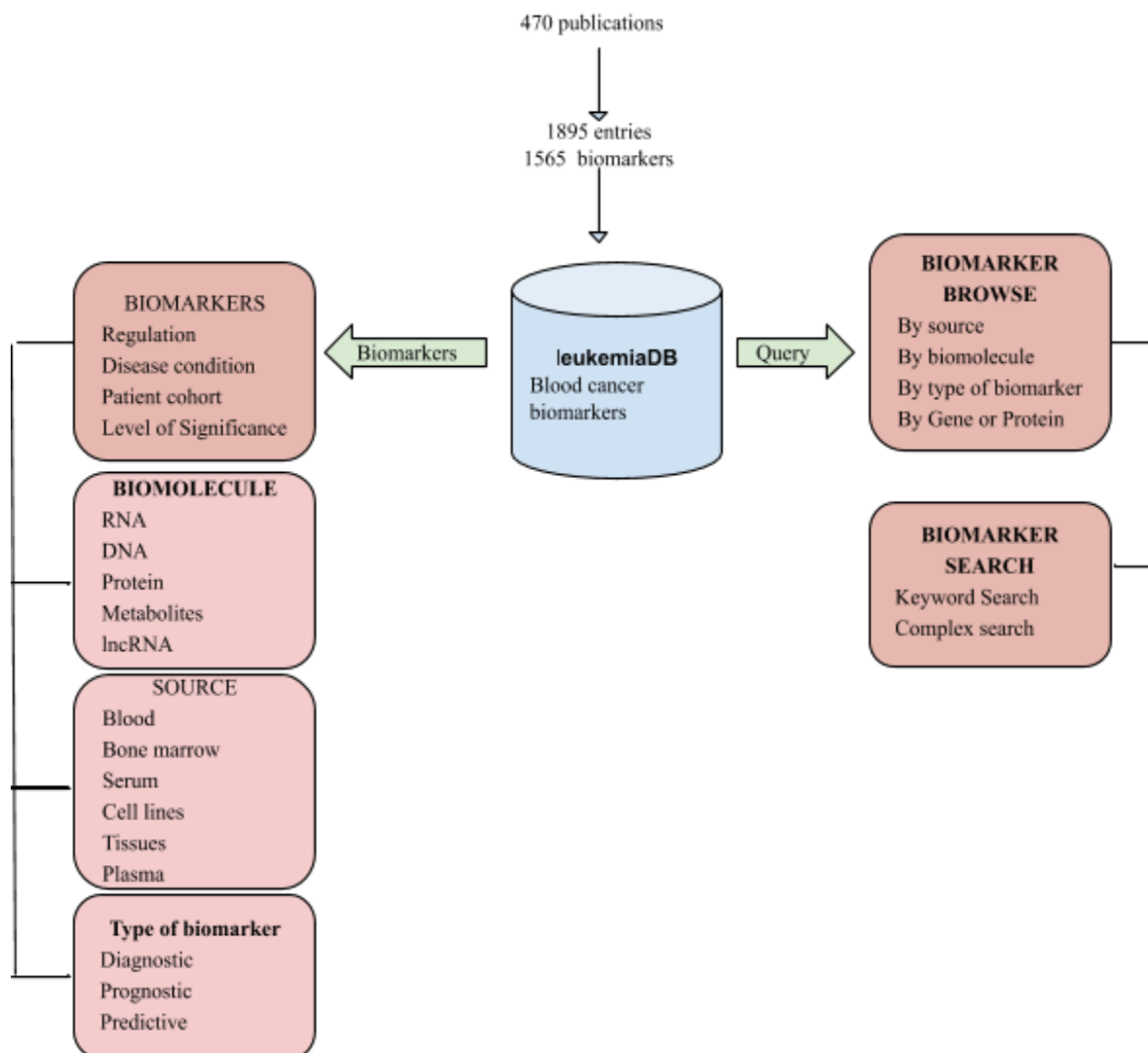


## leukemiaBD: Tutorial & Help

LeukemiaBD is a resource that contains information about leukemia biomarkers. It allows users to search the database for leukemia biomarkers. The architecture of leukemiaDB is as follows:



For providing flexible and hassle-free data searching experience to the users, various tools such as retrieval, browsing, and analysis are integrated with LeukemiaBD.

### A. Search tools

#### A.1 Keyword search

This tool represents keywords for data retrieval modules from LeukemiaBD. This can be executed by search queries such as Cancer Type, Biomarker, Biomolecule, Type of Biomarker, PMID, Regulation and condition and etc. Moreover, this module also allows the users to select

various fields such as Pubmed ID, Biomarker, Biomolecule, Subjects, Cancer Type, Pathway, Level of significance, Patients Cohort, Sensitivity, Specificity, Accuracy, AUC, Degree of Validity and etc., that they want to get displayed for the result.

## **A.2 Complex search**

For performing complex searches using two or more query keywords related to the biomarker, the user can perform multiple structured query systems using the complex search option of leukemiaBD. It performs four query searches simultaneously, by default, but it also allows the user to select a desired field/keyword against which search can be established. Apart from this facility in the complex search module, it allows the user to apply basic standard logical operators (e.g. LIKE, &gt;, &lt;, and = ). Also, the queries to be implemented can also be added or removed to perform precise searches.

## **B. Browse tools**

In leukemiaBD, we have implemented a browsing facility, which helps the user for convenient and flexible data navigation within the database in an orderly manner. In this module, a user can retrieve information on leukemia biomarkers by browsing following 5 main categories:

### **B.1 Browse by GENE NAME:**

This page provides the option to browse the entries of LeukemiaBD based on the gene/miRNA and protein entity.

### **B.2 Browse by SOURCE:**

This page provides the option to browse the entries of LeukemiaBD based on the Source of Samples from which Biomarkers were extracted. Further after clicking on the number of entities, the page shows the result of browsing biomarkers from different fields. It will display different fields such as Biomarker ID, Biomarker, Biomolecule, Subject, Regulation, Biomarker type, Experiment, Level of significance, Source, Year and PMID. On clicking PMID, it will redirect the user to the respective article.

### **B.3 Browse by BIOMARKER TYPE:**

It provides the option to browse the entries of LeukemiaBD based on the Types of Biomarkers (Diagnostic/Prognostic/Predictive). On further clicking on the level of entities, the page will display fields like Biomarker ID, Biomarker, Biomolecule, Subject, Regulation, Biomarker type, Experiment, Level of significance, Source, Year, PMID and etc.

### **B.4 Browse by BIOMOLECULE TYPE:**

It provides the option to browse the biomarkers of LeukemiaBD based on the type of biomolecule (Protein/RNA/miRNA,DNA). Here also, after going further the page will display fields like Biomarker ID, Biomarker, Biomolecule, Subject, Regulation, Biomarker type, Experiment, Level of significance, Source and PMID.

There are respective hyperlinks to each of their PubMed ID's which redirects the research articles to their relevant site domains. Also, the biomarker and the associated disease type are individually linked to their PubMed IDs wherever they are available to enable a flexible and oriented search via the interface.


Working of the database

The database was prepared in such a way that all the information related to the leukemia biomarkers could be available at a single web location. The search and browse option displays all information about the queried biomarker in a tabular representation. Thus it saves time and makes information readily available to the users in a hassle-free way.

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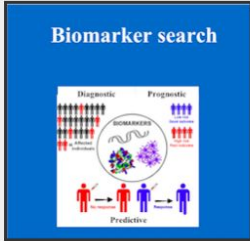
**leukemiaBD: A Database of Biomarker data of blood Cancer**

leukemiaBD is a database of blood cancer that maintains gene expression datasets and biomarkers curated from public repositories and literature respectively. It contains following two modules for extracting data.



[Browse biomarker](#)

This module allows the users to browse for biomarker based on gene/protein name, source, biomolecule and type of biomarker.



[Search biomarker](#)

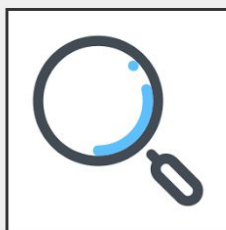
This module allows the users to retrieve biomarkers in leukemiaBD. It has both searching facilities for users.

[Biomarker Search](#) [Biomarker Browse](#) [Biomarker Search](#) [Biomarker Browse](#) [Biomarker Search](#) [Biomarker Browse](#)

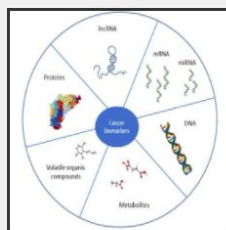
**Figure 6: LeukemiaBD**

**leukemiaBD: A Database of Gene expression and Biomarker data of blood Cancer**

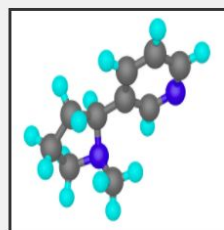
leukemiaBD is a database of leukemia that maintains gene expression datasets and biomarkers curated from public repositories and literature respectively. It contains following three modules for extracting and analyzing data.

**KeywordSearch**

This tool represents keywords for data retrieval modules from LeukemiaBD. This can be executed by search queries such as Cancer Type, Biomarker, Biomolecule, Type of Biomarker, PMID, Regulation and condition and etc. Moreover, this module also allows the users to select various fields such as Pubmed ID, Biomarker, Biomolecule, Subjects, Cancer Type, Pathway, Level of significance, Patients

**Type of Biomarker**

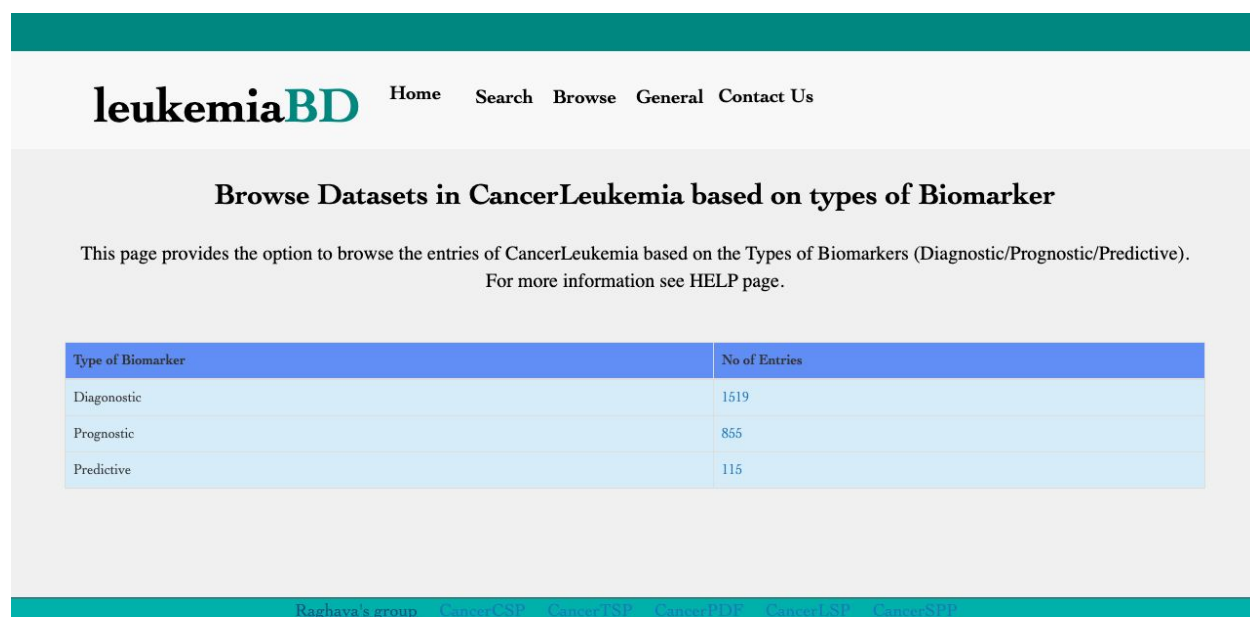
It provides the option to browse the entries of LeukemiaBD based on the Types of Biomarkers (Diagnostic/Prognostic/Predictive). On further clicking on the level of entities, the page will display fields like Biomarker ID, Biomarker, Biomolecule, Subject, Regulation, Biomarker's type, Experiment, Level of significance, Source, Year, PMID and etc.

**Biomolecule**

It provides the option to browse the biomarkers of LeukemiaBD based on the type of biomolecule (Protein/RNA/miRNA/DNA). Here also, after going further the page will display fields like Biomarker ID, Biomarker, Biomolecule, Subject, Regulation, Biomarker's type, Experiment, Level of significance, Source and PMID.

**Figure 7: Browse biomarker based on different categories i.e type,source,biomolecule etc.**

The browsing option has been developed keeping in mind the different needs of a clinician, researcher, counselor, or a patient, to view biomarkers and the associated leukemia subtypes. This allows the user to experience hassle free and complete view about these biomarkers from a single database (Figure 7).



**Figure 8: Browse biomarker based on biomarker type.**

Figure 9 shows a graphical representation, to exhibit how a basic search for the PMID 30840284 can be carried out. figure 10 gives query results i.e all the information about the PMID.

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### Keyword search against Biomarkers

This page is designed for performing keyword search against Biomarker in leukemia. It allows the user to perform search against biomarkers on any field or against multiple fields. It also allows the user to select fields for DISPLAY in biomarkers. If you need any help, please visit [HELP](#) page.

#### Query Submission Form

Paste/insert/type your query to be searched:

#### Select Fields to Search

☐ Disease type[AML,ALL,CLL,CML]  
☐ Biomarker  
☐ Biomolecule[DNA/RNA/Protein/Metabolite/lncRNA]  
☐ Type of Biomarker[Prognostic/Diagnostic/Predictive]

☒ PMID  
☐ Regulation in Cancerous Condition[Upregulation/Downregulation]  
☐ Experiment

#### Select Fields to Display

☒ PMID  
☒ Biomarker  
☒ Biomolecule  
☒ Subjects

☒ Disease Condition  
☒ Regulation in Cancerous Condition  
☐ Effect on Pathway  
☒ Type of Biomarker

☒ Cohort  
☐ Clinical  
☐ Sensitivity  
☐ Specificity

☐ Accuracy  
☐ Degree of Validity  
☐ P-Value

**Figure 9: Example of a keyword Search in Leukemia BD**

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**Welcome!**

This page shows the result of browsing biomarker from different fields.

Please click on PMID to view detailed information.

The total number of entries retrieved from this search are: 1

Row	PMID	Biomarker	biomolecule	Subjects	Disease condition	Regulation in cancerous condition	Type of biomarker	Cohort
36	<a href="#">30840284</a>	MiR-592	miRNA	humans	acute myeloid leukemia	downregulation	Diagnostic	94 patients,healthy control

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CancerTSP
CancerPDF
CancerLSP
CancerSPP

in

**Figure 10: Keyword search Query results**

Figure 11 shows a graphical representation, to exhibit how a complex search for the biomarkers that are diagnostic and is a miRNA can be carried out. figure 12 gives query results i.e all the information about the PMID.

LeukemiaBD

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### Complex Search Module of Biomarker

This page is designed for advanced level of searching of Biomarker. It allows user to perform complex queries, where user can search two or more than two fields with conditions. It also allows user to display any field. If you need more help, please visit [HELP](#) page.

Complex Search Module of Biomarker

No.	Field	Condition	Query	Operator	Delete Row
1	<input type="text" value="Biomolecule"/>	<input type="text" value="LIKE"/>	<input type="text" value="miRNA"/>	<input type="text" value="NO OPERATOR"/>	<input type="button" value="Remove"/>
2	<input type="text" value="Type of Biomarker"/>	<input type="text" value="LIKE"/>	<input type="text" value="Diagnostic"/>	<input type="text" value="AND"/>	<input type="button" value="Remove"/>

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[CancerCSP](#)
[CancerTSP](#)
[CancerPDF](#)
[CancerLSP](#)
[CancerSPF](#)

in

**Figure 11: Example of a keyword Search in Leukemia BD**

Welcome!

This page shows the result of browsing biomarker from different fields.

Please click on PMID to view detailed information.

RN	Biomarker	Biomolecule	Subjects	Regulation	Type of Biomarker	Experiment	Level of Significance	Disease Condition	Source	PMID
10	miR-34a, miR-155, and miR-342-3p	miRNA	humans	upregulation	Diagnostic	CLL vs normal	NA	chronic Lymphocytic Leukemia	blood	<a href="#">21408091</a>
11	miR-103, miR-181a and miR-181b	miRNA	humans	downregulation	Diagnostic	CLL vs normal	NA	chronic Lymphocytic Leukemia	blood	<a href="#">21408091</a>
36	MiR-592	miRNA	humans	downregulation	Diagnostic	AML vs normal	(p < 0.01	acute myeloid leukemia	bone marrow,serum	<a href="#">30840284</a>
38	miR-335-3p	miRNA	humans	downregulation	Diagnostic	c-ALL vs control	P=0.018	Acute lymphoblastic leukemia	bone marrow	<a href="#">30639603</a>

**Figure 12: Complex search Query results**