Abstract: My research is centered on set operators. These are universally applicable regardless of the internal structure of each individual observed datum. In our research, we have developed the theory of set operators to fill holes and gaps in observed data and eliminate paper shred garbage, thereby changing the observed symbolic data set into one whose pattern is closer to the pattern in the underlying population from which the observed data set was sampled with perturbations. We describe different set operators including increasing operators, decreasing operators, expansive operators, contractive operators, union preserving operators, intersection preserving operators, set dilation operators, set erosion operators, dual operators, adjoint operators, opening operators and closing operators. We define the set operators and give proofs, and examples of their properties. We set up the category theory connection that describes the bridges between set theory, mathematical morphology, group theory and topology. For example, dilation and erosion in mathematical morphology are special cases of set operators and are using set dilation operators and set erosion operators, they are dual and adjoint of each other. The pairs of closing operators and opening operators, union preserving operators and their inverses, the intersection preserving operators and their inverses, all give rise to a Galois connection. All these high-level theoretical concepts have been completed. For applications, I illustrate our theorems for complete lattices and simple graphs. Our focus is on the applications of the theory to the structure of natural language texts, such as graphs of words.

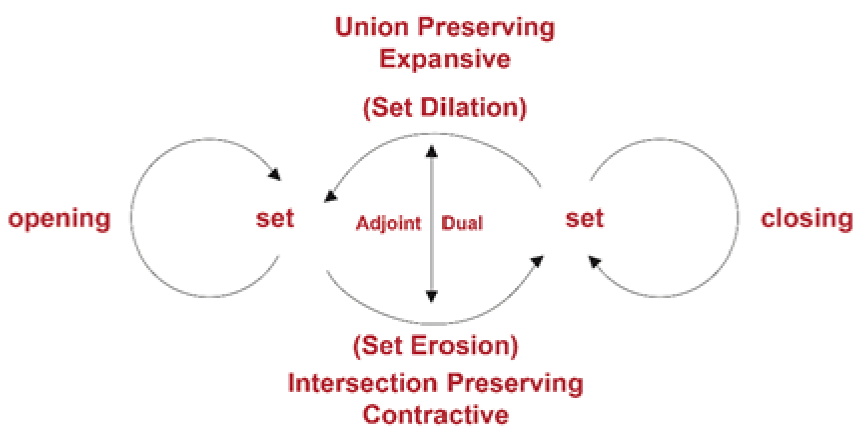

Figure 1: The structure of operators

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