The problem of identifying informative sensors that acquire measurements about multiple sources and clustering them according to their source content is considered. Toward this end, a novel canonical correlation analysis (CCA) framework equipped with sparsity-inducing norm-one regularization is introduced to identify correlated sensor measurements and identify informative groups of sensors. It is established that the novel framework is capable to cluster sensors, based on their source content, correctly (with probability one) even in nonlinear settings and when sources do not overlap. Block coordinate techniques are employed to derive a centralized algorithm that minimizes the sparsity-aware CCA framework. The latter framework is reformulated as a separable optimization program which is tackled in a distributed fashion via the alternating direction method of multipliers. A computationally efficient online distributed algorithm is further derived that is capable to process sensor data online. Extensive numerical tests corroborate that the novel techniques outperform existing alternatives.