Appendix B. The Mapper algorithm

Algorithm 1 Mapper algorithm

Input: $\mathcal{D}$ with $|D| = m$, filter function $f\colon \mathcal{D} \to \mathbb{R}^d$, finite cover $\mathcal{U} = \{\mathcal{U}_i\}_{i\in I}$ of $\mathrm{Im}(f) \subseteq \mathbb{R}^d$, clustering algorithm $\mathcal{C}$.

Output: Simplicial complex $S_{\mathcal{D}}$.

$S_{\mathcal{D}} \leftarrow \emptyset$
$\mathcal{D}_i \leftarrow f^{-1}(\mathcal{U}_i)$ for all $i \in I$
for all $i \in I$ **do**
  $\{C_i^1, \ldots, C_i^{k_i}\} \leftarrow \mathcal{C}(\mathcal{D}_i)$ {Apply the clustering algorithm to $\mathcal{D}_i$: the output are the clusters}
  $S_{\mathcal{D}} \leftarrow S_{\mathcal{D}} \cup \{C_i^1, \ldots, C_i^{k_i}\}$ {Add the clusters found as vertices}
end for
for all $\{C_1, \ldots, C_t\} \in \mathcal{P}\left(\bigcup_{i\in I}\{C_i^1, \ldots, C_i^{k_i}\}\right)$ {For all possible subsets of found clusters} **do**
  if $\bigcap_{j=1}^{t} C_j \neq \emptyset$ **then**
    $S_{\mathcal{D}} \leftarrow S_{\mathcal{D}} \cup \{\{C_1, \ldots, C_t\}\}$ {We add the simplex $\{C_1, \ldots, C_t\}$}
  end if
end for
return $S_{\mathcal{D}}$