The terms “molecular signature” and “gene signature” are often used interchangeably, but they have some distinct differences:

Molecular Signature: A molecular signature refers to a specific pattern or combination of biomolecules that are characteristic of a particular condition, disease, or biological state. The molecular signature can include various types of biomolecules, such as proteins, lipids, metabolites, or even a combination of these. Molecular signatures are often used in biomarker discovery and disease diagnosis, as they can provide valuable insights into the underlying molecular mechanisms and can be used to distinguish between different disease states. Examples of molecular signatures include protein biomarkers, metabolomic profiles, and lipid signatures. Gene Signature: A gene signature refers to a specific pattern or set of genes that are differentially expressed in a particular condition, disease, or biological state. Gene signatures are typically based on the analysis of gene expression data, such as from microarray or RNA-sequencing experiments. Gene signatures can be used to identify specific molecular pathways or biological processes that are altered in a particular condition, and they can be used for disease classification, prognosis, or treatment selection. Examples of gene signatures include gene expression profiles associated with cancer subtypes, immune cell activation, or drug response. In summary, the key difference is that a molecular signature encompasses a broader range of biomolecules, while a gene signature specifically focuses on the patterns of gene expression. Both molecular and gene signatures can provide valuable insights into the underlying biology and can be used for various applications in biomedical research and clinical practice.