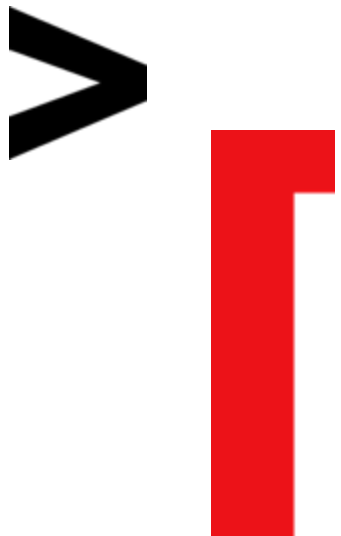
Couchbase

3교시.
Full Text Search 개요, 실습

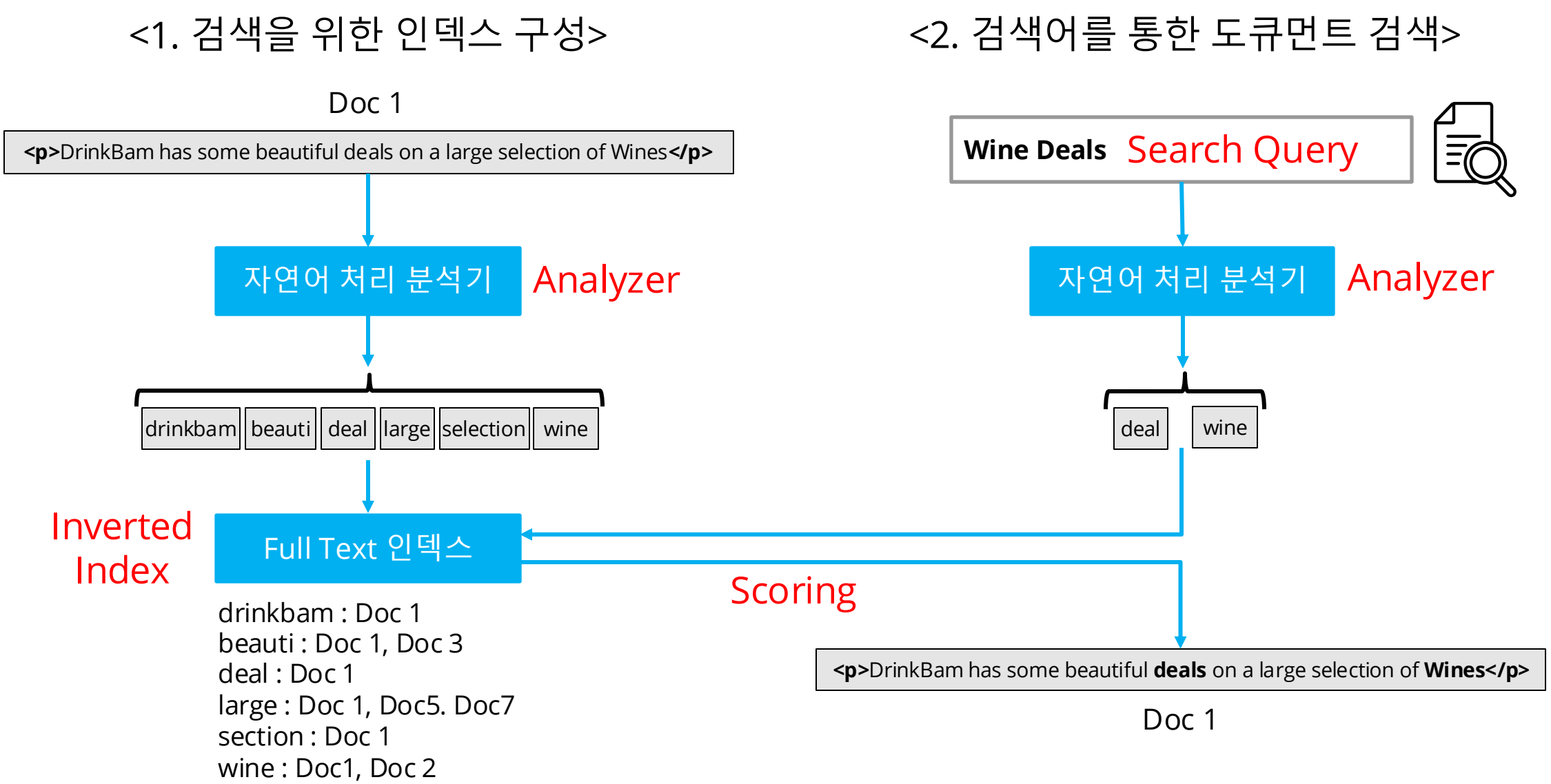
1. FTS 개요
2. Vector Search, Hybrid Search
3. FTS/Vector실습 : RGB

A. FTS 검색 예제

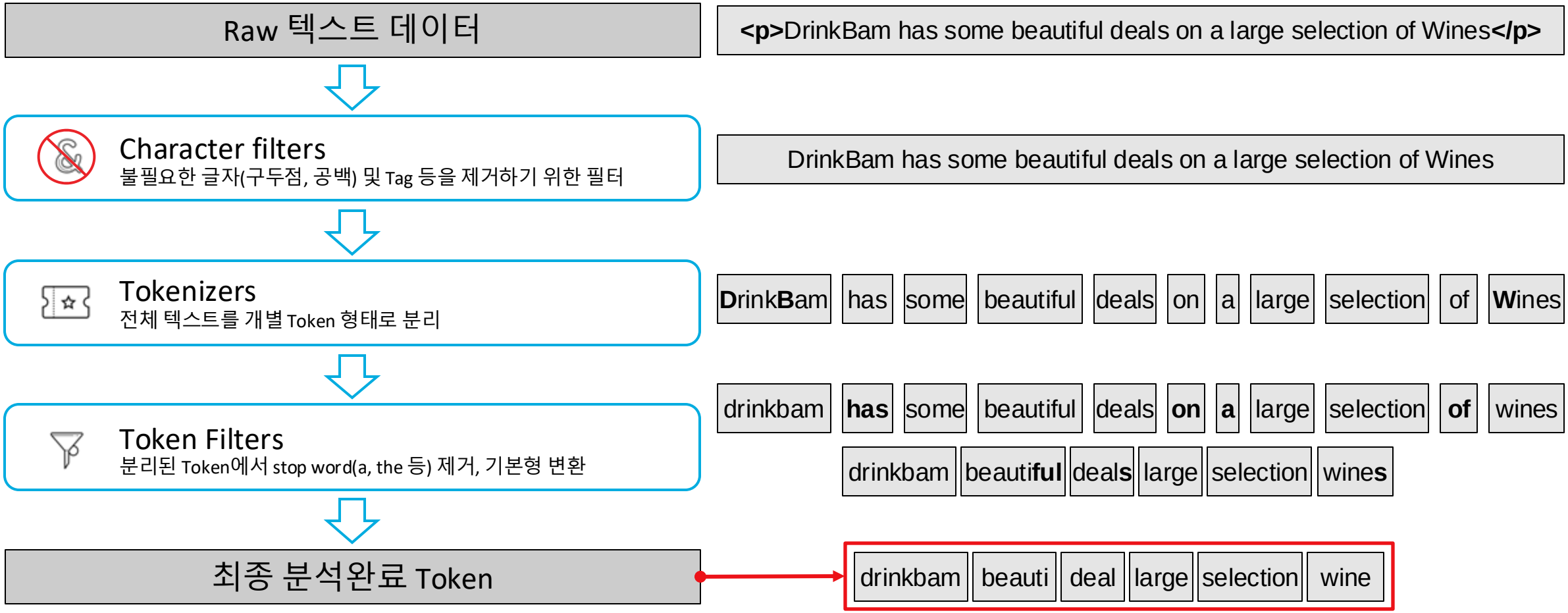
3-1.
Full Text Search 개요



Couchbase의 텍스트 검색 엔진



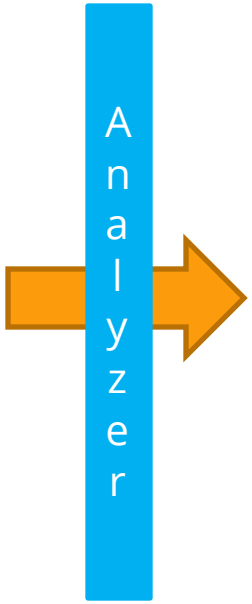
Analyzer : 검색에 맞는 언어 식별성



Inverted Index : 검색 성능

<Raw 텍스트 데이터>

doc1	** **The quick brown fox** **
doc2	** **The quick brown fox jumps over the lazy dog** **
doc3	** **The quick brown fox jumps over the quick dog** **
doc4	** **Brown fox brown dog** **
doc5	** **Lazy jumping dog** **



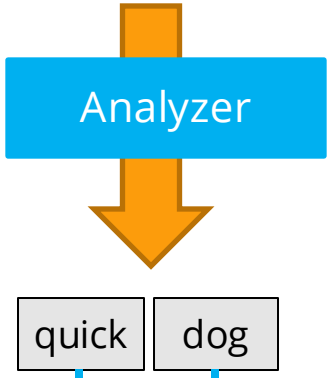
<Inverted Index>

Terms	도큐먼트ID
brown	doc1, doc2, doc3, doc4
dog	doc2, doc3, doc4, doc5
fox	doc1, doc2, doc3, doc4
jump	doc2, doc3, doc5
lazi	doc2, doc5
over	doc2, doc3
quick	doc1, doc2, doc3

Search Query : 검색 용이성

quick dog SEARCH

```
{"field": "Search_Terms",
 "match": "quick dog"}
```



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fox	doc1, doc2, doc3, doc4
jump	doc2, doc3, doc5
lazi	doc2, doc5
over	doc2, doc3
quick	doc1, doc2, doc3

<Search Result>

doc3	**<p>**The **quick** brown fox jumps over the **quick dog**</**p>**
doc2	**<p>**The **quick** brown fox jumps over the lazy **dog**</**p>**
doc1	**<p>**The quick brown fox</**p>**
doc5	**<p>**Lazy jumping dog</**p>**
doc4	**<p>**Brown fox brown dog</**p>**

Scoring : 검색 정확도

Fox are jumping | SEARCH

```
{"field": “Search_Terms",
  "match": “Fox are jumping"}
```

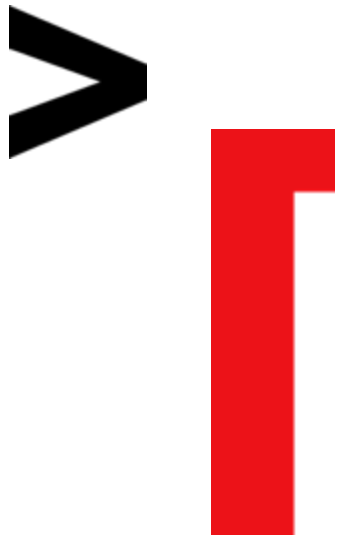
- **TF(Term Frequency) : 개별 도큐먼트 내에 해당 Token이 자주 나올수록 높은 점수**
- **IDF(Inverse Document Frequency) : 해당 Token이 포함된 도큐먼트 개수가 많을수록 낮은 점수**

<Search Result>

doc3	** **The **quick** brown fox jumps over the **quick dog**	**Score : 0.8762741**
doc2	** **The **quick** brown fox jumps over the lazy **dog**	**Score : 0.6744513**
doc1	** **The quick brown fox	**Score : 0.6173784**
doc5	** **Lazy jumping dog	**Score : 0.35847884**
doc4	** **Brown fox brown dog	**Score : 0.32951736**

Score = TF / IDF

3-1-1.
Search Queries



Query types

Simple Queries

Compound Queries

Range Queries (string, date, numeric)

String Queries (natural language)

Geospatial Queries

Non-analytic (i.e. exact match)

Special queries (for dev purpose)

Vector queries

Interacting with FTS

RESTful API

```
{
  "match": "location hostel",
  "field": "reviews.content",
  "analyzer": "standard",
  "fuzziness": 2,
  "prefix_length": 4,
  "operator": "and"
}
```

SDK Clients

```
public static void simpleTextQuery(Bucket bucket) {
        String indexName = "travel-sample-index";
        MatchQuery query = SearchQuery.match("swanky");
        SearchQueryResult result = bucket.query(new
                SearchQuery(indexName, query).limit(10));
        printResult("Simple Text Query", result);
}
```

Through N1QL

Search or FLEX Indexing

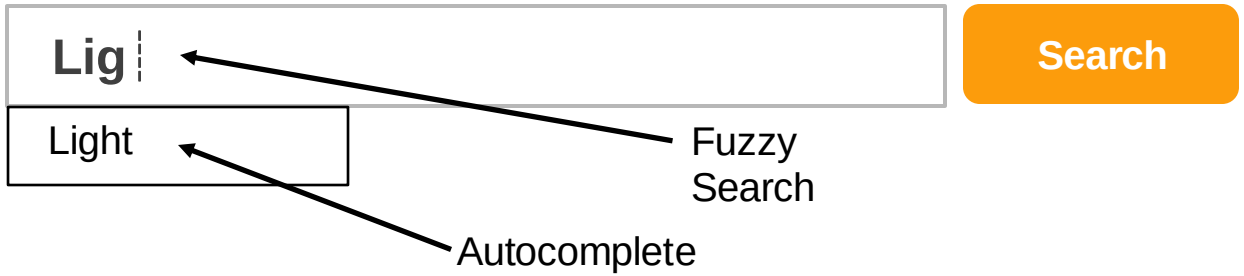
```
SELECT t1.name
FROM `travel-sample` AS t1
WHERE SEARCH(t1, {
      "match": "bathrobes",
      "field": "reviews.content",
      "analyzer": "standard"
});
```

```
SELECT META(b).id
FROM mybucket AS b
USE INDEX (USING FTS)
WHERE b.f1 = "xyz"
      AND b.f2 = 100;
```

Simple Queries

Query type	Example	Matched terms results
MATCH	{"field": "reviews.content", "**match**": "beautiful"}	beauty beautiful
MATCH PHRASE	{"field": "reviews.content", "**match_phrase**": "beautiful location"}	beautifully located beautiful location
FUZZY	{"field": "reviews.content", "**term**": "hotel", "**fuzziness**":"1"}	hotel hostel
PREFIX	{field": "reviews.content", "**prefix**":"bea"}	beach beautiful
REGEXP	{"field": "reviews.content", "**regexp**":"ho[st|t]el"}	hostel hotel
WILDCARD	{"field": "reviews.content", "**wildcard**':"ho?tel"}	hostel
BOOLEAN FIELD	{ field": "reviews.content", "**bool**": true, "**field**":"free_breakfast"}	*documents where the field contains boolean true value*

Fuzziness



Fuzziness allows you to find words when the search term is misspelled.

- The parameter indicates how many letters may be different or missing, leveraging the Levenshtein distance.
- Maximum supported fuzziness is 2 to lower the number of false positives
- One important optimization is that most spelling mistakes happen towards the end => utilize the *prefix_length* option in fuzzy queries

```
{
  "Match":"beautiful",
  "field":"reviews.content",
  "analyzer":"standard",
  "fuzziness":1,
  "prefix_length":2
}
```

"autiful" is only considered for fuzziness

Compound Queries

Query type	Description	Example
CONJUNCTION	Logical AND. Contains multiple child queries. Its result documents must satisfy all of the child queries.	{ "**conjuncts**": [{"field": "reviews.content", "match": "location"}, {"field": "free_breakfast", "bool": true}]}
DISJUNCTION	Logical OR. Contains multiple child queries. Its result documents must satisfy a configurable `min` number of child queries. By default this `min` is set to 1.	{"**disjuncts**": [{"field": "reviews.content", "match": "location"}, {"field": "free_breakfast", "bool": true}]}

BOOLEAN	Combination of conjunction and disjunction queries and takes three lists of queries:
	• `must`: Result documents must satisfy all of these queries.
	• `should`: Result documents should satisfy these queries.
	• `must not`: Result documents must not satisfy any of these queries.
		{"**must**": {
		"conjuncts": [
		{"field": "reviews.content",
		"match": "location"}]},
		"must_not": {
		"disjuncts": [
		{"field": "free_breakfast",
		"bool": false}]},
		"should": {
		"disjuncts": [
		{"field": "free_breakfast",
		"bool": true}]}}

DOC ID	Returns the indexed document or documents among the specified set. This is typically used in conjunction queries, to restrict the scope of other queries' output.	{ "**ids**": ["hotel_10158", "hotel_10159"] }

Boosting

Boosting allows you to give different weights to each element in a compound query.

```
{
   "conjuncts": [
     {
        "field": "description",
              "match": "pool"
        },
     {
        "field": "reviews",
             "match":”pool”,
        “boost”:2
     }
  ]
}
```

Performs Match Queries for `pool` in both the `reviews` and `description` fields, but documents having the term in the `reviews` field score higher.

Range Queries

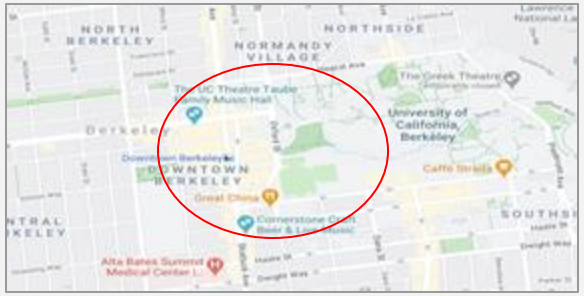
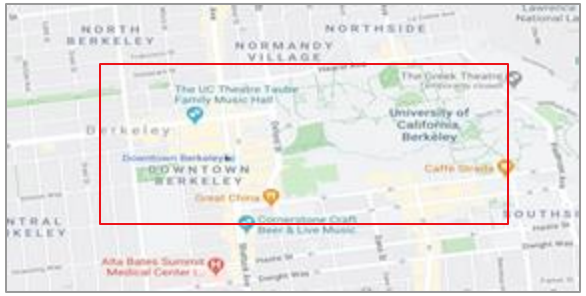
Query type	Description	Example
DATE RANGE	Finds documents containing a date value, in the specified field within the specified range.	{ "**start**": "2001-10-09T10:20:30-08:00", "**end**": "2016-10-31", **"inclusive_start**": false, **"inclusive_end**": false, "**field":** "review_date" }
NUMERIC RANGE	Finds documents containing a numeric value in the specified field within the specified range	{ "**min**": 100, **"max"**: 1000, "**inclusive_min**": false, "**inclusive_max**": false, **"field"**: "id" }
TERM RANGE	Finds documents containing a term in the specified field within the specified range.	{ "**min**": "foo", **"max"**: "foof", **"inclusive_min**": false, **"inclusive_max**": false, **"field"**: "desc" }

Query String

Query type	Description	Example
QUERY STRING	Query strings enable humans to describe complex queries using a simple syntax.	{ "**query**": "+nice +view" }

Example with Query String syntax	Same example with Query syntax
{ "**query**": “pool" }	{ "**match**": "pool", “field”:”_all”}
{ "**query**": "continental breakfast"}	{ "**match_phrase**": "continental breakfast" , “field”:”_all”}
{ "**query**": "description:pool" }	{ "**match**": "pool", “field”:”description”}
{ "**query**": "+description:pool -continental breakfast" }	{"**must**": { "conjuncts": [{"field":"description", "match":"pool"}]}, **"must_not"**: { "disjuncts": [{"field":"default","match":“continental”}]}, **"should"**: { "disjuncts": [{"field":"default", "match":“breakfast”}]}}
{ "**query**":"description:pool name:pool^5”}	*Boost documents having a match on name:pool*

GeoSpatial Query

Query type	Description	Example
POINT DISTANCE		{“field”:”geo”, “**location**”:”53.482358,-2.235143””, “**kilometers**”,”1” }
BOUNDED RECTANGLE		{“field”:”geo”, "**top_left**": [-2.235143, 53.482358], "**bottom_right**": [28.955043, 40.991862], }
BOUNDED POLYGON		{"field": "geo", "**polygon_points**": ["37.79393211306212,-122.44234633404847", "37.77995881733997,-122.43977141339417", "37.78803109202015 5,-122.42925715405579", "37.79026946582319,-122.41149020154114", "37.79571192027403,-122.40735054016113"] }

N1QL with SEARCH predicate

Identify the customer accounts and their related contacts where a particular topic has been discussed. The search criteria may include one or many of the following informations: meeting Title, Date range, Customer Contact Details, Sales team member details

```
SELECT meta(a).id, a.title,a.startDate, a.account.name, a.contacts, a.participants
FROM crm a
WHERE SEARCH(a,
    {"conjuncts": [
        {"field":"title", "match": "artificial intelligence"}   ,
        {"field":"participants.name", "match":"james"}   ,
        {"field":"account.name", "match":"willis"}  ,
        {"field":"startDate","start": "2019-03-20", "end":"2019-03-31"} ,
        {"field":"contacts.name", "match":"boone"}   ,
        {"field":"contacts.email", "match":"obell@gmail.com"}
      ]
    },
    {"index":"all_acts"}
  )
  AND a.type='activity'
  AND a.activityType='Appointm
```

SQL clause

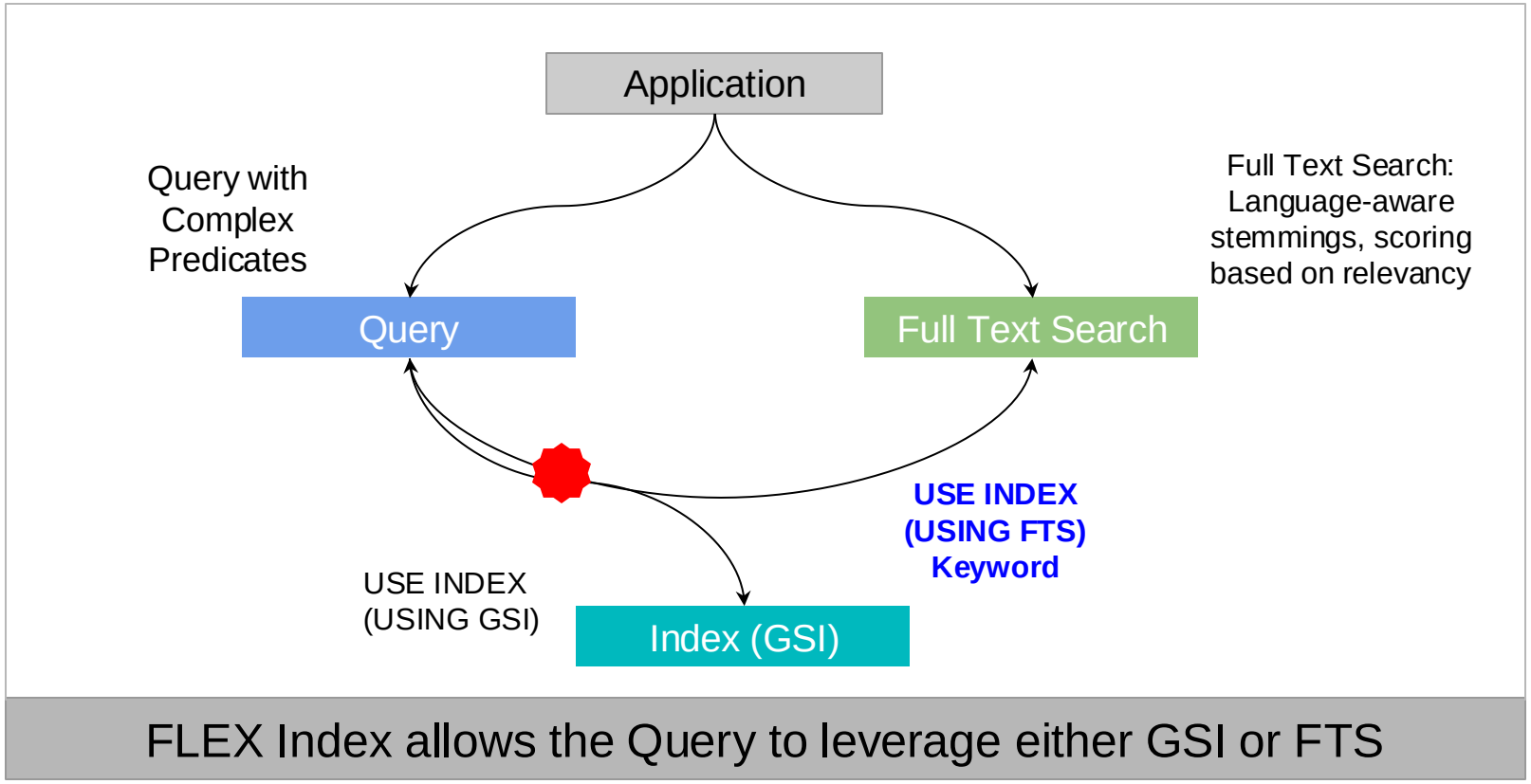
Search index tip

Search clause

N1QL with FLEX Indexing

- Mechanism whereby a N1QL query can leverage either or both Secondary Index and Keyword Text Search with standard N1QL predicates
- Allows N1QL to transparently benefit the full power Text Search capability without any Query limitations

  > Nested document field, Array, SQL Aggregation, Join and Sorting



N1QL with FLEX Indexing When should you use them?

- Where the search conditions of the N1QL statements are not predetermined
  - They can contain varied numbers of predicates, often based on user's selections
  - It is difficult to create indexes to cover all of the search conditions.
- Applications that provide search capabilities involving a large number of predicates
  - With logical operators, such as AND/OR combinations in the search conditions.
- Where the search conditions involve predicates on hierarchical document elements
  - Such as search that involve array elements in an array, or in multiple arrays.
- Where the applications require both the power of FTS and need SQL aggregation, with JOIN to include related information from other objects.
- Or you simply want to use the N1QL predicate syntax over the FTS syntax

N1QL with FLEX Indexing Example

There are two ways to specify that you would like to use a full-text index with a N1QL query without search predicate:

- Use the `USE FTS` hint in the N1QL query.
- Set the `use_fts` request-level parameter to `true`.

```
SELECT META(b).id
FROM mybucket AS b
USE INDEX (USING FTS)
WHERE b.f1 = "xyz" AND b.f2 = 100;
```

1. The query engine considers all available full-text indexes.
2. If any full-text index qualifies, the full-text index is used.
3. If none of the full-text indexes qualify, the query engine considers other available GSI and primary indexes, following existing rules.

Requirements	Description
FTS index	Analysers, Type mappings and Indexed fields must satisfy requirements listed in the documentation.
Query	In order to use a full-text index with a N1QL query, the query predicates (conditions and expressions) must also meet certain requirements listed in the documentation.

3-1-2.
Search Results

Sorting

- The required sort-type is specified by using the `sort` field, as an array of String or Objects. Combination is possible.
- The default sort-order is ascending.
- If multiple fields are included, the sorting of documents begins according to their values for the field whose name is first in the array.

Sorting type	Description	Example

Sorting with Strings	Array of strings containing either:
	• field name
	• _id:
	• _score
		{
		"fields": ["title"],
		"**sort**": ["country", "-_score","-_id"],
		"query":{"query": "beautiful pool"}
		}

Sorting with objects	Fine-grained control over sort-procedure. Each object can have the following fields:
	• by
	• field
	• missing
	• Mode
	• type
		{
		...
		"**sort**": [
		"country",
		{
		"by" : "field",
		"field" : "reviews.ratings.Overall",
		"mode" : "max",
		"missing" : "last",
		"type": "number"
		}
		}

Pagination

Pagination of large number of results are essential for sorting and displaying a subset of these results.

Pagination type	Description	Example
SIZE/LIMIT, FROM/OFFSET	To obtain a subset of results and works deterministically when combined with a certain sort order (default order is relevance)	{ "query": { "match": "California", "field": "state" }, "size": 5, "**from**": 10 }
SEARCH_AFTER SEARCH_BEFORE	For more efficient pagination, designed to fetch the size number of results after or before the key specified. Allow for the client to maintain state while paginating.	{ "query": { "match": "California", "field": "state" }, "sort": ["_id"], "**search_after**": ["hotel_10180"], "size": 3 }

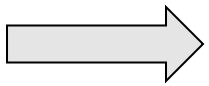
Facets

Facets are **aggregate** information collected on a particular search result set. You do a search and collect additional facet information along with it.

Facet type	Description
TERM FACET	Counts up how many of the matching documents have a particular term in a particular field
NUMERIC RANGE FACET	The user defining their numeric ranges. The facet counts matching documents for a particular field.
DATA RANGE FACET	Same as numeric range facet, but on dates instead of numbers

Term Facet example : search documents containing `air fresheners` *and compute facets on the field* `type`

```
{
    "query": {"query": "air fresheners"},
    "facets": {
        "type": {"field": "type"}
    }
}
```



Results : documents containing `air fresheners` *can be grouped in 2 facets:* `Electric Air Fresheners` *(288 results) and* `Air Fresheners Sprays` *(887 results)*

```
"facets": {
    "type": {
        "field": "type",
        "total": 1175,
        "terms": [
            {"term": "Electric Air Fresheners","count": 288},
            {"term": "Air Freshener Sprays", "count": 887}
        ]
    }
}
```

3-1-3.
Search Indexes

Index Overview

Real-time indexing (auto-updated upon mutation)

Mapping (default map, map by document type and dynamic mapping)

Storing (Stored fields, Term vectors)

Analyzers (Character filters, Tokenization, Token Filtering)

Aliasing (Searches can be performed across multiple buckets)

Creating Search Index

Couchbase
Web Console

RESTful
API

```
{
   "name":"demoIndex",
   "type":"fulltext-index",
   “params":{ ...},,
   "sourceType":"couchbase",
   "sourceName":"travel-sample",
   "sourceUUID":"99e9829898a45ba35f1c9c85dfcdb42b",
   "sourceParams":{...},
   "planParams":{},
   "uuid":""
}
```

TIP: The easiest way to create a FTS index is through the Web Console, then the Index Definition Preview can be copy/paste and reused with REST API

Creating index

Define your indexes based on your access pattern.

1

Identifying document type format

Type Identifier (Json property, Doc ID)

2

Include or Exclude documents by type

Type Mapping (all fields or only specific fields)

Analyser (default, specific or custom)

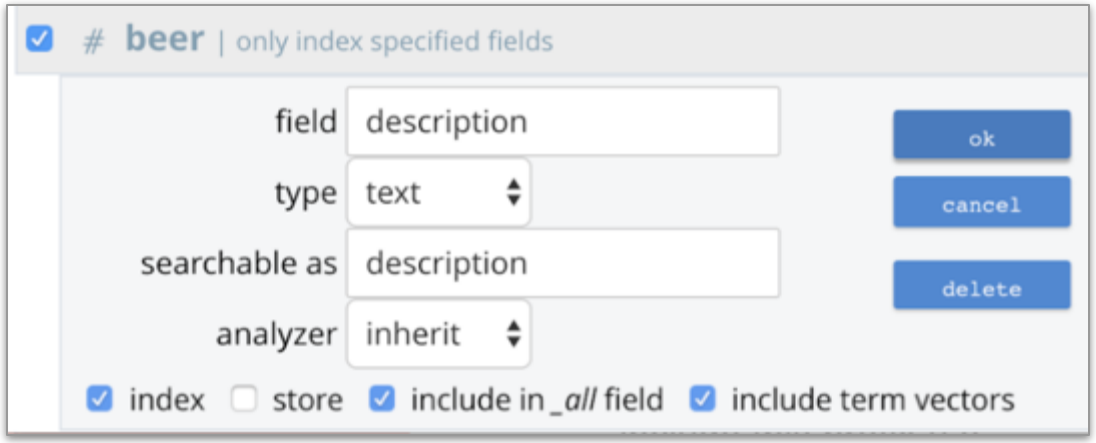
3

Include or Exclude specific fields in the index

Child Field (value or array) or Child Mapping (Json object)

Store (for highlights in results)

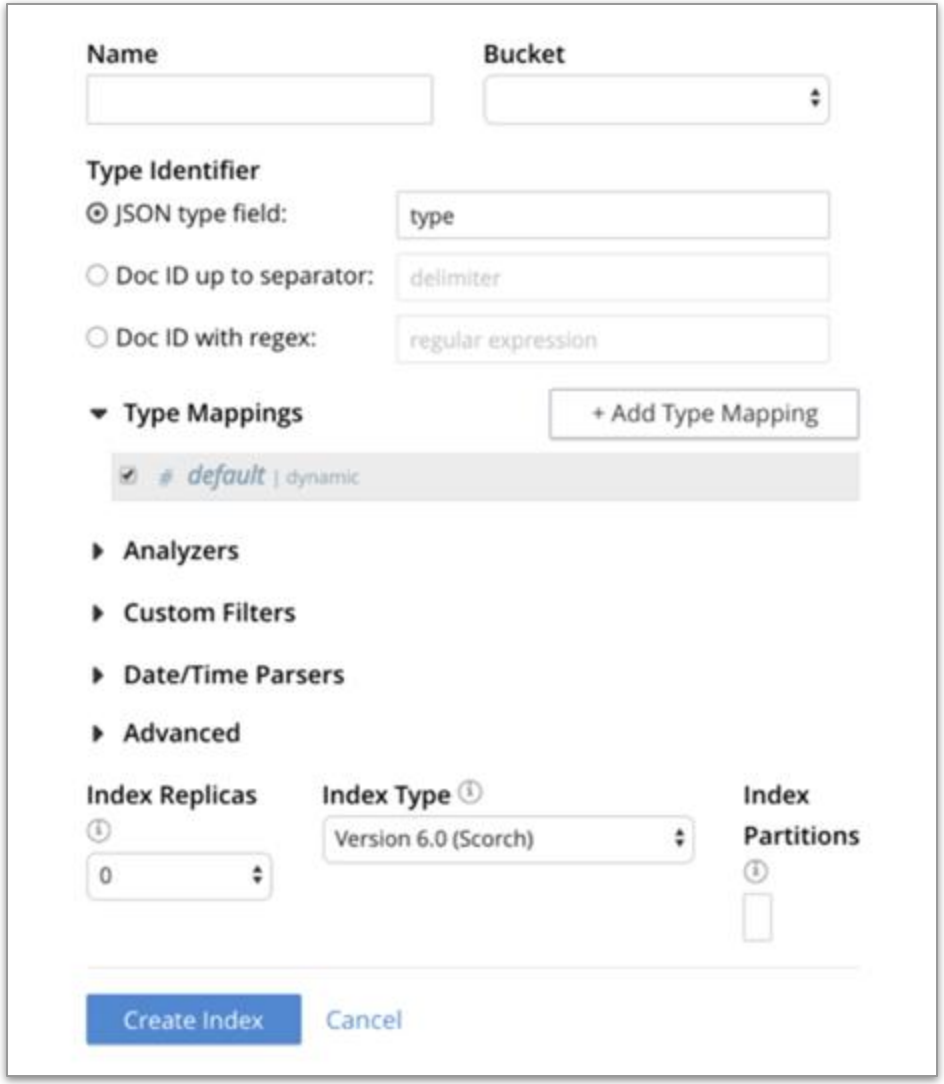
Index mapping



OPTION name	Description
index	If unchecked, fields that match this will not be indexed
store	• This allows the document contents to be written to the index; by default only doc IDs are written to a FTS Index • Enables highlighting and result snippets but generally results in larger indexes that are slower to build. • Encourage use of multi-gets so users don't need to store the additional information in the index.
Include in _all	• The text in this field will be searchable in query strings without prefixing the field name. • If unchecked, the query must include this prefix (i.e. "desc:modern")
Include term vectors	Not storing term vectors results in smaller indexes and faster index build times.

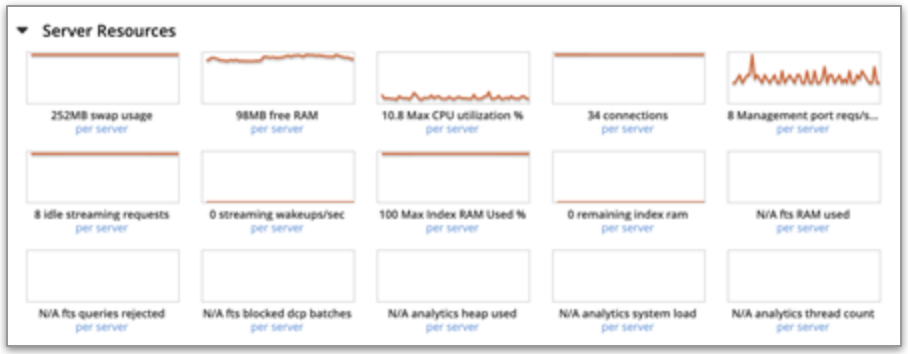
Search Workbench - Creating Indexes

- Visual Web Console
- All features available, including Custom Analyzers creation
- Index definition available in JSON for REST API
- Once built, searchable from Web Console, SDK or REST API



Monitoring Search

Couchbase
Web Console



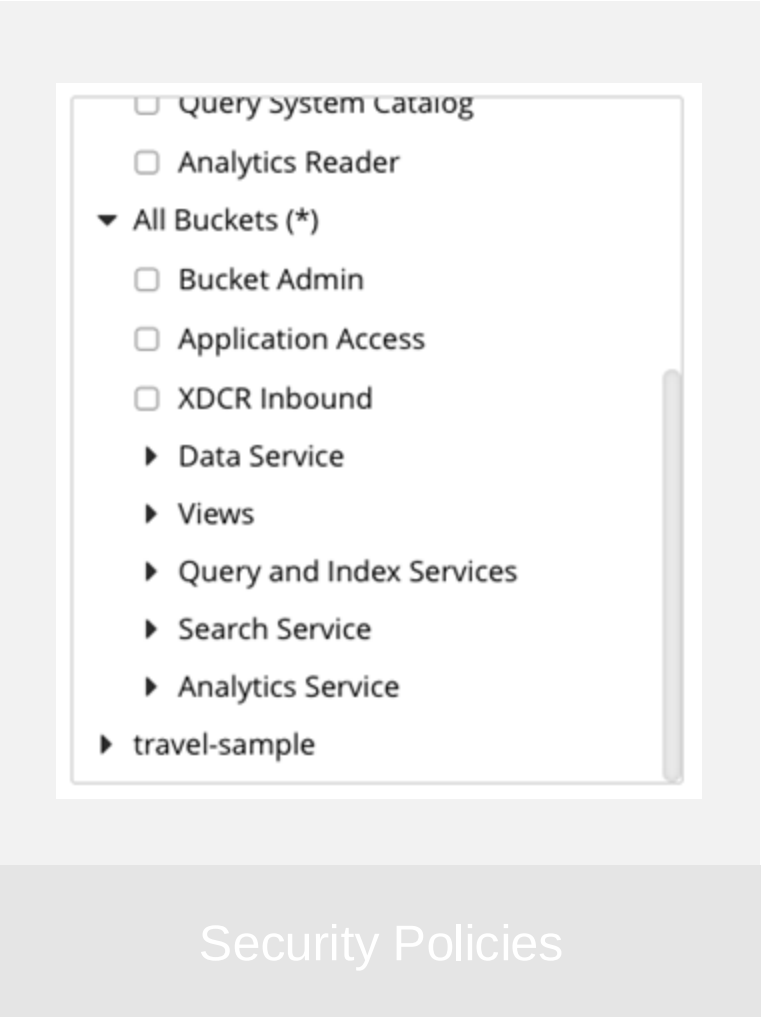
RESTful
API

```
{
  "num_bytes_used_ram": 213924088,
  "travel-sample:geoIdx:avg_queries_latency": 41.771365,
  "travel-sample:geoIdx:num_bytes_used_disk": 295152367,
  "travel-sample:geoIdx:total_queries": 9,
  "travel-sample:geoIdx:total_queries_slow": 0,
  ...
}
```

Off-the-shelf
Integration

Centralized Security Policies

- Authorization with RBAC
- Coarse or Fine granularities
- Centralized policies for all resources, user, groups and roles



3-2.
AI, Vector Search, Hybrid Search

Key Milestones in the History of AI | 20th Century

AI is born | Early Developments | Expert Systems | Machine Learning

Can a Machine think?

1950

Alan Turing test - if a machine tricks a human into thinking it's a human, then it's intelligence.

AI term coined

1956

John McCarthy introduced the term 'Artificial Intelligence' at The Dartmouth Conference.

Gen. Problem Solver

1957

General Problem Solver is the first AI algorithm. It can solve formalized problems (e.g. Towers of Hanoi).

The chatbot Eliza

1965

Eliza is the first chatterbot - or "chatbot" modernly. It can simulate a human conversation.

1st AI Winter
1974-1980

R1, an Expert System

1980

R1 uses 2500 rules to ensure that the customer's order is complete, saving the company $25M a year.

2nd AI Winter
1987-1993

Deep Blue

1997

IBM's Deep Blue supercomputer defeats the world chess champion Garry Kasparov.

Kismet

1998

Cynthia Breazeal at MIT creates Kismet, a robot that can detect and respond to people's feeling.

Key Milestones in the History of AI | 21st Century

Machine Learning | Deep Learning | Generative Models

Watson

2006

IBM's Watson question-answering system is created. In 2011, it defeats Jeopardy!'s champion.

Siri & Alexa

2011

Apple released Siri, an AI assistant that can respond to voice. 3 years later, Amazon launched Alexa.

Google AI

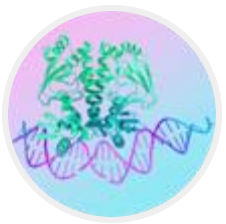
2014

Google AI recognizes cats from 10 million Youtube videos with almost 75% accuracy in 3 days.

AlphaGO

2016

AlphaGo defeats top Go player Lee Sedol in Seoul. Go is incredibly difficult given the vast number of positions.



AlphaFold

2020

DeepMind's AlphaFold system can predict protein structure, with implications for drug discovery and biology.

AI Boom

AI Explosion

DALL.E

2021

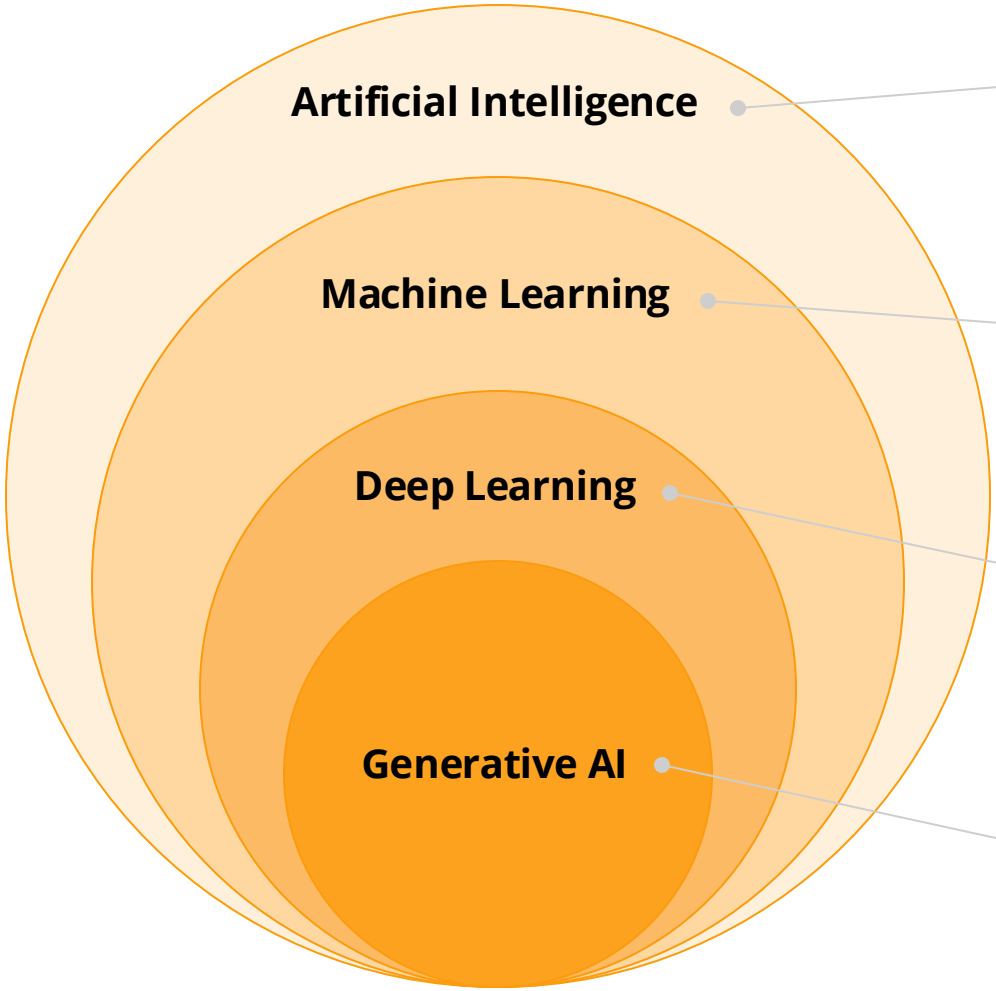
DALL·E, and a year later Midjourney and StableDiffusion, can generate images from textual descriptions.

ChatGPT

2022

OpenAI releases the AI chatbot ChatGPT. It is based on the Large Language Model GPT-3 created in 2020.

The Technology behind AI



Artificial Intelligence (AI)
Techniques that allows computers to emulate human behavior (e.g. learn, recognize patterns, solve complex problems).

Machine Learning (ML)
A subset of AI, using advanced algorithms to detect patterns in large data sets, allowing machines to learn and adapt for prediction or content generation use cases.

Deep Learning (DL)
A subset of ML, using multiple layers of artificial neural networks that simulate human brains for in-depth data processing.

Generative AI (GenAI)
A subset of DL, using models that generate content like text, images, or code based on provided input.

Powering Apps: A Combination of Predictive & Generative AI

Predictive AI

Outcomes and Insights driven by ML

- Predict Outcomes based on historical data
- Utilize ML algorithms for pattern recognition
- Learns patterns and correlations from data
- Drives decision making and Future planning
- High ROI, trained on proprietary data

- Predictive Insights
- Dynamic Pricing
- Fraud Detection
- Inventory Optimization

+

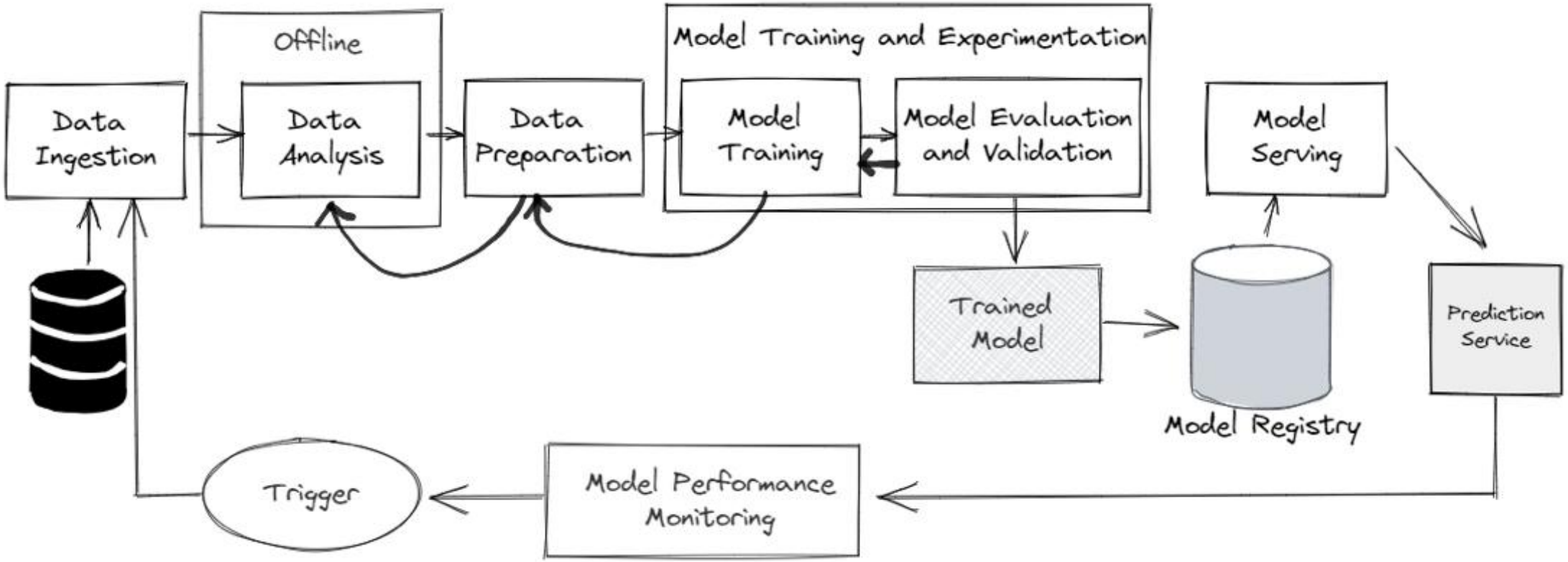
Generative AI

Generate Content and Experiences

- Generate or Synthesize content
- Needs large amounts of unlabeled data for training
- Generates new data probabilistically
- Fosters creativity, innovation
- Accelerates human productivity

- Hyper-personalized experiences
- Contextualized content
- Chatbots and CoPilots
- Synthetic data and Summarization

Model? Machine Learning Workflow



출처 : https://www.iguazio.com/blog/ml-workflows-what-can-you-automate/
https://cloud.google.com/architecture/mlops-continuous-delivery-and-automation-pipelines-in-machine-learning

What is a Vector

What is a Vector? | Basic RGB Example

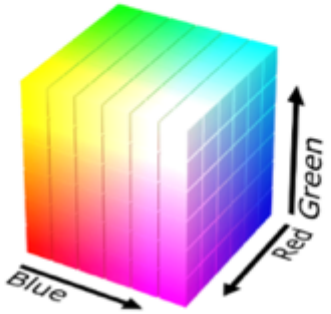
This is a vector

2.6	11.3	-4.2

First value | Second value | Third value

Here, it contains 3 values
=> its dimension is 3

The RGB model example

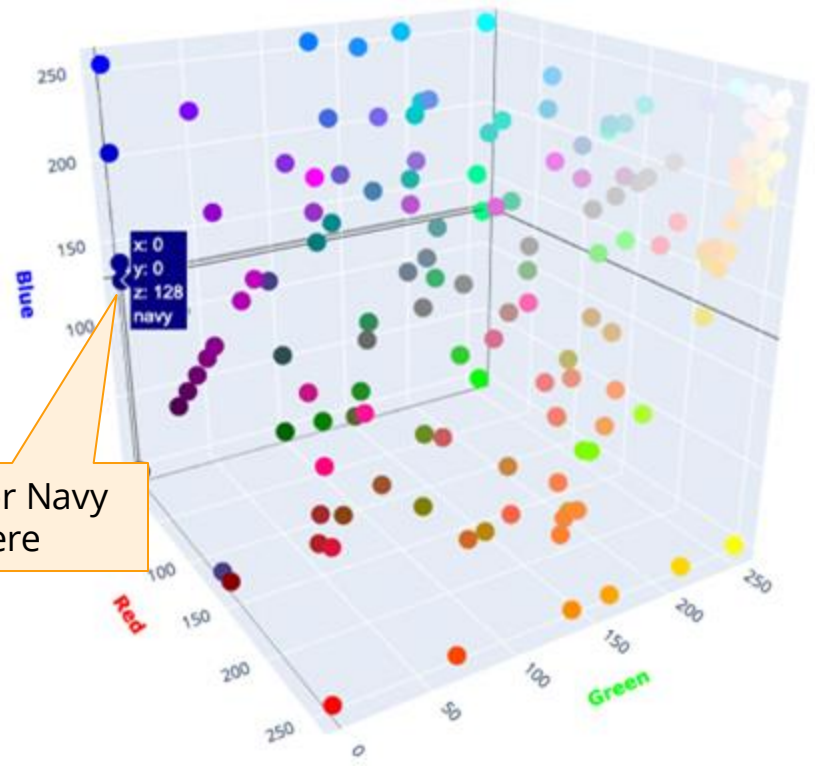


The model used to create the colors you see on TV and computer screens.
Each color is the addition of a **R**ed, **G**reen and **B**lue primary colors.

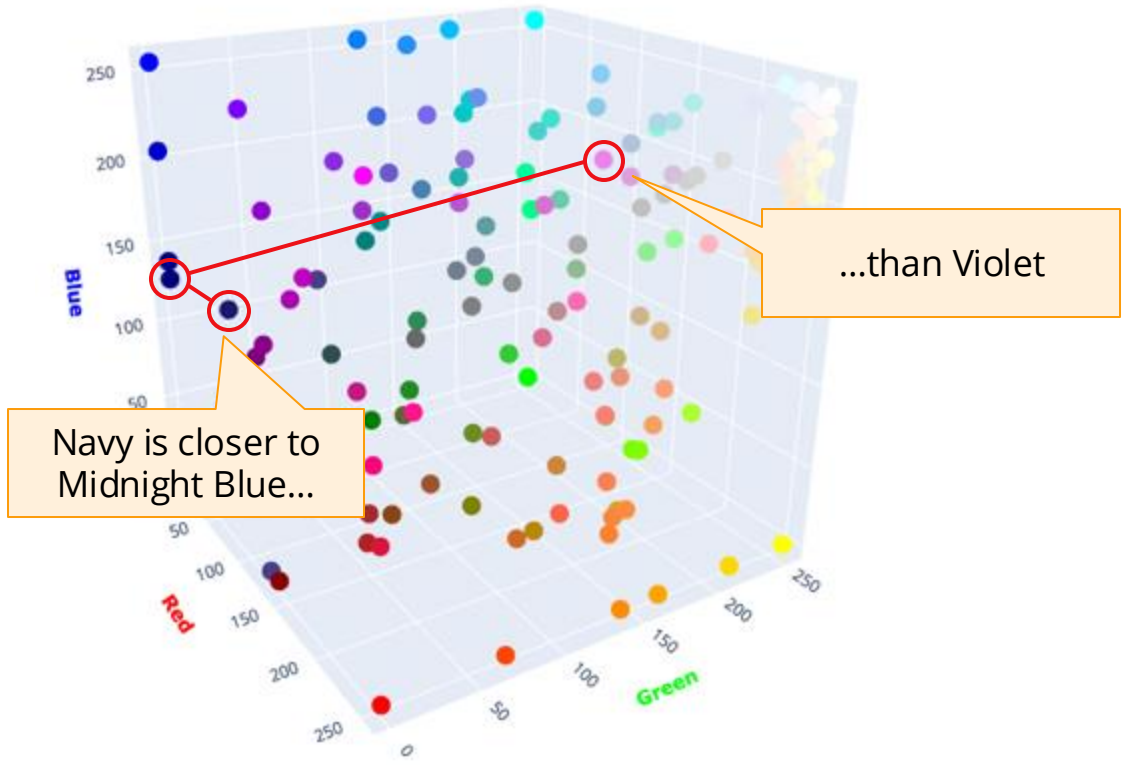
A Vector is a just an **array of numerical values**

Vectors Similarity

Example of 123 vectors of RGB colors



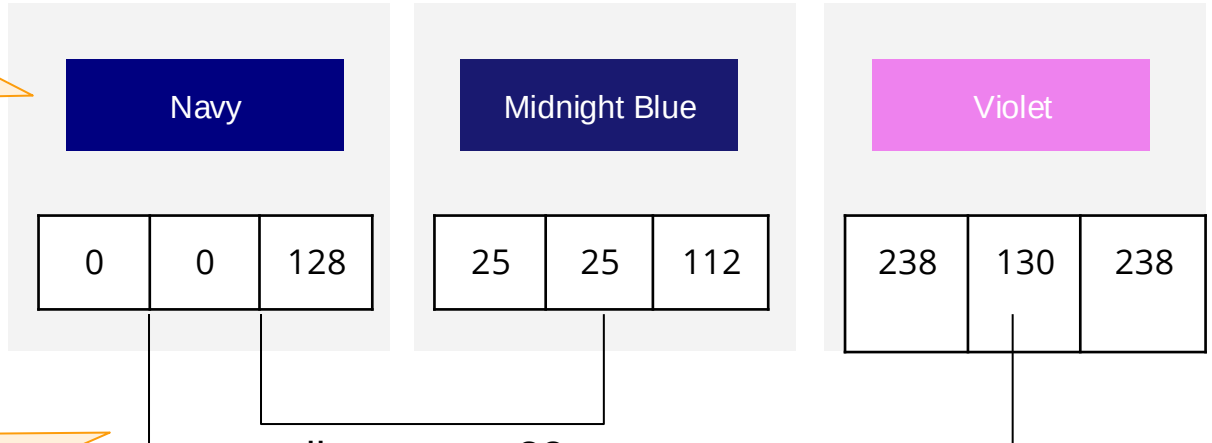
Similar colors are closer to each other



Vectors make it possible to translate **similarity** as perceived by humans to **proximity in a vector space**.

How does Similarity works

To the human eyes,
Navy is closer to Midnight Blue than Violet



Mathematically,
we got the same result by comparing the vectors

Vectors are compared using **a similarity distance.**

Here the *euclidean distance*

$292 \simeq \sqrt{(238-0)^2+(130-0)^2+(238-128)^2}$

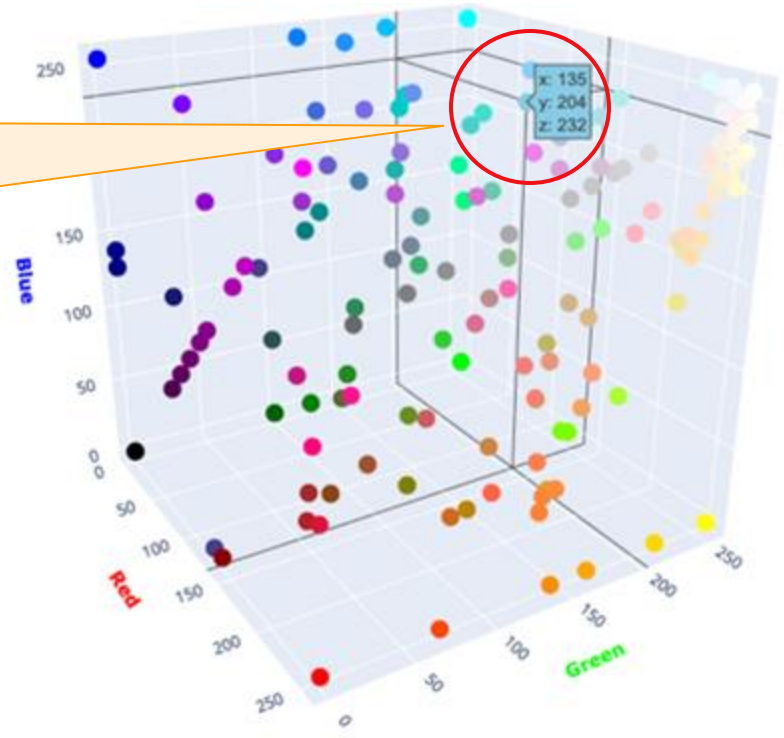
Vectors can easily be compared mathematically using a **similarity distance**

Similarity Search with K-NN (K-Nearest Neighbors)

Which are the top k nearest neighbors to this color?

[135,204,232]

Example of 123 vectors of RGB colors

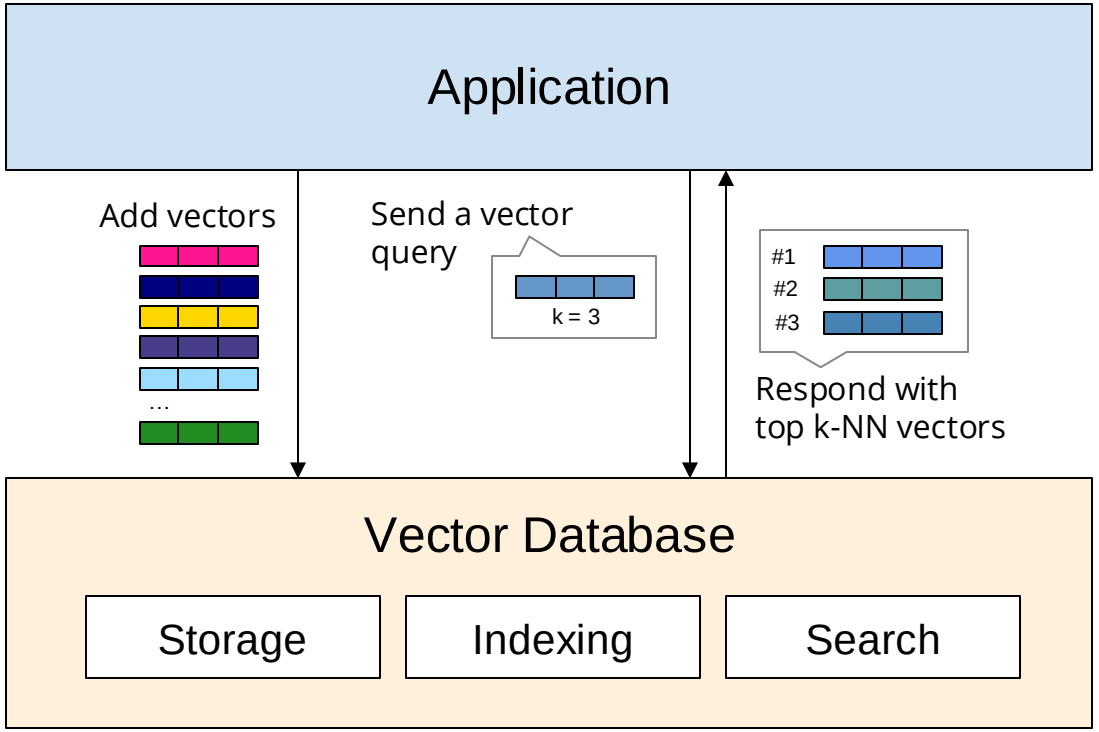


Top k-NN results of the query

#1	sky blue	[135,206,235]
#2	light sky blue	[135,206,250]
#3	light blue	[173,216,230]

A similarity search is a query that **finds the k nearest neighbors to a vector**, as measured by a similarity metric

What is Vector Database



Vector databases provide the ability to **store, index and search vectors** using similarity search

Couchbase Vector Search

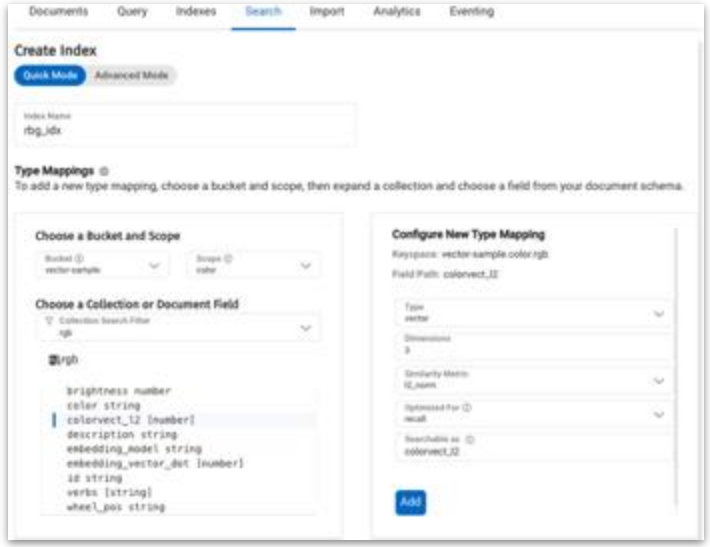
The vectors are stored as **a field in JSON** documents

```
{
 "id": "#000080",
 "color": "navy",
 "brightness": 14.592,
 "colorvect_l2": [0, 0, 128],
 "description": "Navy is a deep, rich color that
     exudes sophistication. It is a dark shade of
     blue that is often associated with authority,
     stability, and elegance. Navy is a versatile
     color that can be both bold and understated,
     making it a popular choice in fashion and
     interior design. It is a timeless color that
     never goes out of style and adds a touch of
     sophistication to any look or space.",
 }
```

JSON Storage

Data Service

A **Vector Index** must created to allow the vectors to be searched



Vector Index

Search Service

A **Vector Query** can now search for the top k-NN of a color

```
{
  "query": { "match_none": {} },
  "knn": [
    {
      "field": "colorvect_l2",
      "vector": [135, 204, 232],
      "k": 3
    }
  ],
  "fields": ["color"]
}
```

Vector Query

Couchbase uses the **Data Service to store vectors**, and the **Search Service to index and query vectors**

Hybrid SQL++ and Vector Search with Couchbase

This is a SQL++ query

Combining Vector Search query

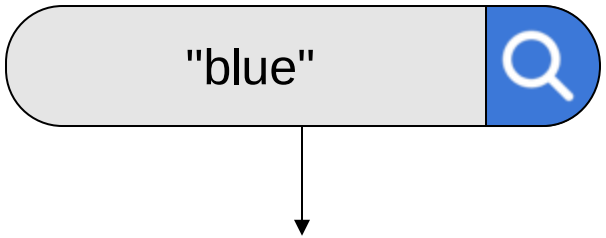
And standard SQL++ criteria

```
SELECT color, brightness
FROM `vector-sample`.color.rgb AS t1
WHERE
    SEARCH(t1,
     {
       "query": {  "match_none": {} },
       "knn": [{
         "field": "colorvect_l2",
         "vector": [135,204,232],
         "k": 3 }]
     }
AND
    brightness >= 180 AND brightness <= 190
    )
```

- ✓ SQL++ is easy and familiar to developers
- ✓ You can filter vector search results with other criteria
- ✓ **You don't have to run 2 separate databases, one for Documents and one for Vector Search!**

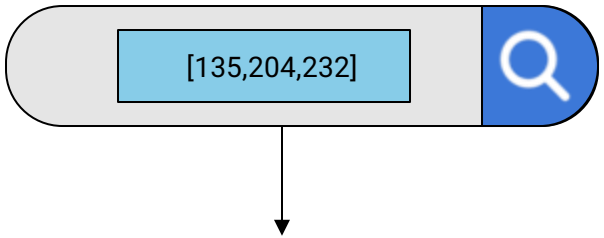
Couchbase can run hybrid SQL++ and Vector Search queries to **facilitate application development**

Comparison between Keyword Search and Vector Search



Keyword Search on the
description of the colors

- Dodger blue
- Blue violet
- Powder blue
- Sky blue



Vector Search on the
RGB vectors of the colors

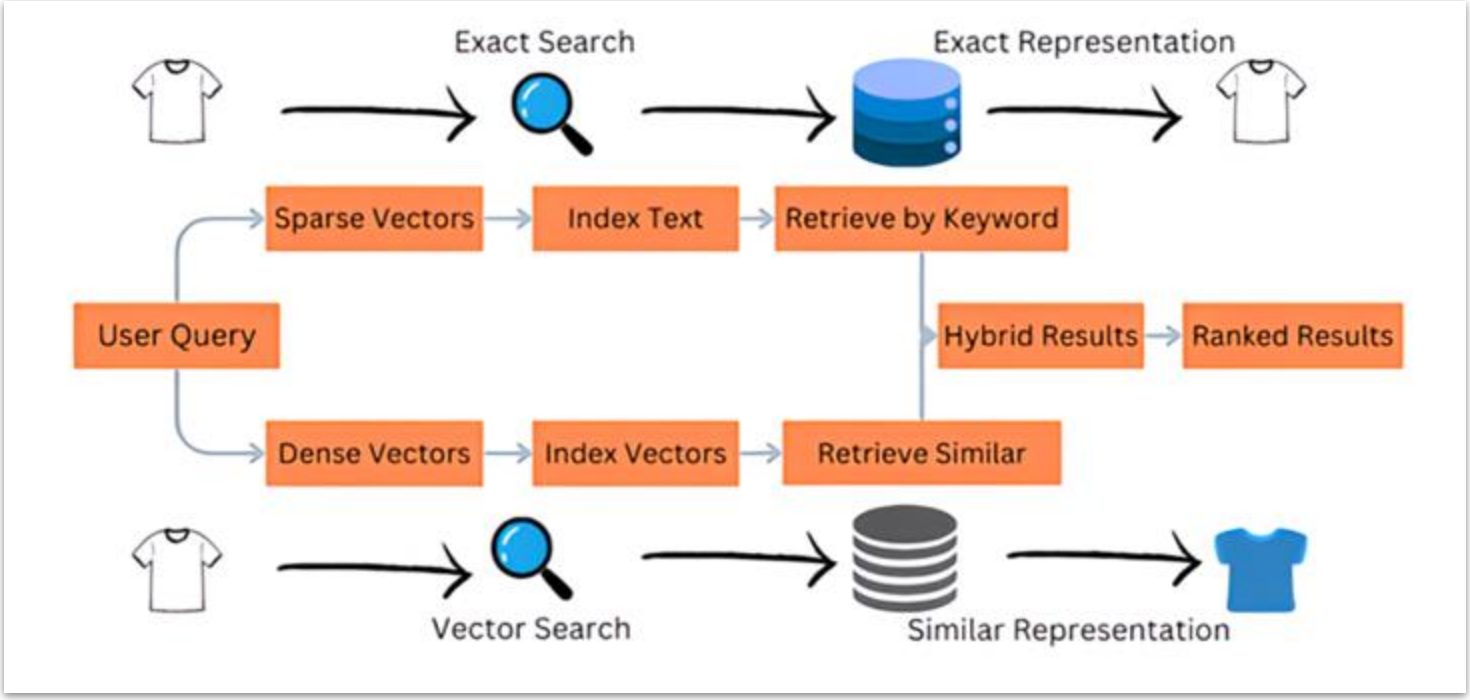
- Sky blue
- Light sky blue
- Light blue
- Light steel blue

A Keyword search looks for **terms** that match

A Vector search looks for **similarity**

Hybrid Search to get the best of both worlds

Hybrid Search Architecture



Hybrid Search with Couchbase

```
{
  "query": {
     "match": "blue",
     "field": "description"
  },
  "knn": [
    {
   "field": "colorvect_l2",
    "vector": [135,204,232],
    "k": 4
    }
  ],
  "fields": ["color","description"],
  "size": 4
}
```

Keyword search

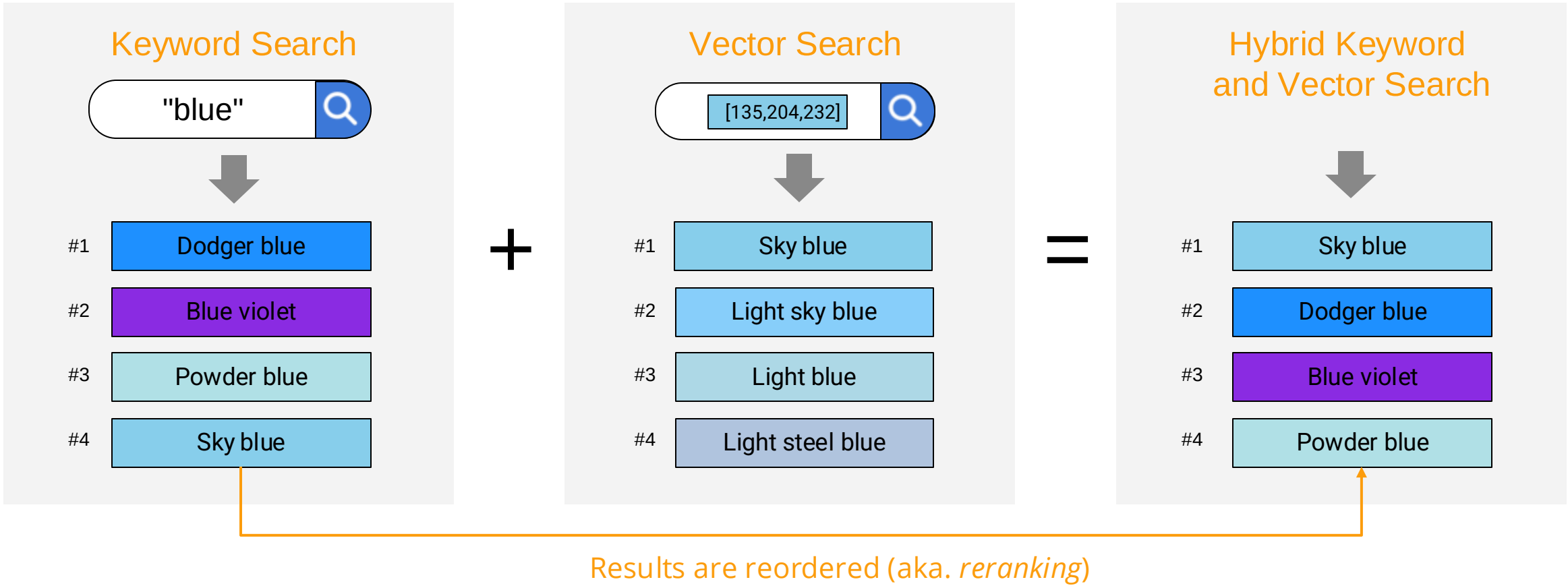
Vector search

Results to return

Vector search in conjunction with traditional Keyword search delivers the most complete and relevant results

Source: Couchbase

Hybrid Keyword and Vector Search Example



Results from the Keyword search are **boosted** if they appear in the Vector Search results

3-3.
FTS/Vector Search 실습 : RGB

3교시.Lab.Couchbase Vector Search_RGB.pdf

첨부.
FTS 검색 예제

SEARCH() : Simple Match Search

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(attribute_name, search_term)
```

```
SELECT country, name, description
FROM hotel
WHERE SEARCH(description, "boutique")
```

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(attribute_name, search_term)
```

```
SELECT country, name, description
FROM hotel
WHERE SEARCH(description, "boutique -luxury")
```

SEARCH() : Simple Match Search

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(attribute_name, search_term)
```

```
SELECT country, name, description
FROM hotel
WHERE SEARCH(description, "+boutique +hotel")
```

SEARCH() : Simple Match Phrase Search

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(attribute_name, search_phrase)
```

```
SELECT country, name, description
FROM hotel
WHERE SEARCH(description, "\"boutique hotel\"")
```

SEARCH() : Query Object Search – String Match

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, query_object)
```

```
SELECT h.country, h.name, h.description
FROM hotel h
WHERE SEARCH(h, { "query": {
                              "match":"boutique",
                              "field":"description"
                            }
                })
```

SEARCH() : Query Object Search – String Match Phrase

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, query_object)
```

```
SELECT h.country, h.name, h.description
FROM hotel h
WHERE SEARCH(h, { "query": {
                              "match_phrase":"boutique hotel",
                              "field":"description"
                            }
                })
```

SEARCH() : Query Object Search – Boolean Match

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, query_object)
```

```
SELECT h.country, h.name, h.free_parking
FROM hotel h
WHERE SEARCH(h, { "query": {
                              "bool":true,
                              "field":"free_parking"
                            }
                })
```

SEARCH() : Query Object

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, object)
```

```
SELECT h.country, h.name, h.description
FROM hotel h
WHERE SEARCH(h, { "query": {
                              "prefix":"exhibit",
                              "field":"description"
                            }
                })
```

SEARCH() : Query Object Search – Location Info

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, object)
```

```
SELECT h.country, h.name, h.description, SEARCH_META() as meta
FROM hotel h
WHERE SEARCH(h, { "query": {
                              "match":"boutique",
                              "field":"description"
                            },
                  "includeLocations":true
               })
```

SEARCH() : Query Object Search – Sort & Size

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, object)
```

```
SELECT h.country, h.name, h.description, SEARCH_META() as meta
FROM hotel h
WHERE SEARCH(h, { "query": {
                              "match":"boutique",
                              "field":"description"
                            },
                  "size":5,
                  "sort":["-_score"]
                })
```

SEARCH() : Query Object Search - And

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, object)
```

```
SELECT h.country, h.name, h.description
FROM hotel h
WHERE SEARCH(h, { "query": {
                    "conjuncts": [{
                                    "bool":true,
                                    "field":"free_parking"
                                  },
                                  {
                                    "bool":true,
                                    "field":"free_breakfast"
                                  }]
                }
              })
```

SEARCH() : Query Object Saerch – Fuzzy

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, query_object)
```

```
SELECT h.country, h.name, h.description
FROM hotel h
WHERE SEARCH(h, { "query": {
                              "match":“free wifi",
                              "field":"description",
                              "fuzziness":1
                            },
 },
                    "size":10,
                    "sort":["-_score"]
                  }
               })
```

SEARCH() : Query Object Search – Regular Expression

```
SELECT attribute_name
FROM collection_name
WHERE SEARCH(collection_name, object)
```

```
SELECT h.country, h.name, h.description
FROM hotel h
WHERE SEARCH(h, { "query": {
                              "regexp":"bathroom.+",
                              "field":"description"
                            }
                })
```

수고하셨습니다.

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