

Búsqueda con Lucene

Sergio Samaniego Martínez

Índice

- Introducción
- Explicación del código
- Ejemplos de uso





Introducción

En esta segunda parte de la práctica de búsqueda con Lucene, se va a proceder a realizar el proceso de búsqueda sobre un índice ya creado de Lucene.

Para facilitar el uso de nuestro programa, se creará una interfaz de usuario que permitirá al usuario realizar distintos tipos de búsquedas (libre, booleana y por rango), poder visualizar los resultados sobre una tabla y aplicar filtros de facetas sobre dichos resultados.



Explicación de código

Tendremos 3 clases fundamentales:

- `Sample.fxml` : Este archivo será el encargado de introducir y definir los distintos elementos que se van a usar en la interfaz gráfica.
- `Main.class` : Esta clase será la encargada de inicializar la la ventana de la interfaz gráfica cargando el contenido de `sample.fxml`
- `Controller.class` : Esta clase será la encargada de controlar y realizar las distintas acciones que la aplicación va a realizar.


Sample.fxml

```
<?xml version="1.0" encoding="UTF-8" ?>
<Label fx:id="searchlabel" layoutX="60" layoutY="30">Write the free search: </Label>
<TextField fx:id="textfield" layoutX="50.0" layoutY="50.0" prefHeight="0" prefWidth="200" />
<Label fx:id="fieldlabel" layoutX="260" layoutY="30">Select the field search: </Label>
<ComboBox fx:id="fieldbox" layoutX="260.0" layoutY="50.0" prefWidth="150.0" promptText="choose">
  <items>
    <FXCollections fx:factory="observableArrayList" >
      <String fx:value="All" />
      <String fx:value="Author" />
      <String fx:value="Title" />
      <String fx:value="Year" />
      <String fx:value="Source Title" />
      <String fx:value="Link" />
      <String fx:value="Resume" />
      <String fx:value="AuthorKeywords" />
      <String fx:value="IndexKeywords" />
      <String fx:value="EID" />
    </FXCollections>
  </items>
</ComboBox>
<Button fx:id="btn" layoutX="420.0" layoutY="50.0" mnemonicParsing="false" onAction="#btnlhandle" text="Button" />
```



Main.class

```
public class Main extends Application {  
  
    @Override  
    public void start(Stage primaryStage) throws Exception{  
        Parent root = FXMLLoader.load(getClass().getResource("sample.fxml"));  
        primaryStage.setTitle("Information Retrieval Search");  
        primaryStage.setScene(new Scene(root, 1500, 1000));  
  
        primaryStage.show();  
    }  
  
    public static void main(String[] args) { launch(args); }  
}
```





Controller.class

Veremos los distintos métodos que componen esta clase como son:

- BtnHandler
- Métodos de las distintas búsquedas
- addFacets
- FilterAction

btnHandler

```
@FXML
void btnlhandle(ActionEvent event) throws IOException {
    tabledocs.setEditable(true);

    //Obtenemos el id del botón que ha lanzado el evento
    String clicked = ((Control)event.getSource()).getId();

    author_col.setCellValueFactory(new PropertyValueFactory<>("Author"));
    title_col.setCellValueFactory(new PropertyValueFactory<>("Title"));
    year_col.setCellValueFactory(new PropertyValueFactory<>("Year"));
    source_col.setCellValueFactory(new PropertyValueFactory<>("Source_Title"));
    link_col.setCellValueFactory(new PropertyValueFactory<>("Link"));
    authorkey_col.setCellValueFactory(new PropertyValueFactory<>("AuthorKeywords"));
    indexkey_col.setCellValueFactory(new PropertyValueFactory<>("IndexKeywords"));

    //Dependiendo del botón que haya sido clickado realizaremos una función determinada
    if(clicked.equals("btn")) {
        search = textfield.getText();
        if (fieldbox.getValue() == null)
            field_select = "All";
        else
            field_select = fieldbox.getValue().toString();

        doSearch();
    } else if(clicked.equals("btnbool")) {
        search = textfieldbool.getText();
        if (fieldboxbool.getValue() == null)
            field_select = "All";
        else
            field_select = fieldboxbool.getValue().toString();
        doSearchBoolean();
    } else {
        search = textfieldint.getText();
        if (fieldboxint.getValue() == null)
            field_select = "All";
        else
            field_select = fieldboxint.getValue().toString();
        doIntSearch();
    }
}
```




doSearch

Con un array que contenga los distintos tokens, se recorre para ir añadiendo a bqbuilder los distintos tokens de la consulta realizada

```
try {
    Path p1 = Paths.get(index_path);
    FSDirectory dir = FSDirectory.open(p1);
    IndexReader ireader = DirectoryReader.open(dir);
    IndexSearcher searcher = new IndexSearcher(ireader);

    //Al ser una consulta libre, lo que hacemos es que todos los tokens deben aparecer
    BooleanQuery.Builder bqbuilder = new BooleanQuery.Builder();
    for(int i=0; i<result.size(); i++) {
        TermQuery q1 = new TermQuery(new Term(field, result.get(i)));
        BooleanClause bc1 = new BooleanClause(q1, BooleanClause.Occur.MUST);

        bqbuilder.add(bc1);
    }
    BooleanQuery bq = bqbuilder.build();
    this.bq = bq;

    TopDocs tdocs = searcher.search(bq, 50);

    System.out.println("Hay "+tdocs.totalHits+" docs");

    ScoreDoc[] hits = tdocs.scoreDocs;

    data.clear();

    for(int i=0; i<hits.length; i++){
        org.apache.lucene.document.Document hitDoc = searcher.doc(hits[i].doc);

        data.add(new IndexDocs(hitDoc.get("author").toString(),
            hitDoc.get("title").toString(),
            hitDoc.get("year_s").toString(),
            hitDoc.get("source_title").toString(),
            hitDoc.get("link").toString(),
            hitDoc.get("AuthorKeywords").toString(),
            hitDoc.get("IndexKeywords").toString()));

        //System.out.println(hitDoc.get("title").toString());
    }

    tabledocs.setItems(data);

    addFacets(bq);
}
catch (IndexNotFoundException e){
    System.out.println("No se ha podido encontrar el índice en el directorio indicado");
}
```



doIntSearch

Al realizar la consulta se tendrán que separar los dos extremos por “.”

Con esto hecho únicamente tendremos que pasarle ambos extremos al nuevo `newRangeQuery`

```
try {
    Path p1 = Paths.get(index_path);
    FSDirectory dir = FSDirectory.open(p1);
    IndexReader ireader = DirectoryReader.open(dir);
    IndexSearcher searcher = new IndexSearcher(ireader);
    Integer startpoint = Integer.valueOf(result.get(0));
    Integer endpoint = Integer.valueOf(result.get(result.size()-1));

    if(startpoint > endpoint){
        Integer aux = startpoint;
        startpoint = endpoint;
        endpoint = aux;
    }

    Query bq = IntPoint.newRangeQuery(field, startpoint, endpoint);

    TopDocs tdocs = searcher.search(bq, new Sort());

    System.out.println("Hay " + tdocs.totalHits + " docs");

    ScoreDoc[] hits = tdocs.scoreDocs;

    data.clear();

    for(int i=0; i<hits.length; i++){
        org.apache.lucene.document.Document hitDoc = searcher.doc(hits[i].doc);

        data.add(new IndexDocs(hitDoc.get("author").toString(),
            hitDoc.get("title").toString(),
            hitDoc.get("year_s").toString(),
            hitDoc.get("source_title").toString(),
            hitDoc.get("link").toString(),
            hitDoc.get("AuthorKeywords").toString(),
            hitDoc.get("IndexKeywords").toString()));

        //System.out.println(hitDoc.get("title").toString());
    }

    tabledocs.setItems(data);
}
catch (IndexNotFoundException e){
    System.out.println("No se ha podido encontrar el indice en el directorio indicado");
}
```



doBooleanSearch

- Tendremos que ser capaces de identificar los tres operadores AND, OR y NOT en nuestra consulta.
- Puesto que utilizamos diferentes analizadores, para cada tipo de campo, será necesario tratar las consultas de formas diferentes dependiendo del Analyzer utilizado

WhiteSpaceAnalyzer

```
try {
    TokenStream stream = analyzer.tokenStream(fieldName: null, new StringReader(search));
    OffsetAttribute offsetAtt = stream.addAttribute(OffsetAttribute.class);
    CharTermAttribute cAtt = stream.addAttribute(CharTermAttribute.class);
    stream.reset();
    String cad = "";
    Integer offsetFinal = 0;
    while (stream.incrementToken()) {

        if(cAtt.toString().toLowerCase().equals("and")){
            booleans.add("AND");
            result.add(cad);
            cad = "";
        }
        else if(cAtt.toString().toLowerCase().equals("or")){
            booleans.add("OR");
            result.add(cad);
            cad = "";
        }
        else if(cAtt.toString().toLowerCase().equals("not")){
            booleans.add("NOT");
            result.add(cad);
            cad = "";
        }
        else{
            cad += cAtt.toString()+" ";
        }
    }

    result.add(cad);
    stream.end();
} catch (IOException e) {
    // not thrown b/c we're using a string reader...
    throw new RuntimeException(e);
}

break;
```

Construcción de la búsqueda booleana

Con un array que contenga los operadores utilizados, lo iremos recorriendo para conocer de qué tipo va a ser la ocurrencia para cada uno de los tokens

```
//Con la consulta tokenizada, pasamos a realizar las consultas
try {
    Path p1 = Paths.get(index_path);
    FSDirectory dir = FSDirectory.open(p1);
    IndexReader ireader = DirectoryReader.open(dir);
    IndexSearcher searcher = new IndexSearcher(ireader);

    BooleanQuery.Builder bqbuilder = new BooleanQuery.Builder();

    //Como tenemos almacenados los operadores utilizados, dependiendo del operador que estemos leyendo
    // usaremos un BooleanQuery.Occur diferente
    for(int i=0; i<result.size(); i++) {
        TermQuery q1 = new TermQuery(new Term(field, result.get(i).trim()));
        BooleanClause bcl;

        if(i == 0){
            bcl = new BooleanClause(q1, BooleanClause.Occur.MUST);
        }
        else {
            if ((booleans.get(i-1)).equals("AND"))
                bcl = new BooleanClause(q1, BooleanClause.Occur.MUST);
            else if ((booleans.get(i-1)).equals("OR"))
                bcl = new BooleanClause(q1, BooleanClause.Occur.SHOULD);
            else
                bcl = new BooleanClause(q1, BooleanClause.Occur.MUST_NOT);
        }

        bqbuilder.add(bcl);
    }
    BooleanQuery bq = bqbuilder.build();
    this.bq = bq;

    TopDocs tdocs = searcher.search(bq, 50);

    System.out.println("Hay "+tdocs.totalHits+" docs");

    ScoreDoc[] hits = tdocs.scoreDocs;

    data.clear();
}
```

AddFacets

```
config.setHitValues( "Author Keywords", fr.doc);

//Creamos FacetsCollector que encontrará las facetas de la búsqueda
FacetsCollector fc = new FacetsCollector();
TopDocs tdc = FacetsCollector.search(searcher, bq, n: 10, fc);

for (ScoreDoc sd : tdc.scoreDocs){
    Document d = searcher.doc(sd.doc);
    //System.out.println(sd.score + d.get("title"));
}

Facets facetas = new FastTaxonomyFacetCounts(taxoReader, fconfig, fc);

List<FacetResult> TodasDims = facetas.getAllDims( n: 100);
//System.out.println("Categorías totales " + TodasDims.size());

AuKeyComboBox.getItems().clear();
AuthorComboBox.getItems().clear();
InKeyComboBox.getItems().clear();
YearComboBox.getItems().clear();

//Cada una de las dimensiones de la faceta se almacenará en un combobox que nos permitirá el filtrado posterior
for(FacetResult fr : TodasDims){
    //System.out.println("Categoría " + fr.dim);
    LabelAndValue[] lv = fr.labelValues;

    switch (fr.dim){
        case "Author Keywords":
            for(int i=0; (i<20 && i< fr.labelValues.length); i++){
                AuKeyComboBox.getItems().add(lv[i].label);
            }
            break;
        case "Authors":
            for(int i=0; (i<20 && i< fr.labelValues.length); i++){
                AuthorComboBox.getItems().add(lv[i].label);
            }
            break;
        case "Index Keywords":
            for(int i=0; (i<20 && i< fr.labelValues.length); i++){
                InKeyComboBox.getItems().add(lv[i].label);
            }
            break;
        case "Year":
            for(int i=0; (i<20 && i< fr.labelValues.length); i++){
                YearComboBox.getItems().add(lv[i].label);
            }
            break;
    }
}

FacetResult fresult = facetas.getTopChildren( n: 10, s: "title");
}
```

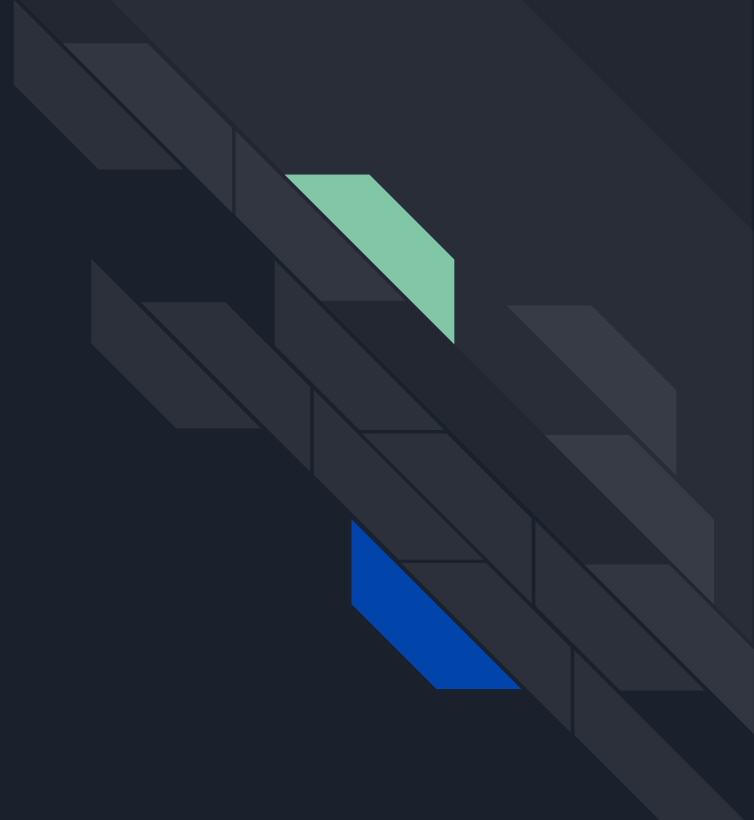


filterAction

- La función se llamará al pulsar el botón **Filter** de la Interfaz.
- Esta función lo único que va a realizar será crear un DrillDownQuery y un DrillSideWays que se ejecutarán sobre la consulta realizada para aplicar los filtros impuestos.



Manual de usuario



Information Retrieval Search

Write the free search: information retrieval

Select the field search: choose

Write the boolean search:

Select the field search: choose

Write the Point search:

Select the field search: choose

Facets:

Author

Year

AuthorKeywords

IndexKeywords

All

Author

Title

Year

Source Title

Link

Resume

AuthorKeywords

IndexKeywords

EID

Button

Button

Button

Author

Title

Year

Source ...

Link

Author ...

Index K...

escribe la consulta

Selecciona el campo sobre el que buscar

Realiza la búsqueda

Tabla sin contenido

Information Retrieval Search

Write the free search:
Information retrieval

Select the field search:
Title

Button

Write the boolean search:

Select the field search:
choose

Button

Write the Point search:

Select the field search:
choose

Button

Facets:
Author
Year
AuthorKeywords
IndexKeywords

Filter

Author	Title	Year	Source ...	Link	Author ...	Index K...
Moraes ...	Modeling information flow in dynamic info...	2017	ICTIR 20...	https://w...	Directed...	Behavio...
Marrara ...	Aggregation operators in Information Retr...	2017	Fuzzy Se...	https://w...	Aggrega...	Decision...
Hattab ...	Linear operators in information retrieval	2017	OpenAc...	https://w...	Cross pr...	Image r...
Mauro N...	Concept-Aware geographic information re...	2017	Proceedi...	https://w...	Informat...	Informat...
Kenter T...	Neural networks for information retrieval	2017	SIGIR 20...	https://w...		Informat...
Banawa ...	Private information retrieval from coded d...	2017	IEEE Int...	https://w...		
Himani ...	A survey on medical information retrieval	2018	Smart In...	https://w...	Medical ...	Bioinfor...
Ventura ...	Similarity measures for music information...	2018	Advance...	https://w...	Entropy; ...	Entropy; ...
Glowack...	Bandit algorithms in interactive informati...	2017	ICTIR 20...	https://w...	Bandit a...	Economi...
Jovanov...	Information retrieval with reinforced word...	2017	ACM Int...	https://w...	Natural l...	Text pro...
Garrouc...	Bayesian network based information retri...	2017	Proceedi...	https://w...	Bayesia...	Bayesia...
Vuong T...	Proactive information retrieval via screen ...	2017	SIGIR 20...	https://w...	Proacti...	Charact...
Voorhee...	Using replicates in information retrieval e...	2017	ACM Tra...	https://w...	Informat...	Data mi...
Banawa ...	Private information retrieval from coded d...	2017	IEEE Int...	https://w...		
Himani ...	A survey on medical information retrieval	2018	Smart In...	https://w...	Medical ...	Bioinfor...
Kobayas...	Opportunities for women, minorities in inf...	2017	Commun...	https://w...		Comput...
Moskovi...	JASIST special issue on biomedical inform...	2017	Journal o...	https://w...		
Yang G...	Differential privacy for information retriev...	2017	ICTIR 20...	https://w...	Different...	Data mi...
Ke W.	Text retrieval based on least information ...	2017	ICTIR 20...	https://w...	Effective...	Bins; En...
Cheng Z...	Exploring user-specific information in mu...	2017	SIGIR 20...	https://w...	Reranki...	Comput...
Soulier L...	On the collaboration support in informatio...	2017	ACM Co...	https://w...	Collabor...	Comput...
Cheng Z...	Exploring user-specific information in mu...	2017	SIGIR 20...	https://w...	Reranki...	Comput...
Soulier L...	On the collaboration support in informatio...	2017	ACM Co...	https://w...	Collabor...	Comput...
Crane M...	An exploration of serverless architectures...	2017	ICTIR 20...	https://w...		Informat...
Han B., ...	Knowledge based collection selection for ...	2018	Informat...	https://w...	Collectio...	Informat...
Nasutio...	Information Retrieval Based on the Extrac...	2018	Advance...	https://w...	Degree; ...	Comput...
Craswell...	Neural information retrieval: introduction ...	2017	Informat...	https://w...		
Wu S., Li...	Intrainstitutional EHR collections for patie...	2017	Journal o...	https://w...		Clinical i...
Kumar ...	A survey of Web crawlers for information ...	2017	Wiley Int...	https://w...		Data mi...
Crane M...	An exploration of serverless architectures...	2017	ICTIR 20...	https://w...		Informat...
Naouar ...	Collaborative information retrieval model ...	2017	Proceedi...	https://w...	Collabor...	Image r...
Polajnar E.	Using Lasso RCCA for cross-language info...	2017	Commun...	https://w...	Alternati...	Comput...

Resultados de la búsqueda

Information Retrieval Search

Write the free search: information retrieval
 Select the field search: Title
 Button

Write the boolean search:
 Select the field search: choose
 Button

Write the Point search:
 Select the field search: choose
 Button

Facets:

Author
 de rijke m.
 lin j.
 losada d.e.
 parapar j.
 barreiro a.
 drias h.
 mitra b.
 khennak i.
 liu j.
 guo j.

Filter

Realiza el filtro

Author	Title	Year	Source ...	Link	Author ...	Index K...
[No auth...	7th International Workshop on Informatio...	2018	Studies i...	https://w...		
Marrara ...	Aggregation operators in Information Retr...	2017	Fuzzy Se...	https://w...	Aggrega...	Decision...
Crane M...	An exploration of serverless architectures...	2017	ICTIR 20...	https://w...		Informat...
Crane M...	An exploration of serverless architectures...	2017	ICTIR 20...	https://w...		Informat...
Imhof M...	A study of untrained models for multimod...	2017	Informat...	https://w...	BM25; M...	
Kumar ...	A survey of Web crawlers for information ...	2017	Wiley Int...	https://w...		Data mi...
Himani ...	A survey on medical information retrieval	2018	Smart In...	https://w...	Medical ...	Bioinfor...
Himani ...	A survey on medical information retrieval	2018	Smart In...	https://w...	Medical ...	Bioinfor...
Amigo E...	Axiomatic thinking for information retriev...	2017	SIGIR 20...	https://w...		Informat...
Glowack...	Bandit algorithms in interactive informati...	2017	ICTIR 20...	https://w...	Bandit a...	Economi...
Garrouc...	Bayesian network based information retri...	2017	Procedi...	https://w...	Bayesia...	Bayesia...
Naouar ...	Collaborative information retrieval model ...	2017	Procedi...	https://w...	Collabor...	Image r...
Mauro N...	Concept-Aware geographic information re...	2017	Procedi...	https://w...	Informat...	Informat...
Sharma ...	Deep web information retrieval process: ...	2017	The Dar...	https://w...		
Yang G...	Differential privacy for information retriev...	2017	ICTIR 20...	https://w...	Different...	Data mi...
Cheng Z...	Exploring user-specific information in mu...	2017	SIGIR 20...	https://w...	Reranki...	Comput...
Cheng Z...	Exploring user-specific information in mu...	2017	SIGIR 20...	https://w...	Reranki...	Comput...
Kawabat...	Information Retrieval and Criticality in Par...	2017	Physical ...	https://w...		Criticall...
Nasutio...	Information Retrieval Based on the Extrac...	2018	Advance...	https://w...	Degree; ...	Comput...
Nasutio...	Information Retrieval Based on the Extrac...	2018	Advance...	https://w...	Degree; ...	Comput...
Jovanov...	Information retrieval with reinforced word...	2017	ACM Int...	https://w...	Natural I...	Text pro...
Wu S., Li...	Intrainstitutional EHR collections for patie...	2017	Journal o...	https://w...		Clinical i...
Moskovi...	JASIST special issue on biomedical inform...	2017	Journal o...	https://w...		
Han B., ...	Knowledge based collection selection for ...	2018	Informat...	https://w...	Collectio...	Informat...
Han B., ...	Knowledge based collection selection for ...	2018	Informat...	https://w...	Collectio...	Informat...
Hattab ...	Linear operators in information retrieval	2017	OpenAc...	https://w...	Cross pr...	Image r...
Moraes ...	Modeling information flow in dynamic info...	2017	ICTIR 20...	https://w...	Directed...	Behavio...
Yuan K.	Multi-dimensional formula feature modeli...	2017	SIGIR 20...	https://w...	Formula ...	Recurr...
Sattari S...	Multimedia information retrieval using fuz...	2017	IEEE Int...	https://w...		Comput...
Craswell...	Neural information retrieval: introduction ...	2017	Informat...	https://w...		
Kenter T...	Neural networks for information retrieval	2017	SIGIR 20...	https://w...		Informat...
Rahimi ...	Online learning to rank for cross-languag...	2017	SIGIR 20...	https://w...	Cross-la...	Comput...

Write the free search:

Select the field search:

Button

Write the boolean search:

Select the field search:

Button

Write the Point search:

Select the field search:

Button

Year

Facets:

Filter

Author	Title	Year	Source ...	Link	Author ...	Index K...
--------	-------	------	------------	------	------------	------------

Escribe el intervalo
separado por “.”

Tabla sin contenido

Write the free search: Select the field search: choose

Write the boolean search: Information not OLAP Select the field search: Title

Write the Point search: Select the field search: choose

Facets:

Author

Year

AuthorKeywords

IndexKeywords

Enter

Author	Title	Year	Source ...	Link	Author ...	Index K...
Moraes ...	Modeling information flow in dynami...	2017	ICTIR 20...	https://w...	Directed...	Behavio...
McGlinn ...	Integrating building information mod...	2017	CEUR W...	https://w...	Building ...	Building...
Xu Y., R...	Information density converges in dia...	2018	Cognition	https://w...	Dialogu...	Article; c...
Shamala...	Integrating information quality dime...	2017	Journal o...	https://w...	Informat...	Informat...
Angelsto...	Shared Information Space	2017	2017 Int...	https://w...	databas...	Comma...
Geiger B...	Relevant information loss	2018	Underst...	https://w...		
Scheben...	Information flow analysis	2016	Lecture ...	https://w...		Electroni...
Henno J.	Information and interaction	2017	Frontier...	https://w...	Finite St...	Artificial...
Costello ...	Online disclosure of illicit informatio...	2017	Journal o...	https://w...		Health ri...
Valášek ...	Influence of Information and Commu...	2018	Advance...	https://w...	Informat...	Informat...
Orso V., ...	Overlaying social information: The e...	2017	Informat...	https://w...	Informat...	Collabor...
Jensen D...	Designs enhancing Fisher information	2017	Commu...	https://w...	Arithmet...	Geometr...
[No auth...	Information Services and Use	2017	Informat...	https://w...		
Lugovic ...	Automatic information behaviour rec...	2017	2017 40...	https://w...	adaptive...	Behavio...
Geiger B...	Relevant information loss rate	2018	Underst...	https://w...		
Uwitonz...	Constrained space information flow	2018	Lecture ...	https://w...	Delauna...	Codes (s...
Wu S.M.,...	The effects of bank employees' infor...	2018	Advance...	https://w...	Commer...	Intellige...
Wu D., ...	Undergraduate information behavior...	2017	Journal o...	https://w...	Academi...	
Tebani A...	Advances in metabolome informatio...	2017	Journal o...	https://w...	Chemo...	biology; ...
Wu S.M.,...	The effects of bank employees' infor...	2018	Advance...	https://w...	Commer...	Intellige...
Shen S., ...	Design and implementation of low-p...	2017	Energies	https://w...	Analog-t...	Compre...
Mannai ...	Information extraction approaches: ...	2018	Advance...	https://w...	Informat...	Artificial...
Marrara ...	Aggregation operators in Informatio...	2017	Fuzzy Se...	https://w...	Aggrega...	Decision...
Hattab ...	Linear operators in information retri...	2017	OpenAc...	https://w...	Cross pr...	Image r...
Devezas...	Information extraction for event ran...	2017	OpenAc...	https://w...	Academi...	Artificial...
Mauro N...	Concept-Aware geographic informati...	2017	Proceedi...	https://w...	Informat...	Informat...
Kenter T...	Neural networks for information retri...	2017	SIGIR 20...	https://w...		Informat...
Jatowt A...	Timestamping entities using context...	2017	SIGIR 20...	https://w...	Entity d...	Informat...
Mannai ...	Information extraction approaches: ...	2018	Advance...	https://w...	Informat...	Artificial...
Lu T.-C.,...	Information manipulation and web c...	2018	Advance...	https://w...	Fake inf...	Autono...
Nielson ...	Content dependent information flow ...	2017	Journal o...	https://w...	Content...	Comput...
Mannai ...	Information extraction approaches: ...	2018	Advance...	https://w...	Informat...	Artificial...

Debemos separar las distintas partes de la búsqueda por uno de los tres operandos como son :

- AND
- OR
- NOT



¡Gracias!