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this chapter provides an overview of dna microarrays microarrays are a technology in which 1000 s of nucleic acids are bound to a surface and are used to measure the relative concentration of nucleic acid sequences in a mixture via hybridization and subsequent detection of the hybridization events we first cover the history of microarrays the dna microarray is a tool used to determine whether the dna from a particular individual contains a mutation in genes what is a dna microarray scientists know that a mutation or alteration in a particular gene s dna may contribute to a certain disease microarray data analysis is the final step in reading and processing data produced by a microarray chip samples undergo various processes including purification and scanning using the microchip which then produces a large amount of data that requires processing via computer software microarray data must be integrated with nucleotide sequence data knowledge of protein structure and function and with phenotypic and clinical data the overall goal of this chapter is to

provide the reader with an overview of current dna microarray technologies and to introduce issues regarding the experimental design and analysis of however innovative statistical techniques and computing software are essential for the successful analysis of microarray data this review shows the current bioinformatics tools and the promising applications for analyzing data from microarray experiments a dna microarray also commonly known as dna chip or biochip is a collection of microscopic dna spots attached to a solid surface scientists use dna microarrays to measure the expression levels of large numbers of genes simultaneously or to genotype multiple regions of a genome a microarray is a laboratory tool used to detect the expression of thousands of genes at the same time dna microarrays are microscope slides that are printed with thousands of tiny spots in a microarray is a multiplex lab on a chip its purpose is to simultaneously detect the expression of thousands of biological interactions it is a two dimensional array on a solid substrate usually a glass slide or silicon thin film cell that assays tests large amounts of biological material using high throughput screening miniaturized a microarray experiment generates large amounts of data and converting this data into valid and meaningful information is key to unlocking its with this

potential a single experiment utilizes multiple individual microarrays and as probe density has increased to provide better genomic coverage a single array may contain millions of in this publication we present the most common uses of dna microarray technologies provide an overview of their frequent biomedical applications describe the steps of a typical laboratory procedure guide the reader through the processing of a real experiment to detect differentially expressed genes and list valuable web based microarray dat here we examine five key components of microarray analysis design preprocessing inference classification and validation box 1 and address important areas where consensus has emerged the analysis of microarray data has been an active field of development it has been applied to a wide variety of problems such as selecting differentially expressed genes building prognostic or diagnostic predictors or discovering groups in data feature selection of microarray data using multidimensional graph neural network and supernode hierarchical clustering open access published 19 february 2024 volume 57 article number 63 2024 cite this article download pdf you have full access to this open access article weidong xie shoujia zhang linjie wang kun yu wei li analysis of microarray data microarrays can be used in many types of

experiments including genotyping epigenetics translation profiling and gene expression profiling gene expression profiling is by far the most common use of microarray technology microarray experiments are providing unprecedented quantities of genome wide data on gene expression patterns although this technique has been enthusiastically developed and applied in many microarray based expression profiling allows us to identity families of genes as well as the important molecular and cellular events that might be important in complex processes like metastasis practical applications in future include diagnostic and prognostic management of patients in microarrays scientists affix thousands of tiny dots of specific nucleotide sequences each representing a different gene to glass slides in precise patterns or arrays researchers apply a sample of interest to each slide and then can assess the relative levels of expression of each sequence in these samples microarrays or gene chips provide a miniaturized system for the simultaneous analysis of hybridization of fluorescent labeled single strand nucleotide chains to an array of oligonucleotide probes immobilized on a support such as glass or a synthetic membrane microarray analysis is a method that makes use of gene chips to which thousands of different mrnas can bind and be quantified

microarray studies are categorized into printed microarray in situ synthesis oligonucleotide microarray high density bead microarray hdbm electronic microarray em and suspension bead microarray sba based on the nature of the probes they are described more below i

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here we examine five key components of microarray analysis design preprocessing inference classification and validation box 1 and address important areas where consensus has emerged

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the analysis of microarray data has been an active field of development it has been applied to a wide variety of problems such as selecting differentially expressed genes building prognostic or diagnostic predictors or discovering groups in data

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microarray based expression profiling allows us to identity families of genes as well as the important molecular and cellular events that might be important in complex processes like metastasis practical applications in future include diagnostic and prognostic management of patients

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