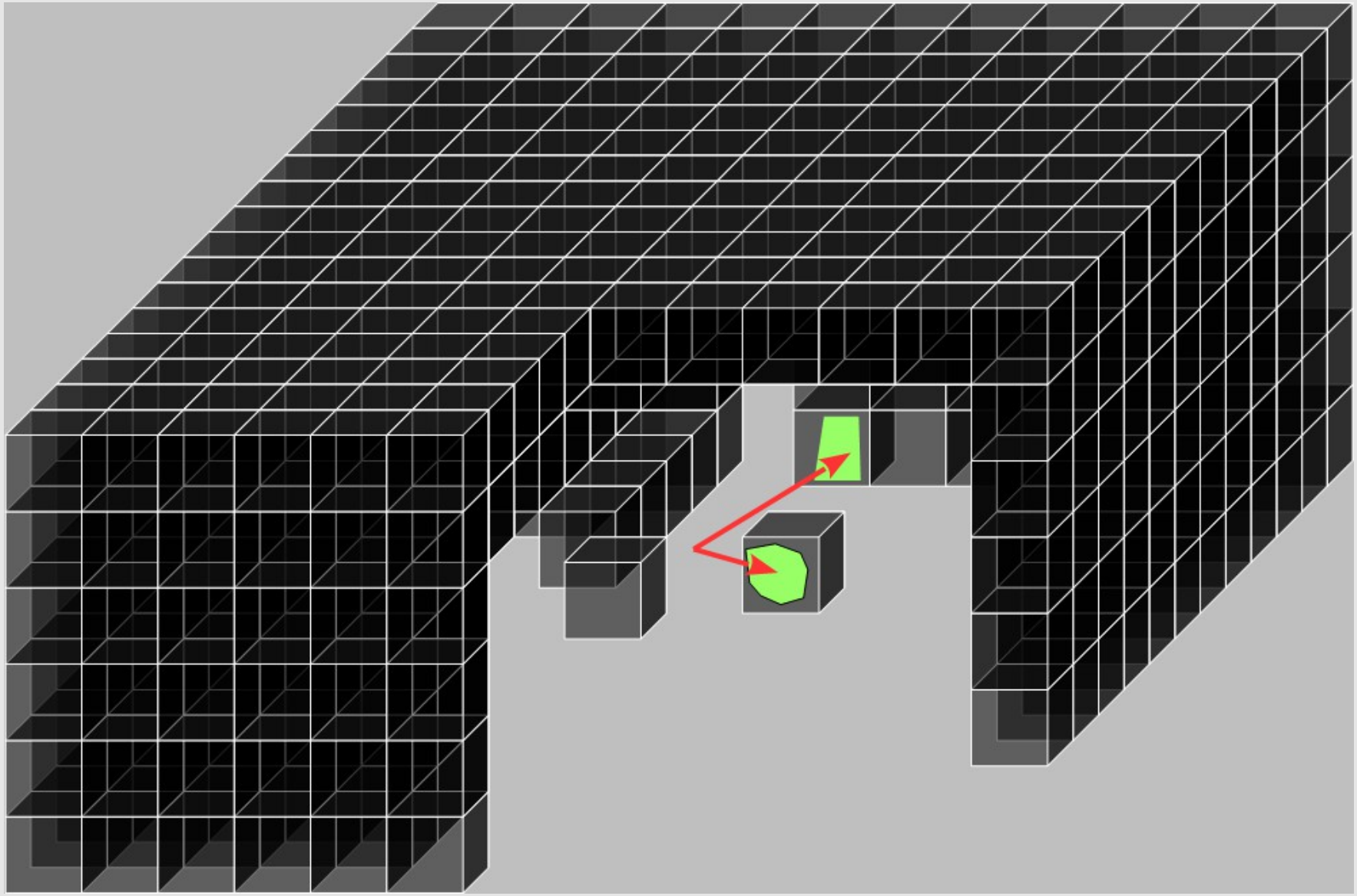
Voxel-based model of the Church



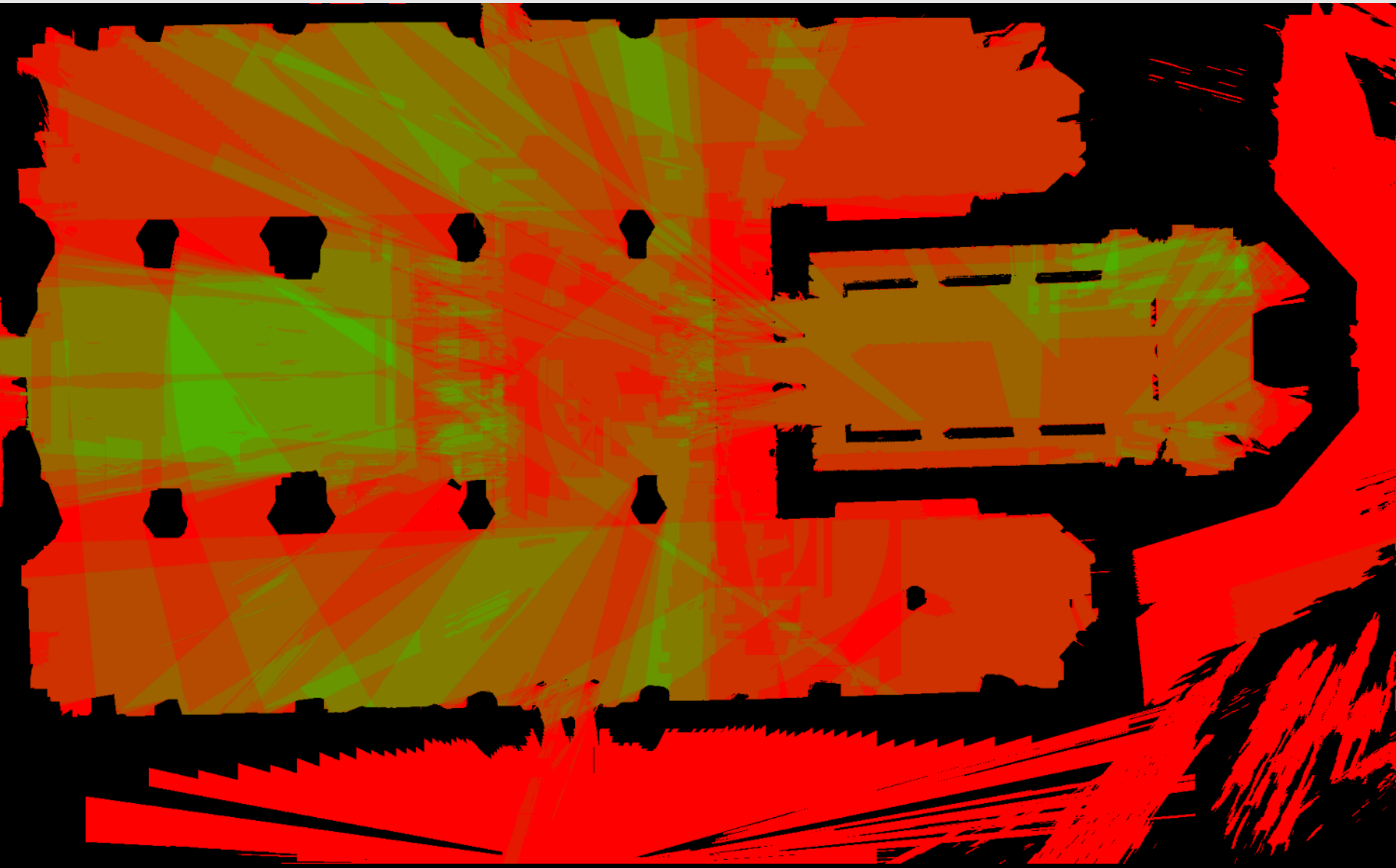
Voxel-based model of the Church



Voxel-based model of the Church



Export and Analysis: 3D visibility at 1.8 m, Inscriptions with ‘Gothic Majuscule’



Export and Analysis: 3D visibility at 1.8 m, Inscriptions with 'Gothic Majuscule', Matrix

FeatureID 1699	distance	horizontal angle	vertical angle	angle of incidence
voxel2040	1,73	278,4	88,3	4,8
voxel2141	5,34	389,3	100,5	12,7
voxel2242	8,22	32,7	97,4	88,3
voxel2343	4,01	149,2	107,2	47,2
voxel2444	13,98	77,3	110,9	20,9
...				

Summary

- Raw 3D pointcloud data is
  - inexpensive
  - objective
  - annotatable
    - computations are costlier, but not impossible (e.g. voxel-based visibility analysis)
- Annotations (on 3D objects)
  - contain information about the meaning of objects
  - arise in Humanities (Semantic Web)
    - flexible accessibility, needs SPARQL knowledge (but user interfaces could make things easier)

Outlook

- Collaborations
  - ideas how annotations could be helpful for archeology
  - other analysis/algorithms on raw pointcloud data
- GenericViewer
  - Try here: ibr.spatialhumanities.de/viewer
  - Code on GitHub: github.com/spatialhumanities
  - Open Source (not sure which license exactly yet)
- Websites
  - Spatial Humanities: www.spatialhumanities.de/ibr
  - i3mainz: i3mainz.hs-mainz.de/en/projekte/ibr

Team

- Academy of Science and Literature Mainz
  - Torsten Schrade
  - Felix Lange
  - Frithjof Schwartz
- i3mainz – Institute for Spatial Information- and Surveying-Technology
  - Fredie Kern
  - Julia Ganicheva
  - Alexandra Müller
  - Martin Unold
- Federal Ministry for Education and Research

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung