Data annotation exercise
Download data for Uganda

• https://springuniversity.bc3research.org/isu-2019/
Import a project
Pathname to projects

- C:\Users\bvoigt\klab
... Or pick only those projects you want to import if present in the list from previous imports

... Or other directories based on locations in the next slide
Projects to import

• C:\Users\bvoigt\klab
• Worldview
  • im.git
  • im.aries.git

• Deploy
  • im.aries.global.git
  • im.components.geoprocessing.git
  • im.data.usa.git
  • im.data.osm.git
... pick only those projects you want to import
... Click Next several times till finalizing the Import wizard
Create a local project

No spaces, no capital letters!!!
Dots to divide words.
Plus a double-click to open the code

Open the code
Create a namespace
No spaces, no capital letters!!!
Creating a context for an observation

Make sure the data is unzipped!
Drag and drop the .shp file to "Resources"
Ignore the error and click "ok"
A click opens a Resource editor if needed
k.LAB Resource Editor

Define all the properties of a resource, its geometry and its provenance information
LOCAL, UNPUBLISHED

Resource data
Documentation Permissions

Resource data

Urn: local:zuzanaharmackova:zuzana.sar Local name: Uganda_EastElgon_Boundaries.shp

Geometry
Space (click to edit)

VECTOR adapter data

Adapter property Type Value

Publishable Why not
Attributes Inputs Outputs
Name

Local name

No results

No temporal context

System Log
Report Info
Paste to the code
Write the rest of the code chunk
The resulting context appears in the Navigator
namespace elgon;

observe earth:Region named elgon

over space {
  urn = 'local:zuzanaharmackova:zuzana.sandbox:elgon';
  grid = "100 m",
  projection = "EPSG:4326"
};
Annotate a NDVI dataset

NDVI dataset; drag and drop to Resources; ignore the error and press “ok”
```
del "Local:zuzanaharmackova:zuzana.sandbox:mosaic20:
    as ecology:NormalizedDifferenceVegetationIndex;
```
namespace elgon;

observe earth:Region named elgon
  over space (  
    urn = "local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon", 
    grid = "100 m", 
    projection = "EPSG:4326" )
  );

//model "local:zuzanaharmackova:zuzana.sandbox:mosaic2018_Ugand...
Use Knowledge Search to search for concepts; double-click on the selected concept to get its exact spelling.
If we now don’t move the map, reset the context with and observe NDVI directly in k.Explorer, it remembers the previous context dragged and dropped in k.Modeler and shows NDVI for that area.
Sironko, Eastern Region, Uganda

Normalized difference vegetation index
Annotate a Land Cover dataset

This is an incomplete annotation – we didn’t annotate the actual Land Cover classes (types)
namespace elgon;

observe earth:Region named elgon
  over space (urn = "local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon", grid = "100 m", projection = "EPSG:4326");

//model "local:zuzanaharmackova:zuzana.sandbox:mosaic2018_Uganda_EastElgon"
  as ecology:NormalizedDifferenceVegetationIndex;

model "local:zuzanaharmackova:zuzana.sandbox:ugandanvi"
  as ecology:NormalizedDifferenceVegetationIndex;

model "local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon_LandCover"
  as landcover:LandCoverType
classified into
  landcover:Forest if 1,
  landcover:MoorAndHeathland if 2,
  landcover:NaturalGrassland if 3,
  landcover:AgriculturalVegetation if 4,
  landcover:Wetland if 5,
  landcover:SparseVegetation if 6,
  landcover:BareArea if 7,
  landcover:ArtificialSurface if 8,
  landcover:WaterBody if 10
  over space (urn = "local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon_LandCover", grid = "100 m", projection = "EPSG:4326");
This is an incomplete annotation – we didn’t annotate the actual Land Cover classes (types)
Land Cover Classes

• Forest – 1
• Moor & HeathLand – 2
• Natural Grassland – 3
• Agricultural Vegetation – 4
• Wetland – 5
• Sparse Vegetation – 6
• Bare Area – 7
• Artificial Surface – 8
• Water Body - 10

We need to annotate the data so that individual Land Cover classes from the dataset are recognised.
Finish the annotation of the classes
namespace elgon;

observe earth:Region named elgon
  over space {
    urn = "local:zuzanaharova/zuzana.sandbox:Uganda_EastElgon",
    grid = "100 m",
    projection = "EPSG:4326"
  };

//model "local:zuzanaharova/zuzana.sandbox:mosaic2018_Uganda_EastElgon_LandCover" as ecology:NormalizedDifferenceVegetationIndex

//model "local:zuzanaharova/zuzana.sandbox:mosaic2018_Uganda_EastElgon_LandCover" as ecology:NormalizedDifferenceVegetationIndex

model "local:zuzanaharova/zuzana.sandbox:ugandandvi"
  as ecology:NormalizedDifferenceVegetationIndex
  classified into
    landcover:Forest if 1,
    landcover:MoorAndHeathland if 2,
    landcover:NaturalGrassland if 3,
    landcover:AgriculturalVegetation if 4,
    landcover:Wetland if 5,
    landcover:ArtificialVegetation if 6,
    landcover:BareArea if 7,
    landcover:WaterBody if 10
  over space (urn = "local:zuzanaharova/zuzana.sandbox:Uganda_EastElgon_Boundaries.shp")

over space (urn = "local:zuzanaharova/zuzana.sandbox:Uganda_EastElgon_Boundaries.shp")

over space (urn = "local:zuzanaharova/zuzana.sandbox:Uganda_EastElgon_LandCover_Sentinel2018.shp")

over space (urn = "local:zuzanaharova/zuzana.sandbox:Uganda_EastElgon_LandCover_2018.shp")
Drag and drop
To get details of the result; then reset the context.
A combination of our local data and the globally available Land Cover dataset.
Information on which dataset was used accessed from k.Modeler
Information on which dataset was used accessed from k.Explorer
“Clipping” the local Land Cover data to just a given area, here the context we created previously

1. Save in k.Modeler
2. Reset the context in k.Explorer with
3. Drag and drop in k.Modeler
4. Re-observe through typing “LandCoverType” in k.Explorer
Both datasets are now visible, with the local one clipped to our context.
namespace elgon;

observe earth:Region named elgon
  over space (urn = "local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon_Boundaries", grid = "100 m", projection = "EPSG:4326");

model "local:zuzanaharmackova:zuzana.sandbox:mosaic2018_Uganda_EastElgon_Boundaries"
  as ecology:NormalizedDifferenceVegetationIndex;

model "local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon_LandCover_Sentinel2016"
  as landcover:LandCoverType
  classified into
    landcover:Forest if 1,
    landcover:MoorAndHeathland if 2,
    landcover:NaturalGrassland if 3,
    landcover:AgriculturalVegetation if 4,
    landcover:Wetland if 5,
    landcover: SparseVegetation if 6,
    landcover:BareArea if 7,
    landcover: ArtificialSurface if 8,
    landcover: WaterBody if 10
  over space (urn = "local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon_Boundaries#subregion=ELGON");
MCA exercise
Import a project from GitHub

https://bitbucket.org/integratedmodelling/
Copy the link to the repository

https://ZuzanaHarmackova@bitbucket.org/integratedmodelling/im.examples.git
Import one or more projects from a Git repository.

Select an import wizard:

- General
- Git
- Projects from Git
- Run/Debug
- Team

Next >>
Paste the link to the repository and click next till the finish of the import wizard.
```python
namespace im.mca;

/**
 * Using the interactive parameters in the benefit an
 * interactive mode. The labels used for the weights
 * is named with. Start with equal weights for a neut
 *
 * Docstring goes into interactive form.
 *
 * TODO keep adding "independent" values to this as t
 * FIIXME semantics for the main observable
 */

@benefit(value?1) im:Retained soil:Soil im:M
@benefit(value?1) chemistry:Organic chemistry

model value of demography:Human policy:Management beh
"The total ES value is a 0-1 ranking that mixes t ES. As a default, all ES have equal value." observing

```
Open a viewer
namespace im.mca;

/**
 * Using the interactive parameters in the benefit and interactive mode. The labels used for the weights
 * is named with. Start with equal weights for a neutral
 * Docstring goes into interactive form.
 * TODO keep adding "independent" values to this as to
 * FIXME semantics for the main observable.
 */

test value of demography:Human policy:Management belief
"The total ES value is a 0-1 ranking that mixes ES. As a default, all ES have equal value."
MCA is more feasible for smaller contexts
?= in the code stands for parameters set by the user in a dialogue window in k.Explorer.
Drag and drop
Specify the parameters
Creating a resource instead of dragging and dropping
integratedmodelling.org/geoserver
Layer Preview

List of all layers configured in GeoServer and provides previews in various formats for each.

Results 1 to 1 (out of 1 matches from 849 items)

Type | Name | OpenLayers XML | Select one
--- | --- | --- | ---
[Icon] | stefano-balbi-eu-es-bi-geography:Uganda_ndvi2018 | | |
[Icon] | Uganda_ndvi2018 | | |

Search: uganda
In some cases it may be necessary to use a double underscore instead of ":" in wcsIdentifier.
It may be necessary to repeat the import of the Resource several times before it succeeds.
Replacing the original annotation by a new one referring to the new Resource.
Useful hint if we lose some of the perspective windows
In the case that k.Explorer is in the Inractive mode, these two commands equal and both reset the current context.
This particular data is not working due to projection issues: the corrected version of the data on the geoserver: uganda_ndvi:Uganda_NDVI_reproject
Non-semantic models in k.Modeler
1. Copy URN.

2. Copy URN.

3. `number "Local:zuzana.harmackova:zuzana.sandbox:mosaic1990_Uganda as ndvi_1990;`
model "Local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon_LandCover" as landcover:LandCoverType
classified into
- landcover:Forest if 1,
- landcover:MoorAndHeathland if 2,
- landcover:NaturalGrassland if 3,
- landcover:AgriculturalVegetation if 4,
- landcover:Wetland if 5,
- landcover:SparseVegetation if 6,
- landcover:BareArea if 7,
- landcover:ArtificialSurface if 8,
- landcover:WaterBody if 10
over space (urn = "Local:zuzanaharmackova:zuzana.sandbox:Uganda_EastElgon_LandCover")

model each "Local:zuzanaharmackova:zuzana.sandbox:mosaic1990_Uganda_EastElgon_LandCover" as earth:MountainPeak;

number "Local:zuzanaharmackova:zuzana.sandbox:mosaic1990_Uganda_EastElgon_LandCover" as ndvi_1990;

number "Local:zuzanaharmackova:zuzana.sandbox:mosaic2018_Uganda_EastElgon_LandCover" as ndvi_2018;
Semantic operations with models
Semantic differential between two non-semantic resources

If we needed a more complex mathematical expression, we use Groovy to write inside the []
<table>
<thead>
<tr>
<th>Operator</th>
<th>Purpose</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>addition</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>subtraction</td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>multiplication</td>
<td></td>
</tr>
<tr>
<td>/</td>
<td>division</td>
<td>Use <code>intdiv()</code> for integer division, and see the section about <code>integer division</code> for more information on the return type of the division.</td>
</tr>
<tr>
<td>%</td>
<td>remainder</td>
<td></td>
</tr>
<tr>
<td>**</td>
<td>power</td>
<td>See the section about the <code>power operation</code> for more information on the return type of the operation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operator</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>==</td>
<td>equal</td>
</tr>
<tr>
<td>!=</td>
<td>different</td>
</tr>
<tr>
<td>&lt;</td>
<td>less than</td>
</tr>
<tr>
<td>&lt;=</td>
<td>less than or equal</td>
</tr>
<tr>
<td>&gt;</td>
<td>greater than</td>
</tr>
<tr>
<td>&gt;=</td>
<td>greater than or equal</td>
</tr>
</tbody>
</table>

And many more on:
http://docs.groovy-lang.org/latest/html/documentation/core-operators.html
Elgon

Differential normalized difference vegetation index

Grid size
1217295 (1065 x 1143) cells

Cell size
0.001 x 0.001 m

Total area

OpenStreetMap contributors.
Calculates the difference in those cells in which NDVI has decreased between 1990 and 2018.
Calculates the difference in those cells in which NDVI has increased between 1990 and 2018.
Pull changes in repositories
Landscape heterogeneity
Operation with a circular moving window, default radius = 1000 m
k.Explorer in a non-interactive mode goes directly to results.
Inspect and edit the dataflow user parameters before running

The following parameters admit user input in interactive mode. Please inspect the default values and change them as required. Press Submit Values to continue with the modified values, UseDefaults to proceed with the default values, or Cancel Run to stop the computation.

radius: 5000

- Radius of the neighborhood to consider in meters.
- Default is the distance spanning one cell at the current resolution, producing a Moore neighborhood.

CANCEL RUN  USE DEFAULTS  SUBMIT