

[Machine Learning] Creating more relevant search results with "Learn to Rank"

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Dropsolid

Makkelijk Digitaal Ondernemen



Basic Concepts

How to apply in Drupal

1

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[Why Drupal?](#)[Build](#)[Solutions](#)[Services](#)[Community](#)[Resources](#)[Association](#)[Try Drupal](#)

Drupal™

Found 30228 results containing the words: **install apache**

Sort by Relevancy

Installing PHP, MySQL and Apache under Linux

Posted by [mike stewart](#) on 25 January 2018

like Percona Server or MariaDB. **Install Apache** and PHP Once MySQL has been **installed**, download **Apache** ... and PHP, and unpack them in the same directory. To **install Apache** together with PHP and MySQL, follow ... Linux development environments Prior to choosing components to **install**, please be sure to ...

7 comments – Documentation page

How to install LTR module / plugin for apache solr to Drupal?

Posted by [mehuls](#) on 31 December 2018

to found exact steps how to **install apache** solr LTR module / plugin. Where could I download related ... I want to add search weight in my **apache** solr search. I heard about LTR module. But I am not able ...

Multi-site Install using Apache VirtualHost- Requirements problem error

Posted by (not verified) on 26 October 2018

Hi folks, A couple of days ago I was testing a multi-site **install** on my local server. It worked ... fine. However, in replicating the same **install** on my VPS (running Debian Linux), I keep getting an ... **installation** process: The Drupal **installer** requires that you create a settings file as part of the **installation** ...

3 comments – Forum topic

Searched for install apache

Search again

or filter by...

All (28177)

[Forums & Issues \(27434\)](#)

[Documentation \(535\)](#)

[Modules \(190\)](#)

[Distributions \(16\)](#)

[Groups \(2\)](#)

or search for...

[IRC Nicks](#)

[Users](#)

[Advanced Issues](#)

How is this any relevant?



Step 4: Configure your installation

Last updated on 11 May 2019

While we expect this somehow to float to the top

Having a local web server to use a fully integrated, virtualized AMP (Apache, MySQL, PHP) stack that mimics the development, staging, and production servers that one may need to deploy Drupal.

AMP stack on a local machine

A developer workflow begins with having an AMP (Apache, MySQL, PHP) stack installed and configured on a Windows, Mac, or Linux based system. Depending on the operating system, there are a lot of different methods that one can use to set up an ideal environment on the system. However, when it comes down to choices, there are only three:

1. **Native AMP stack:** This option refers to systems that generally either come pre-configured with Apache, MySQL, and PHP or have a generally easy installation path to download and configure these three requirements. There are plenty of great tutorials on how to achieve this workflow, but this requires familiarity with the operating system.
2. **Packaged AMP stack:** This option refers to third-party solutions, such as
 1. **MAMP** (<https://www.mamp.info/en/>),
 2. **WAMP** (<http://www.wampserver.com/en/>), or
 3. **Acquia Dev Desktop** (<https://dev.acquia.com/downloads>).

Installing Drupal 8

Before installation

Step 2: Install dependencies with composer

Step 3: Create a database

Step 4: Configure your installation

Step 5: Run the installer

Step 6: Status check

Add Composer to an existing site

Drupal Quick Start

Trusted Host settings

Tags

Drupal 8

Ereloonsupplement

originalScoreModel ▾

Search results

Een supplement?

Somewhat Relevant

[Redacted text]

Wat is een kamersupplement?

Not Relevant

[Redacted text]

Supplementen - Dokter, waarom betalen wij?

Not Relevant

[Redacted text]

Tarieven ziekenhuisopname

Somewhat Relevant

[Redacted text]

Uw kamer

Not Relevant

[Redacted text]

Tureluur van uw factuur?

Relevant

[Redacted text]

[Home](#) » Search

Search

🔍 chocolate cake Apply

[Chocolate-Hazelnut Icebox Cake](#)

Tags [cake](#) [chocolate](#) [dessert](#) [untried](#)

Difficulty Medium

Cooking time 0 minutes

... [Chocolate-Hazelnut Icebox Cake](#) ... 0 minutes Medium 1 1/2 cup [chocolate](#) hazelnut spread ...

[Towering flourless chocolate cake](#)

Tags [dessert](#) [cake](#) [chocolate](#) [untried](#)

Difficulty Medium

Cooking time 35 minutes

... Towering flourless [chocolate cake](#) ... 35 minutes Medium 2 1/2 stick unsalted butter, cut into pieces, plus more for the pan 6 ounce bittersweet [chocolate](#), chopped 6 ounce unsweetened [chocolate](#), chopped 6 ...

[Victoria sponge cake](#)



Tags [Cake](#)

Difficulty Easy

Cooking time 20 minutes

... Victoria sponge [cake](#) ... Umami 20 minutes Easy A classic, uncut Victoria sponge ... Preheat the oven to 350°F/180°C and grease two 8

<http://drupal8-umami-search-update.localhost/search?query=chocolate+cake>

let's look at our current situation. Searching for chocolate cake. Let's also rank the intended results we like

<http://localhost:5000/stats>

But what about the other results? Let's take a look.

Machine Learning

Is it Artificial Intelligence?

Mathematical Model, based on sample data (training data) in order to make predictions or decisions without being explicitly programmed to perform the task.

Traditional ML

Traditional ML solves a prediction problem (classification or regression) on a single instance at a time.

if you are doing spam detection on email, you will look at all the features associated with that email and classify it as spam or not.

The aim of traditional ML is to come up with a **class** (spam or no-spam) or a **single numerical score** for that instance.

Learn To Rank

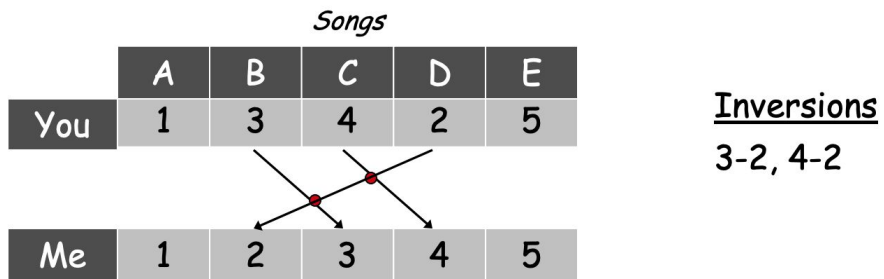
Learning to Rank (LTR) is a class of techniques that apply supervised machine learning (ML) to solve **ranking problems**.

The screenshot shows a search interface with a search bar containing 'Ereloonsupplement'. Below the search bar, the text 'Search results' is displayed. A dropdown menu is open, showing six search results. Each result has a title, a blurred description, and a relevance label in a colored box. The labels are: 'Somewhat Relevant' (green), 'Not Relevant' (red), 'Not Relevant' (red), 'Somewhat Relevant' (green), 'Not Relevant' (red), and 'Relevant' (green). To the right of the search results, there is a green button labeled 'originalScoreModel'. Three blue arrows originate from the right side of the search results and point towards the 'originalScoreModel' button, indicating a process of re-ranking or model application.

Search Result	Relevance Label
Een supplement?	Somewhat Relevant
Wat is een kamersupplement?	Not Relevant
Supplementen - Dokter, waarom betalen wij?	Not Relevant
Tarieven ziekenhuisopname	Somewhat Relevant
Uw kamer	Not Relevant
Tureluur van uw factuur?	Relevant

RankNet

RankNet was originally developed using neural nets, but the underlying model can be different and is not constrained to just neural nets. **The cost function for RankNet aims to minimize the number of inversions in ranking.**



LambdaRank & LambdaMart

Burgess et. al. found that during RankNet training procedure, you don't need the costs, only need the gradients (λ) of the cost with respect to the model score.

You can think of these gradients as little arrows attached to each document in the ranked list, indicating the direction we'd like those documents to move.



Solr/Elasticsearch (Hint, it's actually both Lucene)

- Document
 - - Contains Fields
 - - - Made of Types
 - - - - Which are Normalized by Processors
- Are stored in an index
- Each document is by default stand-alone*, does not need other documents for full scope
- An index is created so that based on tokens (read: words), we find references to the documents.

* there are ways to have references to other documents but this is not the 99% case as it is used today in Drupal. This becomes handy when it comes to personalized search

Solr - Generated by search_api_solr-8.x-3.x

```
// Return all documents where  
// Our Search Query is cookies  
q={..}cookies&
```

```
q={!boost b=boost_document}(!edismax qf='tm_X3b_en_rendered_item^1  
tm_X3b_en_title^5'}cookies)&fl=id,score,tm_X3b_en_title,sm_url&fq=index_id:um  
ami_search_index&fq=hash:t1nhb6&rows=10
```

Solr - Generated by search_api_solr-8.x-3.x

// and limit search to these fields

```
qf=tm_aggregated_field^1+tm_X3b_en_title^5&
```

```
q={!boost b=boost_document}{(!edismax qf='tm_X3b_en_rendered_item^1  
tm_X3b_en_title^5'}cookies)&fl=id,score,tm_X3b_en_title,sm_url&fq=index_id:um  
ami_search_index&fq=hash:t1nhb6&rows=10
```

Note: In Search Api Solr 8.x-3.x a new way of using eDisMax was added, which makes this query different from what you might be used to.

Solr - Generated by search_api_solr-8.x-3.x

```
// and see how heavily we need to boost each item as defined  
// by processors in search_api on index time.  
{!boost+b%3Dboost_document}
```

```
q={!boost b=boost_document}(!edismax qf='tm_X3b_en_rendered_item^1  
tm_X3b_en_title^5'}cookies)&fl=id,score,tm_X3b_en_title,sm_url&fq=index_id:uma  
mi_search_index&fq=hash:t1nhb6&rows=10
```

Note: In Search Api Solr 8.x-3.x a new way of using eDisMax was added, which makes this query different from what you might be used to.

Solr - Generated by search_api_solr-8.x-3.x

// Return these fields

fl=id,score,tm_X3b_en_title,sm_url&

**q={!boost b=boost_document}(!edismax qf%3D'tm_X3b_en_rendered_item^1
tm_X3b_en_title^5'}cookies)&fl=id,score,tm_X3b_en_title,sm_url&fq=index_id:u
mami_search_index&fq=hash:t1nhb6&rows=10**

Solr - Generated by search_api_solr-8.x-3.x

```
// Limit documents to this index & site  
fq=index_id:umami_search_index&  
fq=hash:t1nhb6&
```

```
q={!boost b=boost_document}(!edismax qf%3D'tm_X3b_en_rendered_item^1  
tm_X3b_en_title^5'}cookies)&fl=id,score,tm_X3b_en_title,sm_url&fq=index_id:um  
ami_search_index&fq=hash:t1nhb6&rows=10
```

Solr - Generated by search_api_solr-8.x-3.x

```
// Return 10 results  
rows=10
```

```
q={!boost b=boost_document}(!edismax qf%3D'tm_X3b_en_rendered_item^1  
tm_X3b_en_title^5'}cookies)&fl=id,score,tm_X3b_en_title,sm_url&fq=index_id:uma  
mi_search_index&fq=hash:t1nhb6&rows=10
```



Basic Concepts

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What is relevant?

2

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Feature Definition

Let's take Restaurants as an example. When searching for a restaurant, what are the criteria that you would use to mark the restaurant as high quality?

Can we do the same for our site with Articles, Recipes and Pages?

Feature Definition

- amountOfTags
- freshness
- originalScore
- titleScore
- typeScore
- urlScore
- descriptionScore

Feature Definition

```
{
  "initArgs": {},
  "initializedOn": "2019-01-21T21:09:59.011Z",
  "updatedSinceInit": "2019-01-21T22:01:14.113Z",
  "managedList": [
    {
      "name": "descriptionScore",
      "class": "org.apache.solr.ltr.feature.SolrFeature",
      "params": {
        "q": "{!field f=tm_rendered_item} ${query}"
      },
      "store": "_DEFAULT_"
    },
    {
      "name": "amountOfTags",
      "class": "org.apache.solr.ltr.feature.FieldLengthFeature",
      "params": {
        "field": "itm_field_tags"
      },
      "store": "_DEFAULT_"
    },
    {
      "name": "freshness",
      "class": "org.apache.solr.ltr.feature.SolrFeature",
      "params": {
        "q": "{!func} recip( ms(NOW,ds_changed), 3.16e-11, 1, 1)"
      },
      "store": "_DEFAULT_"
    }
  ]
}
```



What Is Relevant?

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Learn To Rank

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Database best practices can be found at

<https://drupalsear.ch/>

Code can be found at

<https://github.com/nickveenhof/drupal8-umami-search>

Back to Drupal

Solr best practices are different.

Back to Drupal

What fields to index?

Back to Drupal

- Rendered HTML Output
- Title

Note: be careful of Layout Builder. It can have unintended side effects/consequences

Rendered HTML output	rendered_item	rendered_item	Fulltext	1.0	Edit	Remove
----------------------	---------------	---------------	----------	-----	------	--------

Edit field Rendered HTML output

User roles *

Anonymous user

Authenticated user

Administrator

Your item will be rendered as seen by a user with the selected roles. We recommend to just use "Anonymous user" here to prevent data leaking out to unauthorized roles.

View mode for Content » Article

Search index

View mode for Content » Basic page

Search index

View mode for Content » Recipe

Search index

You can choose the view modes to use for rendering the items of different datasources and bundles. We recommend using a dedicated view mode (for example, the "Search index" view mode available by default for content) to make sure that only relevant data (especially no field labels) will be included in the index.

Cancel

Save

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What about hidden fields such as metatags? We are exposing it to Search Engines like Google, why not to our internal search?

Right now, this is blocked by a patch. Feel free to help out.

<https://www.drupal.org/project/metatag/issues/2901039>

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All other fields are only useful for Facets or for our Machine Learning Model

▼ GENERAL

LABEL	MACHINE NAME	PROPERTY PATH	TYPE	BOOST
<input type="text" value="Aggregated field"/>	<input type="text" value="aggregated_field"/>	aggregated_field	<input type="text" value="Fulltext"/>	<input type="text" value="1.0"/>
<input type="text" value="Rendered HTML output"/>	<input type="text" value="rendered_item"/>	rendered_item	<input type="text" value="Fulltext"/>	<input type="text" value="1.0"/>
<input type="text" value="URI"/>	<input type="text" value="url"/>	search_api_url	<input type="text" value="String"/>	

▼ CONTENT

LABEL	MACHINE NAME	PROPERTY PATH	TYPE	BOOST
<input type="text" value="Authored on"/>	<input type="text" value="created"/>	created	<input type="text" value="Date"/>	
<input type="text" value="Changed"/>	<input type="text" value="changed"/>	changed	<input type="text" value="Date"/>	
<input type="text" value="Content type"/>	<input type="text" value="type"/>	type	<input type="text" value="String"/>	
<input type="text" value="Cooking time"/>	<input type="text" value="field_cooking_time"/>	field_cooking_time	<input type="text" value="Integer"/>	
<input type="text" value="Ingredients"/>	<input type="text" value="field_ingredients"/>	field_ingredients	<input type="text" value="Fulltext"/>	<input type="text" value="1.0"/>
<input type="text" value="metatag » Keywords"/>	<input type="text" value="keywords"/>	field_metatag:keywords	<input type="text" value="Fulltext"/>	<input type="text" value="1.0"/>
<input type="text" value="Number of servings"/>	<input type="text" value="field_number_of_servings"/>	field_number_of_servings	<input type="text" value="Integer"/>	
<input type="text" value="Preparation time"/>	<input type="text" value="field_preparation_time"/>	field_preparation_time	<input type="text" value="Integer"/>	
<input type="text" value="Tags"/>	<input type="text" value="field_tags"/>	field_tags	<input type="text" value="Integer"/>	
<input type="text" value="Title"/>	<input type="text" value="title"/>	title	<input type="text" value="Fulltext"/>	<input type="text" value="5.0"/>

Query Parser

Displays

Page [+ Add](#)

Display name: [Page](#)

TITLE
Title: [Search](#)

FORMAT
Format: [Unformatted list](#) | [Settings](#)
Show: [Fields](#) | [Settings](#)

FIELDS [Add](#) ▼
[Search: Rendered item](#)
[Search: Excerpt](#)

FILTER CRITERIA [Add](#) ▼
[Search: Fulltext search \(and \)](#)

SORT CRITERIA [Add](#)

hint text that appears inside the field when empty.

Parse mode

[Multiple words with EDisMax](#) ▼

Choose how the search keys will be parsed.

Multiple words with EDisMax

Path: [/search](#)

Menu: [Normal: Search](#)

Access: [None](#)

HEADER [Add](#) ▼
[Global: Rendered entity – Block \(Global: Rendered entity – Block\)](#)

FOOTER [Add](#)

NO RESULTS BEHAVIOR [Add](#) ▼
[Global: Text area \(Global: Text area\)](#)

PAGER
Use pager: [Mini](#) | [Mini pager, 10 items](#)
More link: [No](#)

Back to Drupal

What fields to search

Search query options

Searched fields

- Aggregated field
- Content » Ingredients
- Content » metatag » Keywords
- Rendered HTML output
- Content » Title

Select the fields that will be searched. If no fields are selected, all available fulltext fields will be searched.

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What processors to enable

ENABLED

- ☐ Content access
Adds content access checks for nodes and comments.
- ☐ Double Quote Workaround
Replaces double quotes in field values and query to work around a bug in Solr streami
- ☐ Entity status
Exclude inactive users and unpublished entities (which have a "Published" state) from l
- ☒ Highlight
Adds a highlighted excerpt to results and highlights returned fields.
- ☒ HTML filter
Strips HTML tags from fulltext fields and decodes HTML entities. Use this processor w
- ☐ Ignore characters
Configure types of characters which should be ignored for searches.
- ☐ Index hierarchy
Allows the indexing of values along with all their ancestors for hierarchical fields (like
- ☐ Reverse entity references
Allows indexing of entities that link to the indexed entity.
- ☐ Solr dummy fields
Adds dummy fields to all datasources to register a pseudo field names that get their v
- ☒ Type-specific boosting
Adds a boost to indexed items based on their datasource and/or bundle.

Back to Drupal

How to get the excerpt in your view

▼ ADVANCED

☒ Retrieve result data from Solr

When checked, result data will be retrieved directly from the Solr server. This might make item loads unnecessary. Only indexed fields can be retrieved. Note also that the returned field data might not always be correct, due to preprocessing and caching issues.

☒ Retrieve highlighted snippets

Return a highlighted version of the indexed fulltext fields. These will be used by the "Highlighting Processor" directly instead of applying its own PHP algorithm.

Back to Drupal

How to get the excerpt in your view

Highlight returned field data

Always

Select whether returned fields should be highlighted.

☐ Highlight partial matches

When enabled, matches in parts of words will be highlighted as well.

☒ Create excerpt

When enabled, an excerpt will be created for searches with keywords, containing all occurrences of keywords in a fulltext field.

☒ Create excerpt even if no search keys are available

When enabled, an excerpt will be created even with an empty query string.

Excerpt length

256

The requested length of the excerpt, in characters

Exclude fields from excerpt

☐ Aggregated field (aggregated_field)

☒ Ingredients (field_ingredients)

☐ metatag » Keywords (keywords)

☐ Rendered HTML output (rendered_item)

☒ Title (title)

Exclude certain fulltext fields from being included in the excerpt.

Highlighting prefix

Text/HTML that will be prepended to all occurrences of search keywords in highlighted text

Highlighting suffix

Text/HTML that will be appended to all occurrences of search keywords in highlighted text

Back to Drupal

How to get the excerpt in your view



FIELDS Add ▼

Search: Rendered item

Search: Excerpt

- ☒ Use highlighted field data
Display field with matches of the search keywords highlighted, if available.



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Learn To Rank

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Demo

Improvement

Pre Optimization

Ranker	F-SCORE@5	PRECISION@5	RECALL@5	F-SCORE@10	PRECISION@10	RECALL@10
originalScoreModel	24%	18%	49%	20%	15%	55%

Post Optimization

Ranker	F-SCORE@5	PRECISION@5	RECALL@5	F-SCORE@10	PRECISION@10	RECALL@10
lambdamart-NDCG-10-100-1557408961	40%	28%	85%	29%	19%	91%
originalScoreModel	36%	25%	76%	27%	18%	81%

Stats

Ranker Performance

originalScoreModel ▾

Contact

F-SCORE@10: 0.18

PRECISION@10: 0.1

RECALL@10: 1.0

Conventie

F-SCORE@10: 0

PRECISION@10: 0.0

RECALL@10: 0.0

Conventionering

F-SCORE@10: 0.5

PRECISION@10: 0.33

RECALL@10: 1.0

Ereloonsupplement

F-SCORE@10: 0.6

PRECISION@10: 0.43

RECALL@10: 1.0

Facebook

F-SCORE@10: 0

PRECISION@10: 0.0

RECALL@10: 0.0

Facturatie

F-SCORE@10: 0.18

PRECISION@10: 0.1

RECALL@10: 1.0

Factuur

F-SCORE@10: 0.18

PRECISION@10: 0.1

RECALL@10: 1.0

Financiële dienst

F-SCORE@10: 0

PRECISION@10: 0.0

RECALL@10: 0.0

Geconventioneer

F-SCORE@10: 0.45

PRECISION@10: 0.29

RECALL@10: 1.0

Geneesmiddelenforfait

F-SCORE@10: 1.0

PRECISION@10: 1.0

RECALL@10: 1.0

Recall

$$\text{recall} = \frac{\text{shown relevant result}}{\text{all relevant results}}$$

Should be nearing 100% as much as possible.

Src:

<https://blog.exsilio.com/all/accuracy-precision-recall-f1-score-interpretation-of-performance-measures/>

Ranklib

Using the RankLib library, we can train our model and import it into Apache Solr. There are a couple of different models that you can pick to train - for example Linear or LambdaMART - and you can further refine the model to include the number of trees and metrics to optimize for.

https://lucene.apache.org/solr/guide/7_4/learning-to-rank.html

Ranklib

Let's look at such a model

Applying our model

```
&rq={  
  !ltr  
  efi.query=ereloonssupplement  
  model=lambdamart-NDCG@10-100-2019-02-11-12-24  
  reRankDocs=100  
}
```

fl=*,score&start=0&hl.fragsize=0&fq=%2Bindex_id:umami_search_index&rows=11&q
=(tm_aggregated_field:(chocolate+cake)^1+tm_title:(chocolate+cake)^5)&omitHeader
=true&wt=json&rq={!ltr+efi.query%3Dchocolate+cake+model%3Dlambdamart-ND
CG-10-100-1558611159+reRankDocs%3D100}

Applying our model

Learn To Rank ☆

[View](#)[Edit](#)[Fields](#)[Processors](#)[Learn To Rank](#)

[Home](#) » [Administration](#) » [Configuration](#) » [Search and metadata](#) » [Search API](#) » [Umami Search Index](#)

Settings form for Search overrides. Manage configuration here.

Learn To Rank Model *

The model to use for this index

Save

How can I do this?

https://www.drupal.org/project/search_api_ltr

Results

If we look at the actual result, it shows us that the search results that we've marked as relevant are suddenly surfacing to the top. Our model assessed each property that we defined and it learned from the feedback! Hurray!

Ereloonsupplement lambdamart-NDCG@10-100-2019-02-11-12:24

Search results

Tureluur van uw factuur? Relevant

Een supplement? Somewhat Relevant

Tarieven ziekenhuisopname Somewhat Relevant

Wat is een kamersupplement? Not Relevant

Uw kamer in Not Relevant

Supplementen - Dokter, waarom betalen wij? Not Relevant



Learn To Rank

Demo

Questions

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Demo (Python Tool for statistics)

delete all models

```
python3 ./manage.py delete-model --all-models
```

start our statistics tools

```
python3 ./manage.py run-server
```

Let's look at the statistics of regular drupal

<http://localhost:5000/stats>

Demo (Drupal)

Let's rank chocolate!

<http://drupal8-umami-search-update.localhost/search?query=chocolate+cake>

Train a model with Drush & Drupal.

```
drush search_api_ltr:train search page_1
```

Set our model to be used in Drupal

http://drupal8-umami-search-update.localhost/admin/config/search/search-api/index/umami_search_index/ltr

Demo (Drupal)

Let's look at the results

<http://drupal8-umami-search-update.localhost/search?query=chocolate+cake>

let's look at our statistics

<http://localhost:5000/stats>

Conclusion

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Questions



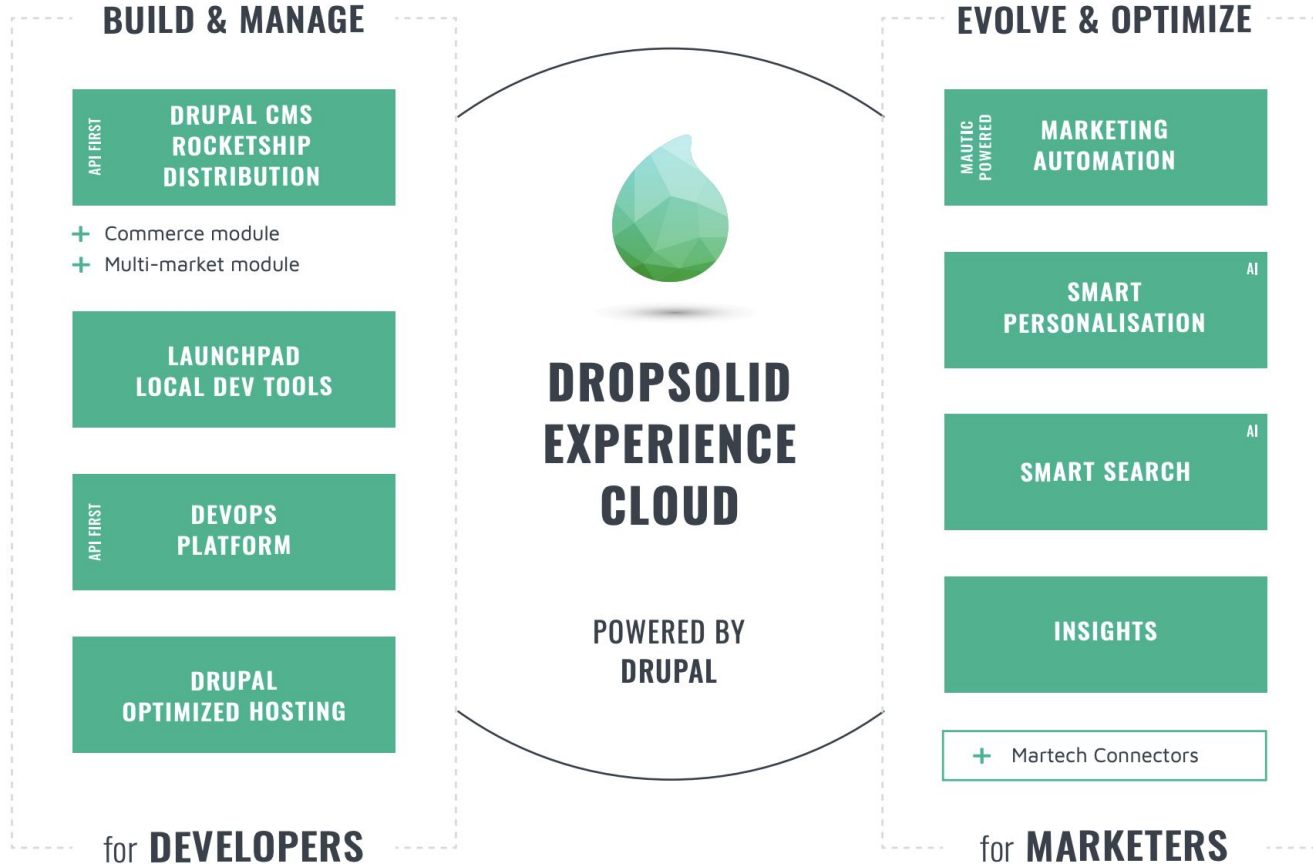
Conclusion

We compiled a learning dataset
we trained our model and uploaded the result to Apache Solr.

Next, we used this model during our queries to re-rank the last 100 results based on the trained model.

It is insanely important to have a good data model, which means getting all the basics on Search covered first.

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Tonight, 7PM!



Questions?

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Join us for contribution opportunities

Thursday, October 31, 2019

Mentored Contribution

9:00-18:00
Room: Europe Foyer 2

First Time Contributor Workshop

9:00-14:00
Room: Diamond Lounge

General Contribution

9:00-18:00
Room: Europe Foyer 2

#DrupalContributions

What did you think?

Locate this session at the DrupalCon Amsterdam website:

<https://drupal.kuoni-congress.info/2019/program/>

Take the Survey!

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Thank you!