Automated Selection and Processing

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Introduction

- **Problem:**
  - Large amount of images, but many are useless
  - When getting a set of images, which image can be seen as representative for this set?

- **Solution:**
  - Automated Selection and Processing
  - Before working with images only the best images for the certain purpose will be provided
  - Showing typical images for a certain set enables more efficient work
Function in general
Architecture

Input: n Images

Filter by KO-criteria

Filter by spatial overlap

Set 1
Selection of Set 1

Set 2
Selection of Set 2

Set 3
Selection of Set 3

Output: k images
KO-Criteria

n Images

1. Light when taken images?
   - yes
   - no

2. $4 < \text{Brightness} < 252$
   - yes
   - no

3. Variance > x?
   - yes
   - no

k_1 Images

k_2 Images

k_3 Images
Architecture

Input: n Images

Filter by KO-criteria

Filter by spatial overlap

Set 1
Selection of Set 1

Set 2
Selection of Set 2

Set 3
Selection of Set 3

Output: k images
Filter by spatial overlap

Input: Image 1

Compare Bounding Box

Input: Image 2

Same BB

Overlapping BB

Non overlapping BB

Overlapping BB in %

Over threshold

Under threshold

Spatial Similar

Spatial different
Mahalanobis Distance

\[ d(x, y) = \sqrt{(x - y)' S^{-1} (x - y)} \]

\[ S = \begin{pmatrix}
\text{cov}(X1, X1) & \text{cov}(X1, X2) & \cdots & \text{cov}(X1, X9) \\
\text{cov}(X2, X1) & \cdots & \cdots & \text{cov}(X2, X9) \\
\cdots & \cdots & \cdots & \cdots \\
\text{cov}(X9, X1) & \cdots & \cdots & \text{cov}(X9, X9)
\end{pmatrix} \]
Example

\[ S = \begin{pmatrix} 0.1 & 0.0 & \ldots & 0.0 \\ 0.0 & \ldots & \ldots & \ldots \\ \ldots & \ldots & \ldots & \ldots \\ 0.0 & \ldots & \ldots & 2 \end{pmatrix} \quad S^{-1} = \begin{pmatrix} 10 & 0.0 & \ldots & 0.0 \\ 0.0 & \ldots & \ldots & \ldots \\ \ldots & \ldots & \ldots & \ldots \\ 0.0 & \ldots & \ldots & 0.5 \end{pmatrix} \]

• low covariance => high weight
• deviation in pixel X1 is rare
• therefore a strong indication of dissimilarity if it differs
Pro’s and Con’s

• takes regard of the image’s spatial structure
• frequently used in multivariate statistics
• invertability of S has to be guaranteed
## Timeline

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<tr>
<th>Date Range</th>
<th>Activity</th>
<th>Estimated Time</th>
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<td>25.11. – 27.11.</td>
<td>Introduction to GEONET Cast</td>
<td>10</td>
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<tr>
<td>30.11. – 13.12.</td>
<td>Implementation I</td>
<td>40</td>
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<td>14.12. – 23.12.</td>
<td>1st Thst Phase &amp; plausibility validation</td>
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<td>24.12. – 03.01.</td>
<td>Christmas Break</td>
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<tr>
<td>04.01. – 10.01.</td>
<td>Implementation II</td>
<td>25</td>
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<tr>
<td>11.01. – 17.01.</td>
<td>Final Test Phase II &amp; Report</td>
<td>20</td>
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<tr>
<td>18.01.</td>
<td>Report representation creation</td>
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<tr>
<td>19.01.</td>
<td>Final Report Meeting</td>
<td>2</td>
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<td>20.01. – 24.01.</td>
<td>Debugging</td>
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<tr>
<td>25.01. – 29.01.</td>
<td>Project Closure</td>
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## Time effort

<table>
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<td>Research &amp; Preparation</td>
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<tr>
<td>Implementation</td>
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<td>Testing</td>
<td>20</td>
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<td>Debug &amp; Project Closure</td>
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</tr>
<tr>
<td>Project Management</td>
<td>45</td>
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### Time Effort Distribution:

- **Research & Preparation**: 17%
- **Implementation**: 37%
- **Testing**: 11%
- **Debug & Project Closure**: 11%
- **Project Management**: 24%