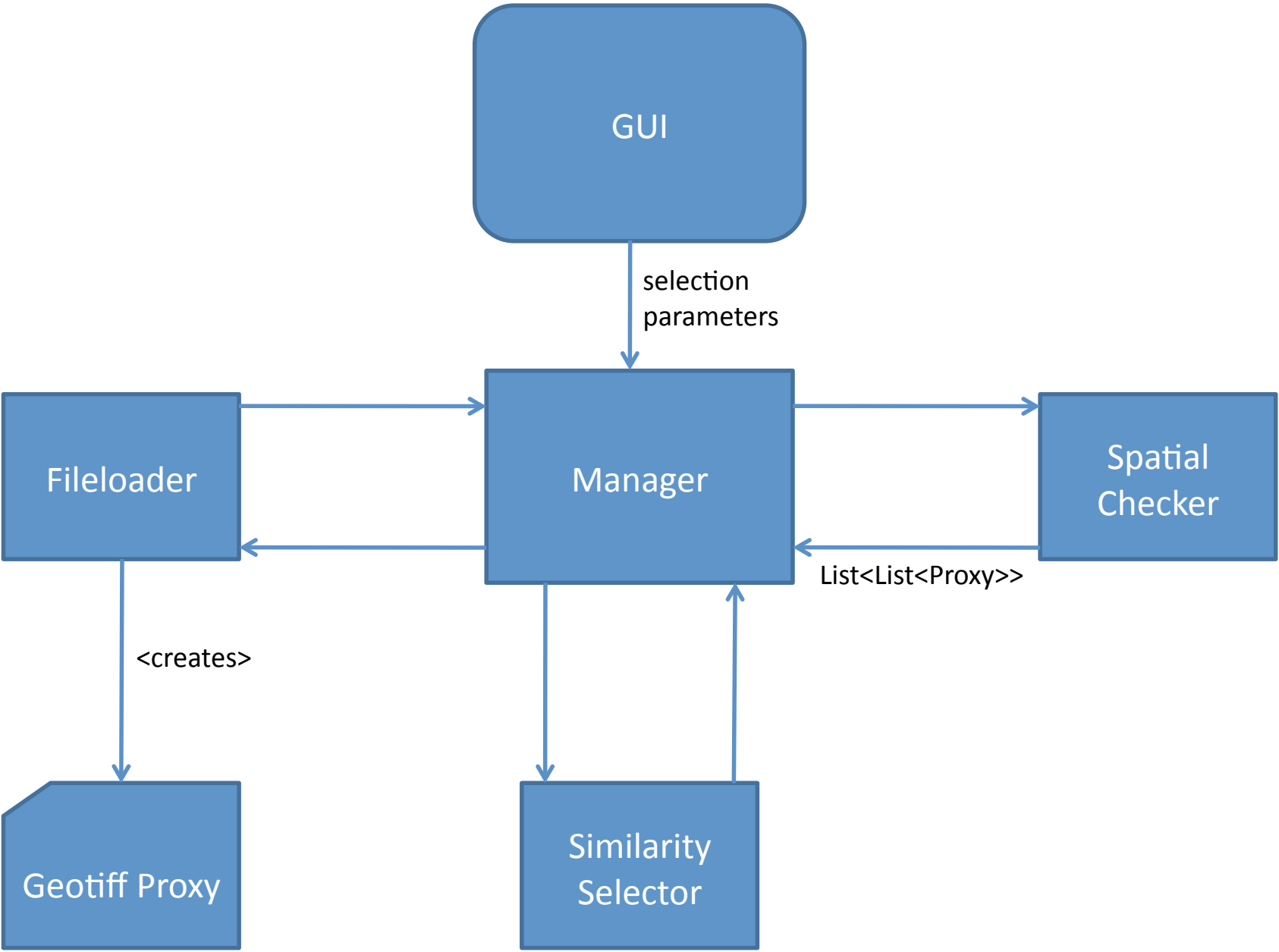


ASAP

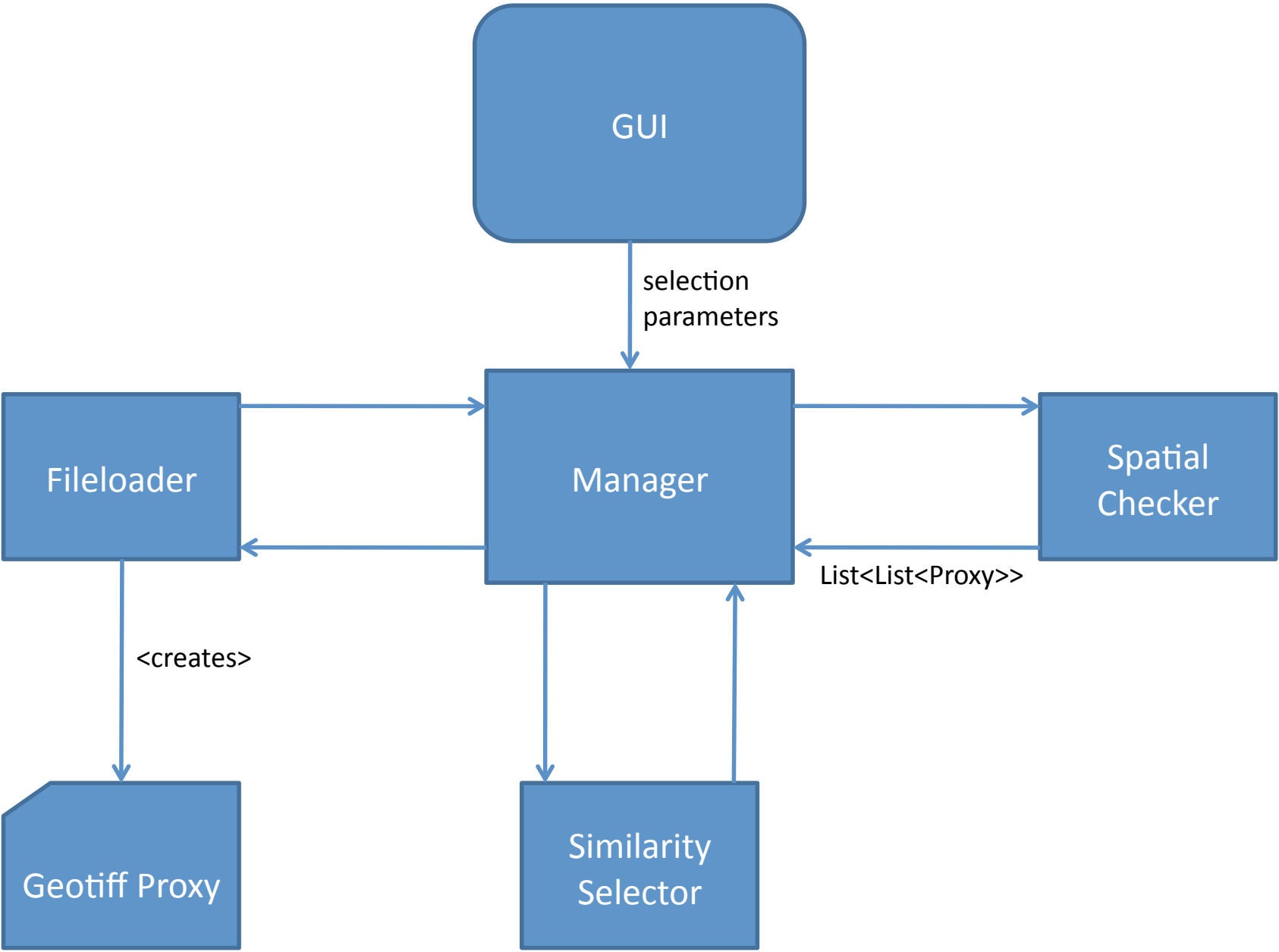
GEONETCast Course WS 09/10



The logo for Geotiff Proxy is a blue rectangle with a white border and a white diagonal line in the top-left corner. The text "Geotiff Proxy" is written in white inside the rectangle.

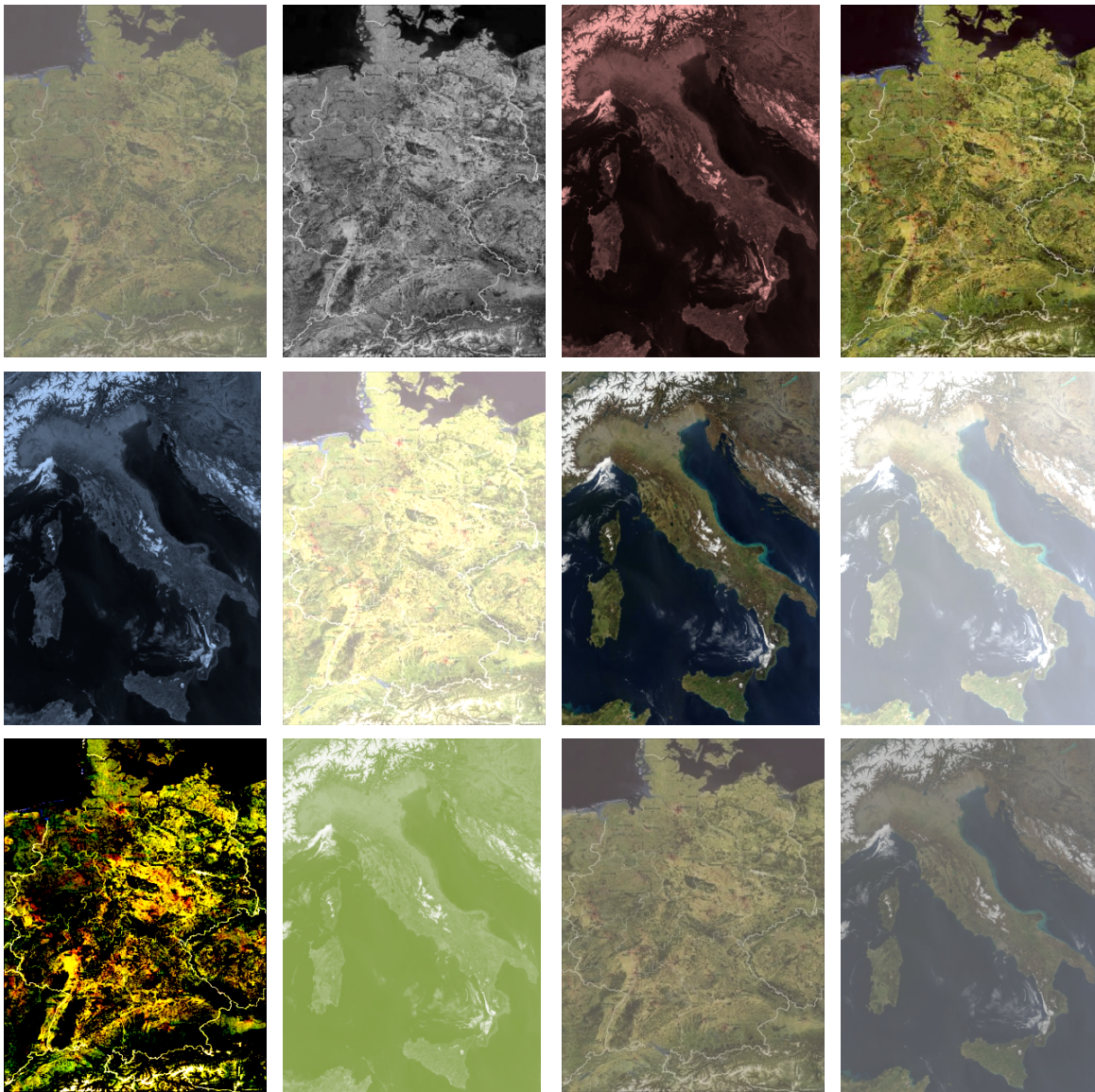
Geotiff Proxy

- -common design pattern
- -contains all relevant information
 - -bounding box
 - -file path
 - -sample of pixels
- -is the central element to process

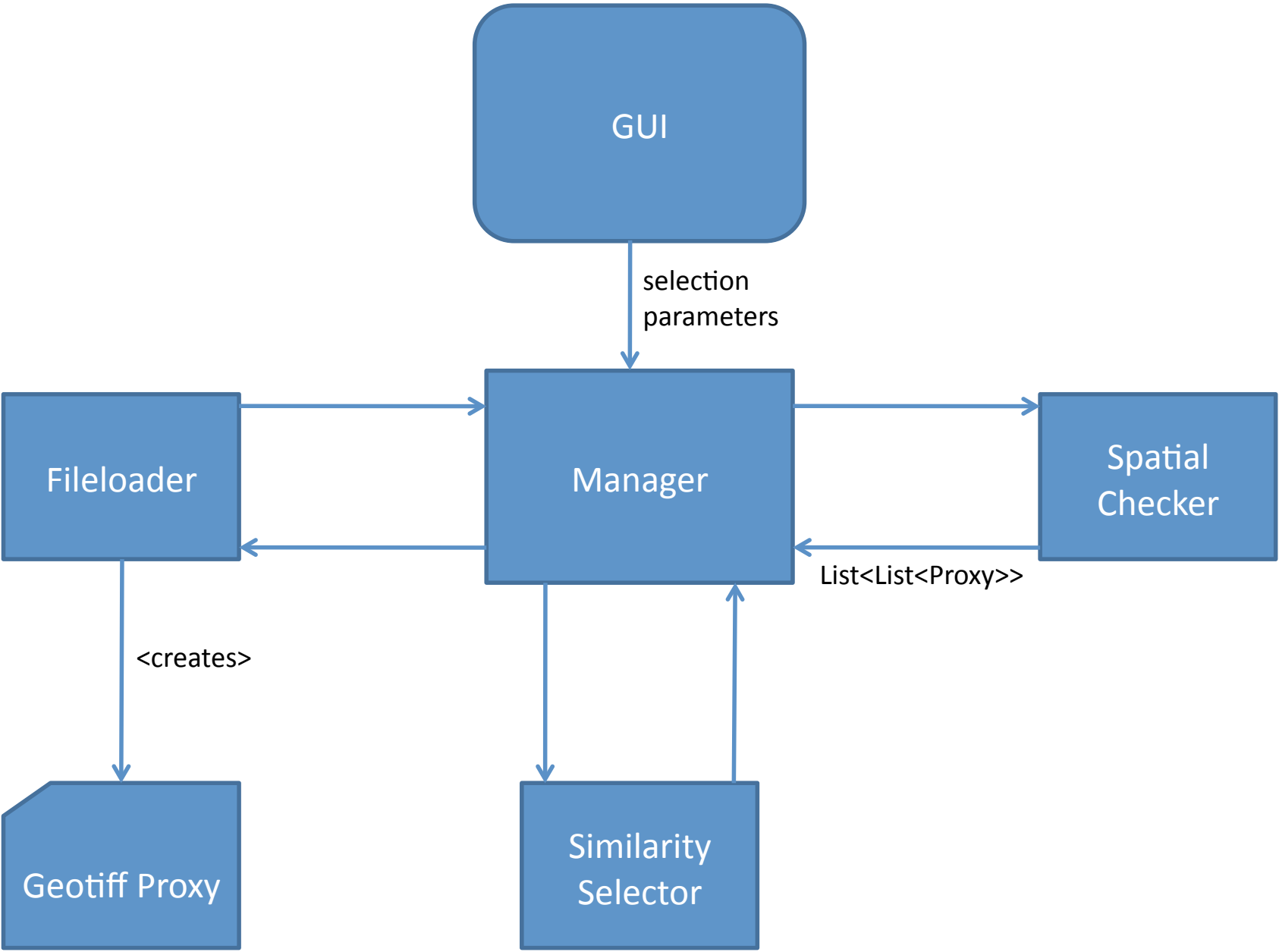


Spatial Checker

- -seperates the input by its spatial extract
- -only images of the same space can be compared



Spatial
Checker



Similarity Selector

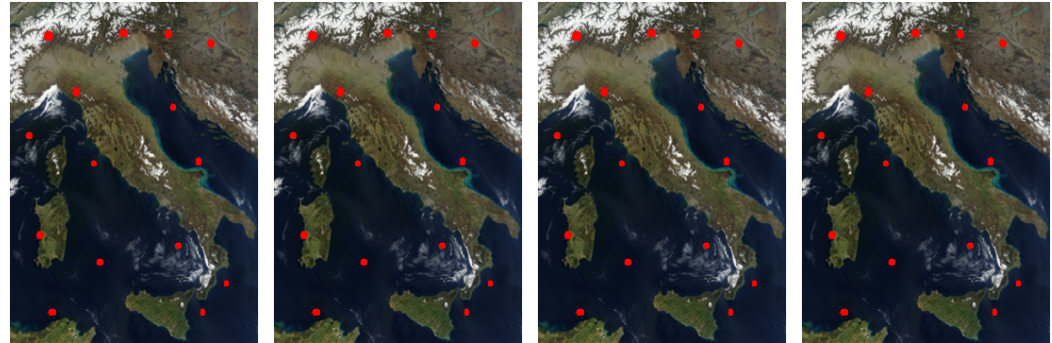
- 1st important concept:
- Mahalanobis distance between images x and y

$$d = \sqrt{(\vec{x} - \vec{y})' * S^{-1} * (\vec{x} - \vec{y})}$$

$$\vec{x} = (x_1, x_2, \dots, x_n)'$$

- n is the number of pixels (sample size)
- Problem: How to estimate S ?

Similarity Selector



- Problem: How to estimate S ?
- Number of pixels n (e.g. $n=1000$)
- Number of images k (e.g. $k=20$)
- $n \gg k$
- $\Rightarrow S$ is singular, therefore not invertible!

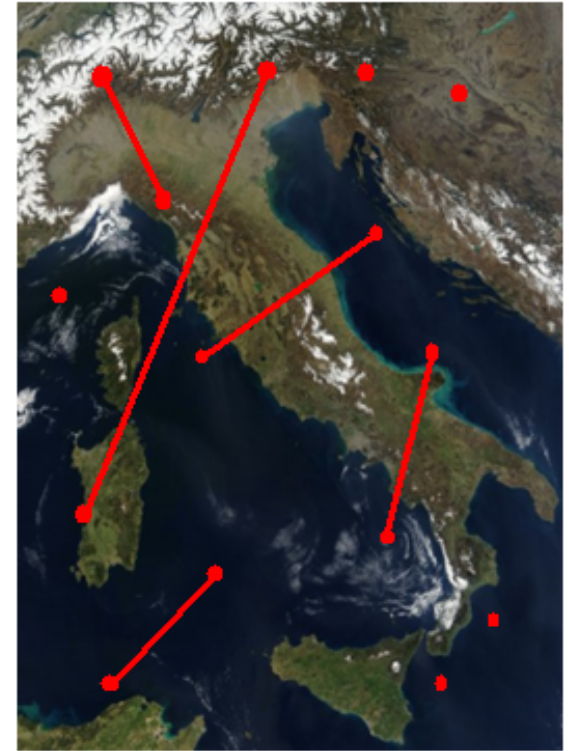
Similarity Selector

- Problem: How to estimate S ?
- Idea: Autocovariance function

$$\text{cov}(x_i, x_j) = \text{acv}(h_{i,j})$$

$$\text{acv}(h_{i,j}) = e^{-h_{i,j}/a}$$

$$S = \begin{pmatrix} \text{acv}(0) & \cdots & \text{acv}(h_{1,n}) \\ \vdots & \ddots & \vdots \\ \text{acv}(h_{n,1}) & \cdots & \text{acv}(0) \end{pmatrix}$$



Similarity Selector

- S can now be inverted!
- Next: Distance Matrix M ($k \times k$) of all combinations of the k images

$$M = \begin{pmatrix} 0 & d(x, y) & \cdots & d(x, z) \\ d(x, y) & 0 & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ d(x, z) & \cdots & \cdots & 0 \end{pmatrix}$$

$$d(x, y) = \sqrt{(\vec{x} - \vec{y})' * S^{-1} * (\vec{x} - \vec{y})}$$

Similarity
Selector

- What to do with M ?
- 2nd important concept:
- Multi Dimensional Scaling (MDS)

Similarity Selector

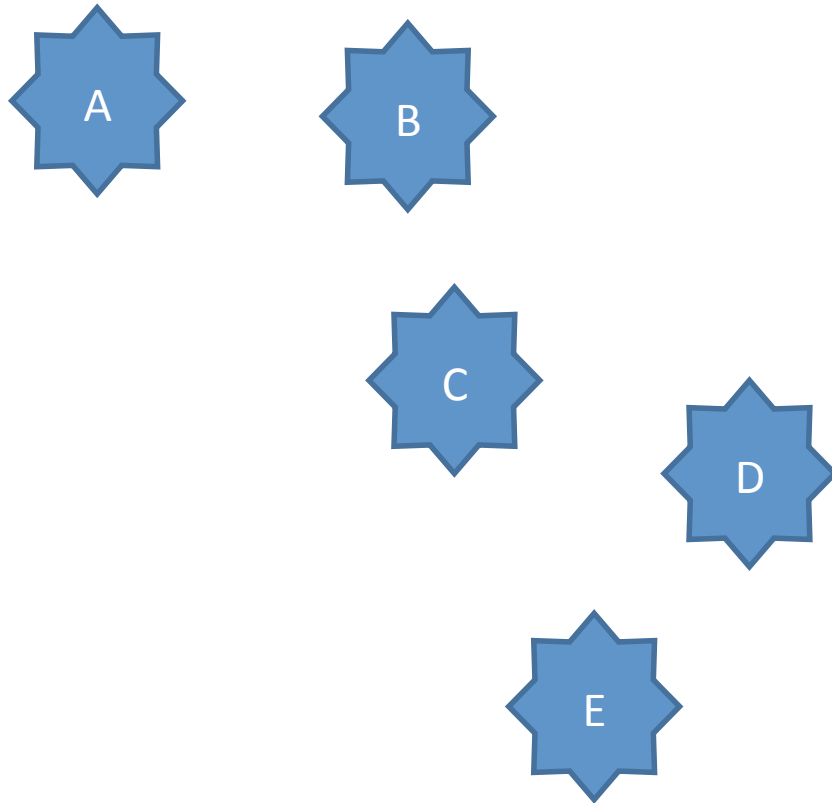
- Multi Dimensional Scaling (MDS)
- Example: Here 2 dimensions

	A	B	C	D	E
A	0	15	30	45	60
B	...	0
C	0
D	0	...
E	0

- How can we get the relative positions?

Similarity
Selector

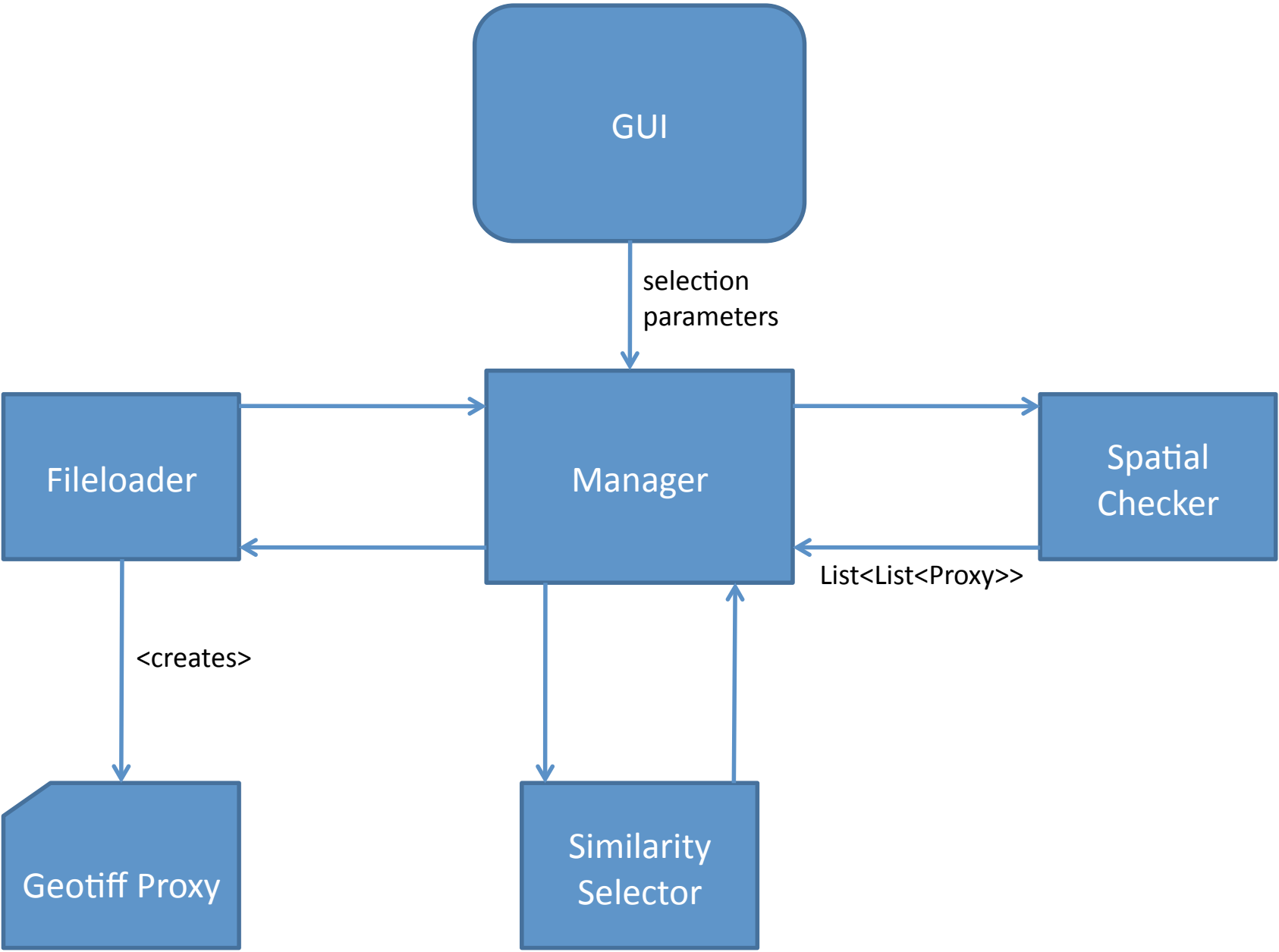
- Multi Dimensional Scaling (MDS)



Similarity Selector

- Multi Dimensional Scaling (MDS)
- We need One-Dimensional-Scaling
- Each image gets an MDS value

Im10	im1	im7	im2	im6	im8	im4	im3	im9	im5
-500	-312	-201	-23	65	134	333	506	709	899



- Thanks for your attention!