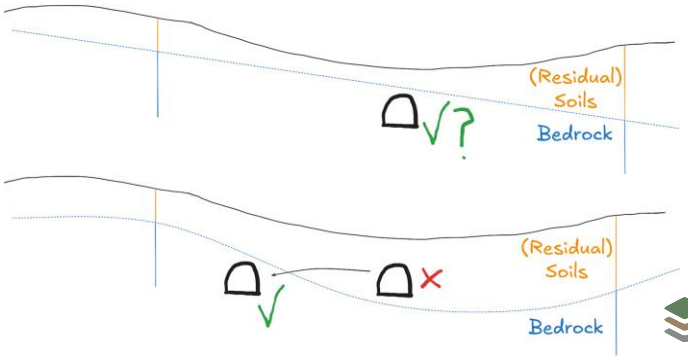
Unearthing the hidden potential in ground investigation data by converting to geospatial databases

KIVI be-net

Geophysics to fill in gaps between boreholes & CPTs?



After graduating I moved to Madrid and joined Arup

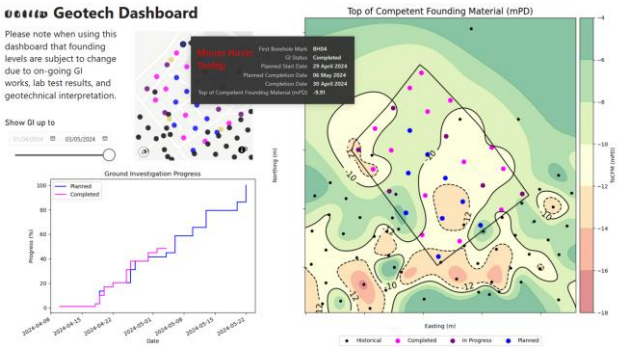
I was fascinated by computational design

Computational design for geotechnical engineering

Ground Investigation
↓
Ground Modeling
↓
Geotechnical Analysis & Design
↓
Delivery

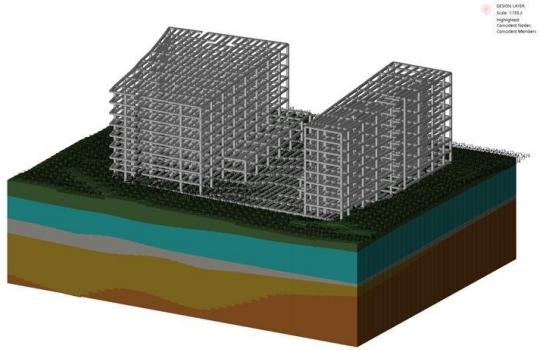
Computational design for geotechnical engineering

Shallow foundation feasibility dashboard



Computational design for geotechnical engineering

Automated raft foundation analysis



I worked for Arup on projects all over the world

Ground Investigation (GI) data is different everywhere

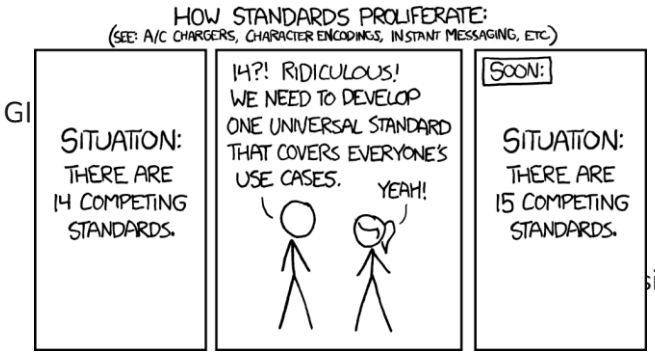
Formats

- PDF
- CSVs
- Excel
- AGS 3
- AGS 4
- GEF
- Many more…

Committees

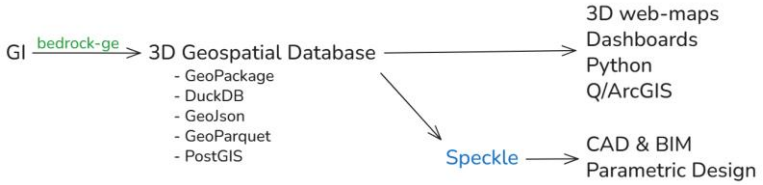
- AGS data management working group
- OGC geotech interoperability experiment
  OGC, bSI (IFC), AGS, DIGGS

How do we get our GI data where we need it?



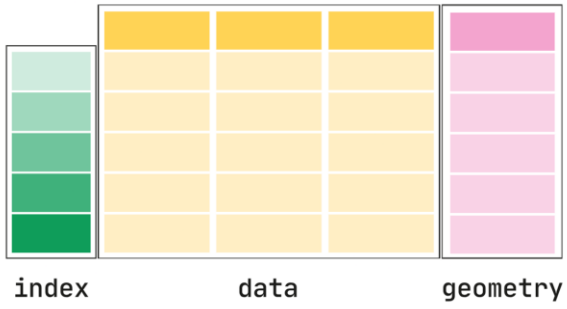
How do we get our GI data where we need it?

bedrock-ge



GI data is 3D geospatial vector data

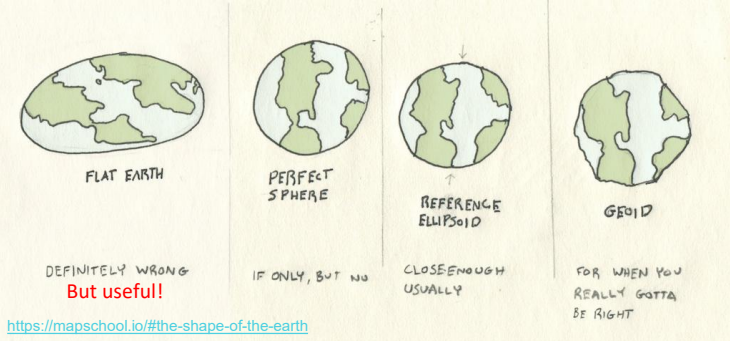
(Not BIM data)



GI data is relational

GI Tables	Geospatial Geometry Type
• Projects	
• Locations	LINESTRING Z
In-Situ Observations & Measurements	
• Raw CPT Data	None
• Interpreted CPT Soil Profiles	LINESTRING Z
• Geological Descriptions	LINESTRING Z
• Vane Shear Test	POINT Z
• Samples	POINT Z or LINESTRING Z
Laboratory Tests	
• Densities	
• Moisture Contents	
• Atterberg Limits	
• Particle Size Distributions	
• Consolidation Tests	
• Triaxial Tests	
• Direct Shear Tests	

GIS software handles CRS transformations



GI → bedrock-ge → 3D Geospatial DB

How about PDFs?

AI

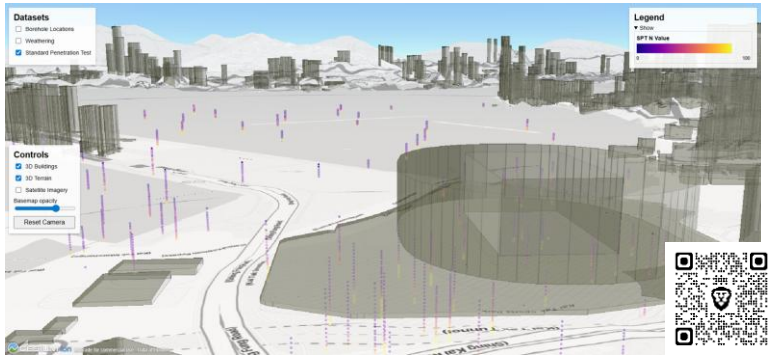
However, AI needs to put the data it extracts from the PDFs in a <u>useful data structure</u>.

AGS 3 GI data in Hong Kong

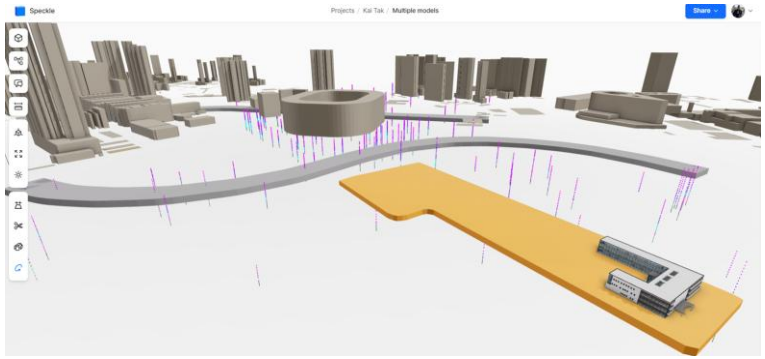
ArcGIS (Online) 3D (web-)map

AGS 3 GI data in Hong Kong

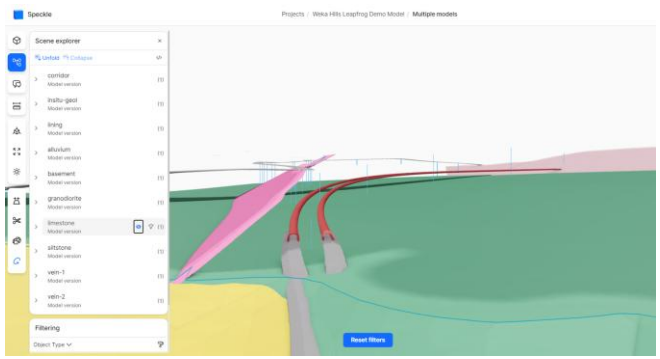
CesiumJS 3D web-map



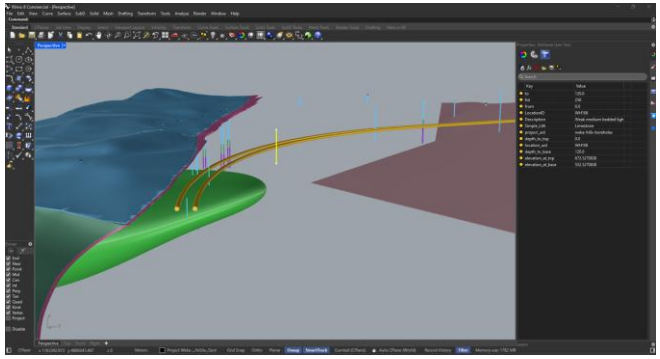
AGS 3 GI data in Hong Kong
Speckle



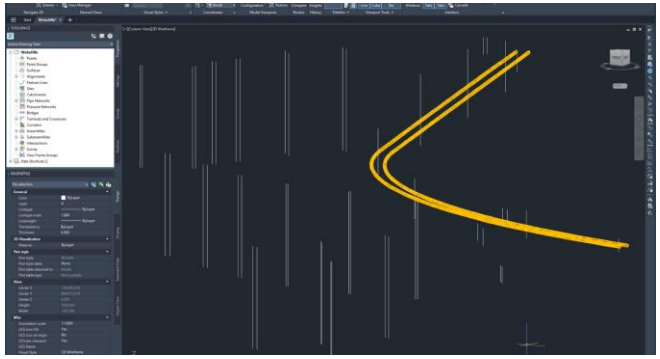
Leapfrog demo model
Speckle



Leapfrog demo model
Rhino / Grasshopper

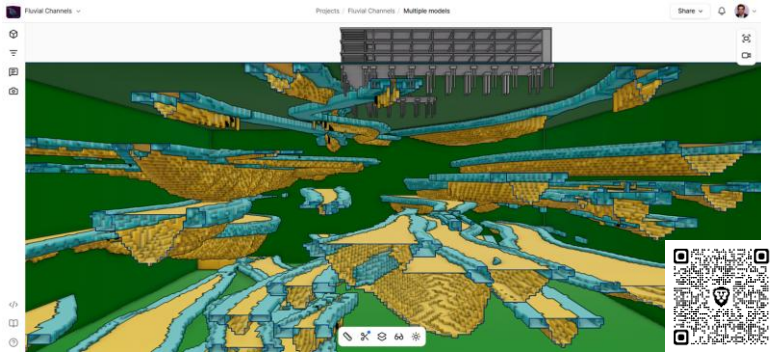


Leapfrog demo model
Civil3D



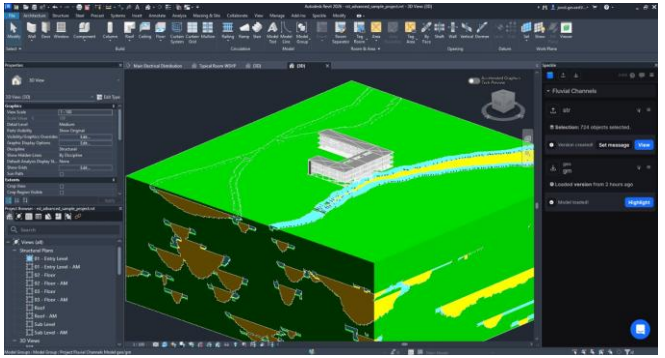
Synthetic ground model with fluvial channels

Speckle



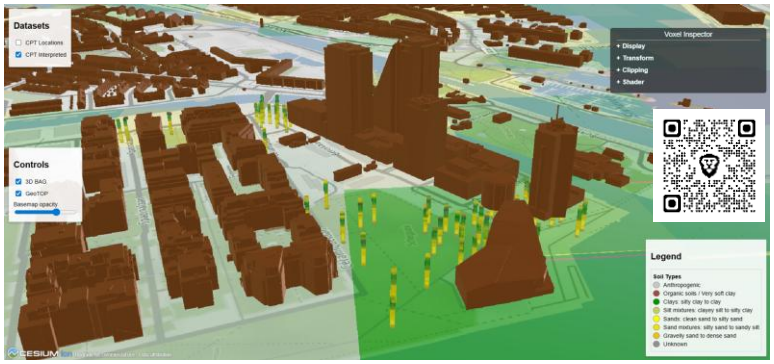
Synthetic ground model with fluvial channels

Revit



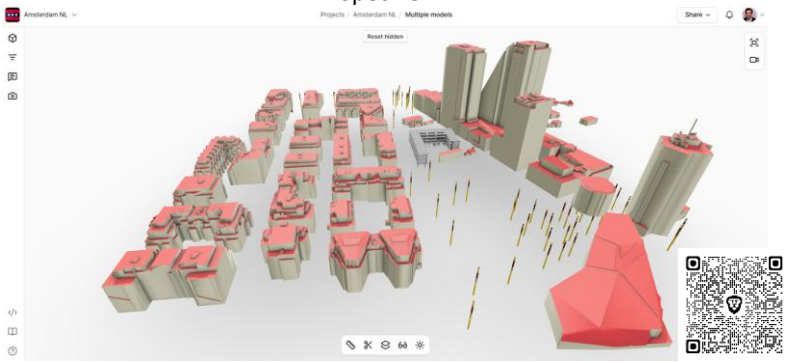
Amsterdam Noord, Interpreted BRO CPTs

CesiumJS



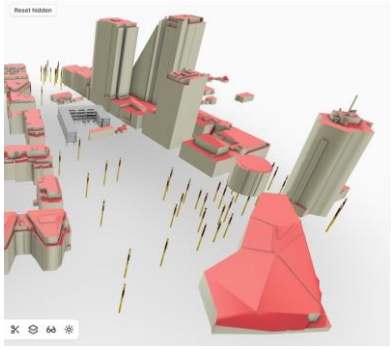
Amsterdam Noord, Interpreted BRO CPTs

Speckle



Why haven't we structured GI data as 3D geospatial data before?

- 3D GIS is new
- GIS ↔ BIM is easier now



Bedrock, the open-source foundation for geotechnical engineering