# IMPROVING PRECISION OF E-COMMERCE SEARCH RESULTS

#### **ABOUT US**





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#### About OTTO and otto.de



- Founded in 1949
- Number of employees 4,900
- Revenue in 2018/19 3.2 billion Euro



- On average **1.6 million visits** on otto.de per day
- Up to 10 orders per second
- More than **3 million items** on otto.de
- More than **400 OTTO market partners**
- Approx. 6,800 brands on otto.de
- Expansion of the business model towards becoming a

#### Key Figures Product Search @otto.de in 2018





### Our Key Requirement for Search Relevance @otto.de OTTO



#### Search relevance @otto.de is determined by

- our user queries
- product data (quality)
- different performance indicators of our products
- different business goals for different categories

Finding the balance between the user's intent and the business' perspective is our key requirement for search relevance @otto.de

# WHAT IS THE PROBLEM?

### One Challenge wrt. Search Relevance @otto.de: Understanding the User's Intent



Query results for category searches are often too fuzzy: recall is good, but precision can be quite bad





### One Challenge wrt. Search Relevance @otto.de: Understanding the User's Intent

Fuzzy search results lead to difficulties in ranking





### One Challenge wrt. Search Relevance @otto.de: Understanding the User's Intent

Results via navigation deliver much higher precison for the same category



Turenticola . Tha	usnan .	Huene . Heintestalen .		zedg . Harnen . Abarea
tartseite   Suchergebnis für	krawatte (436)			Seite 1 von 7 >
Für wen?	^		Sor	tieren nach Topseller 🔻
O Herren (422)		%	%	%
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O Damen (3)		Ĩ		V
Sortiment	^			
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Bekleidung (17)				
Bastelbedarf (2)		8.		
Malen (2)				
Aufbewahrung (1)				
Spielzeug (1)				
verkieldung (1)				
Kategorie	~	BRUND BANAN	BRUNG BANANI	RUSTY NEAL
Produkttyp	~	Bruno Banani Anzug (Set, 4-tig, mit Krawatte und Einstecktuch)	Bruno Banani Anzug (Set, 4-tlg., mit Krawatte und Einstecktuch) der	Rusty Neal Hemdenset mit Weste und Krawatte
Farbe	~	€ 199,99 ab € 134,99	perfekte Gentlemen Dress	€ 79,95 € 64,90
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		4	* 3	
		MAN'S WORLD	AJC	BRUNO BANANI
		Man's World Anzug (4-tlg., mit	AJC Röhrenhose mit kleinem	Bruno Banani Krawatte, inklusive





### Topical Relevance vs. Business Value





HOW IS IMPROVING THE PRECISION GOING TO AFFECT THE USER?

#### First Business Objective: Search Effectiveness

We regard an order in a search session as a sign of success

#### Successful search session:



#### Unsuccessful search session:



**KPI: search conversion rate** 

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# Second Business Objective: Search Efficiency We regard a search session with less search interactions as more efficient Q **5** Search Interactions 1 search order Ratio 5:1 1 search order 2 Search Interactions Ratio 2:1 **KPI:** Ratio of search interactions to search orders

### Hypothesis for improving the precision



How will an improvement in precision influence our users?

#### **Hypothesis 1: Search Effectiveness**

We assume that some of our users have a low involvement in the search task or the online shop. They are easily frustrated due to the current lack of precision and leave the shop before they find what they are looking for.



An improvement in precision will therefore lead to a higher search conversion rate

#### **Hypothesis 2: Search Efficiency**

We assume that some of our users have a high involvement in the search task. They will tolerate the lack of precision and still find what they are looking for. It just cost them more effort (time, clicks, thoughts).



 $\rightarrow$ An improvement in precision will therefore lead to a lower ratio of search interactions to orders

# OUR APPROACH

### Our basic discovery approach



In our discoveries we loosely follow the design thinking process



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### Our Idea for a Solution of the Problem : Automatic Filter Selection

Use the data our customers leave behind



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## Our Idea for a Solution of the Problem: Automatic **OTTO** Filter Selection



### It took us four iterations to define the prototype





Iteration 1	Iteration 2	Iteration 3	Iteration 4
Scope: brand searches Insight: potential too low	Scope: category searches Insight: potential ok, but there might be more	Scope: all searches Insight: higher potential, but also higher risk	Scope: Shaping the prototype Insight: Definition of cut-off, decision for data fields and metrics

### Our basic discovery approach



In our discoveries we loosely follow the design thinking process



### Offline Evaluation of Search Relevance Improvements



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#### Offline Evaluation Architecture





#### Metrics in the Making



- Topical relevance metrics
  - Precision@n
  - NDCG
  - Average Precision
  - ERR
- Adressing temporal changes in frequency and significance
  - Traffic weight as metric factor at query-level
- Adressing significance as business performance predictor
  - Traffic weight \* business importance at query-level





We evaluated 12 configurations based on different product data, interaction data and filter/attribute value selection on a query-set with 100.000 entries

#### Filter Attribute Value Selection Strategy

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## OTTO

#### Produkttyp

#### LED-Fernseher (411)

Smart TV (320)

✓ 4k Fernseher (249)

✓ Ultra HD Fernseher (249)

✓ QLED-Fernseher (35)

Ambilight TV (20)

OLED Fernseher (17)

Curved TV (7)

Bluetooth Lautsprecher (4)

Standlautsprecher (4)

TV Wandhalterung (1)

Produkttyp Values	Clicks	Cumulated Sum	Coverage
LED-Fernseher	100	100	50%
4k Fernseher	80	180	90%
Curved TV	10	190	95%
Smart TV	5	195	97,5%
•••		•••	
		200	100%

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Attribute Name	Interaction Type	Coverage	Uplift	Uplift	Uplift	Uplift	Uplift	% of changed	% of changed	Avg. difference
			P@4	P@30	P@100	AP@30	AP@100	traffic	queries	of hits
producttype	clicks	90%	4,22%	5,76%	13,33%	5,76%	10,14%	86,61%	63,37%	31,19%
producttype	clicks	95%	4,19%	5,58%	12,87%	5,64%	9,89%	86,65%	63,38%	30,56%
category	clicks	90%	2,66%	4,21%	8,76%	3,79%	6,48%	88,35%	84,12%	14,35%
category	clicks	95%	2,62%	4,12%	8,50%	3,72%	6,31%	88,37%	84,14%	13,82%
producttype	add2basket	90%	1,84%	2,82%	7,40%	2,81%	5,45%	74,54%	19,69%	32,56%
producttype	add2basket	95%	1,84%	2,78%	7,33%	2,78%	5,41%	74,86%	19,69%	32,11%
category	add2basket	90%	1,13%	1,84%	4,74%	1,69%	3,34%	79,86%	29,84%	14,96%
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#### Every configuration leads to increased precision.





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#### Higher attribute granularity $\rightarrow$ higher precision





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Using click events performs better than using add2basket events.

### Our basic discovery approach



In our discoveries we loosely follow the design thinking process



#### **Technical Integration**







```
"krawatte" =>
FILTER: class:krawatten
```







### **Query Selection for Auto Filtering**



No brands

Hit set >30

• Pos. metric change

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#### No Nonsense 1.

- Identical hit count  $\bullet$
- 0-hits
- **Unclear judgements** ullet

#### **User Interaction Challenge**







#### Data Update Challenges

- Filtering data removes existing interaction patterns
- Missing "trending" attribute selections may lead to missing products
- Frequency of interaction data updates



#### **On-Site Test Results\***



#### Hypothesis 1: Search effectiveness

An improvement in precision will lead to a higher search conversion rate **KPI**: conversion rate search **Test result**: -0,49%

#### Hypothesis 2: Search efficiency

An improvement in precision will lead to a lower ratio of search interactions to orders **KPI**: Ratio of search interactions to search orders **Test result**: -0,73% (the lower the better)

#### We generate data with the A/B-Test...



... and use the insights for the next iteration



**Next Iteration** 

#### identifying queries with fuzzy search results in need of filtering finding appropriate filter attributes and values ۲

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We aim for:

• a self-learning system:

With plenty of query and product features we can train a machine learning algorithm to predict a relation between seachterm and product characteristics, determining a query re-formulation to improve precision

Products and user interests change over time

 $\rightarrow$  a fixed set of filters is not an option on the long term

#### 06.11.2019





## Connect with us.



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# We are hiring ;)