



# Learning-To-Rank Framework

## Farm your ranking models

18.06.2025

**MICES 2025**

Mlx-Camp E-commerce Search

**Ilan Dubois**  
ML Engineer, OLX Group

**Marcin Gumkowski**  
ML Engineer, OLX Group



Image by [pch.vector](#) on Freepik



# About us



From **Normandy**, France



BSc and MSc in **Computer Engineering**

@ EPITA (2013-2018)



**Ilan Dubois**

Senior Machine  
Learning Engineer

Berlin, Germany

# About us



From **Poznań**, Poland



BSc and MSc in **Computer Science**

@ Poznań University of Technology  
(2009-2014)



**Marcin Gumkowski**

Senior Machine  
Learning Engineer

Poznań, Poland



# LTR framework

## Meet the team



**Ilan Dubois**

Senior Machine  
Learning Engineer



**Marcin Gumkowski**

Senior Machine  
Learning Engineer



**Catarina  
Gonçalves**

Data Scientist



**Katarzyna  
Wagner-Wojciska**

Senior Data  
Product Manager



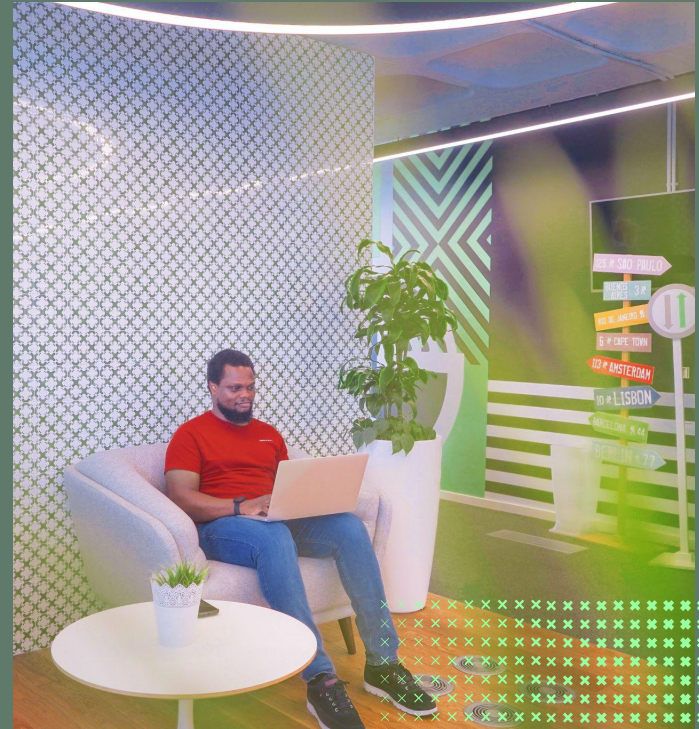
**Cristian Martinez**

Data Science  
Manager



# Agenda

- OLX Group
- Learning to rank - algorithm intro (OLX use case)
- OLX Group challenges
- LTR Framework
- Business Use Cases
  - Ranking Personalization
  - Package/Group Kickers







We are

OLX



# OLX TODAY



**1**

\*Source: CEB - C-Sat with users (buyers and C2C sellers) on OLX EU Platforms from April 23 - April 24



Associates:

OLX Brasil

dubizzle  
group

OfferUp®

# We empower millions of people in making **key life decisions\***

**>11M**  
found a  
**new home**  
with our  
platforms



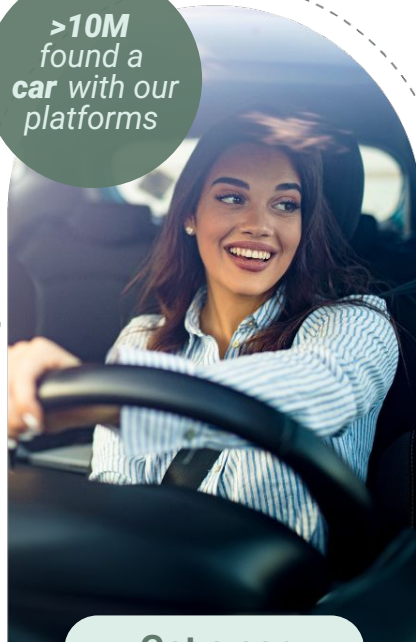
**Moves away**

**Starts their career**



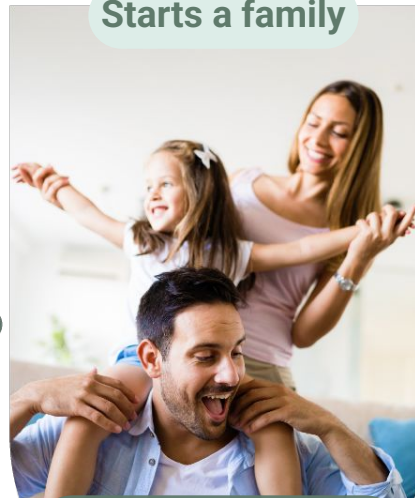
**>4M**  
found a  
**job** on OLX

**>10M**  
found a  
**car** with our  
platforms



**Get a car**

**Starts a family**



**0.5M** found a  
**Wedding planner** on OLX

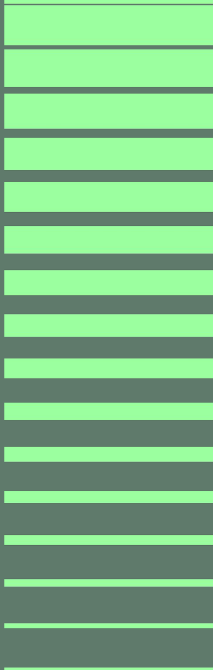
**0.6M** found  
**baby stroller** on OLX

**>2M** found a **video game**  
or console on OLX

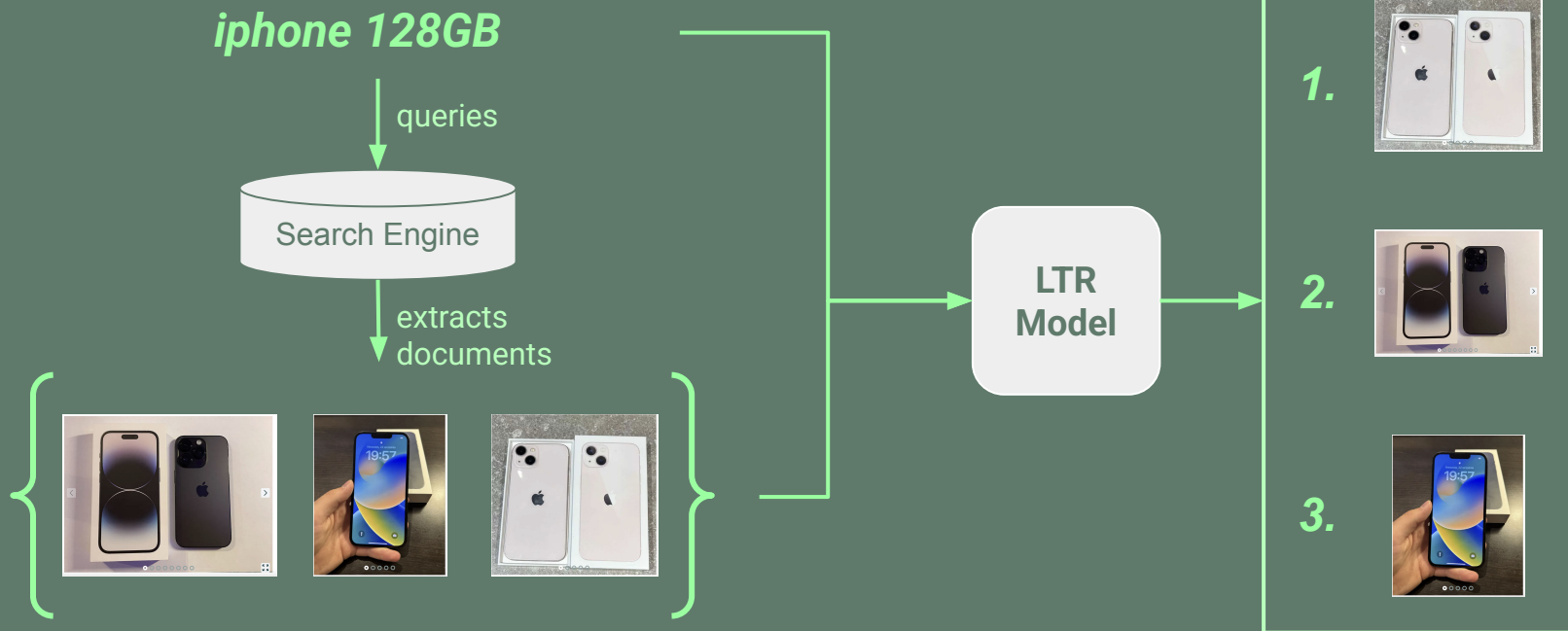


01

# Learning to Rank Algorithm Introduction



# Learning to Rank



# What are the characteristics that make an ad relevant?



Search bar: Iphone

Item listing: Iphone 14 128GB 95% battery MIDNIGHT BLACK

Price: PLN 1,900 (to negotiate)

Service: Service service with OLX Parcel

Location: Zabrze - June 5, 2024

Buttons: Buy, Send a message, Call

User Signals - clickstream events

Just an item

**PLN 3,249**

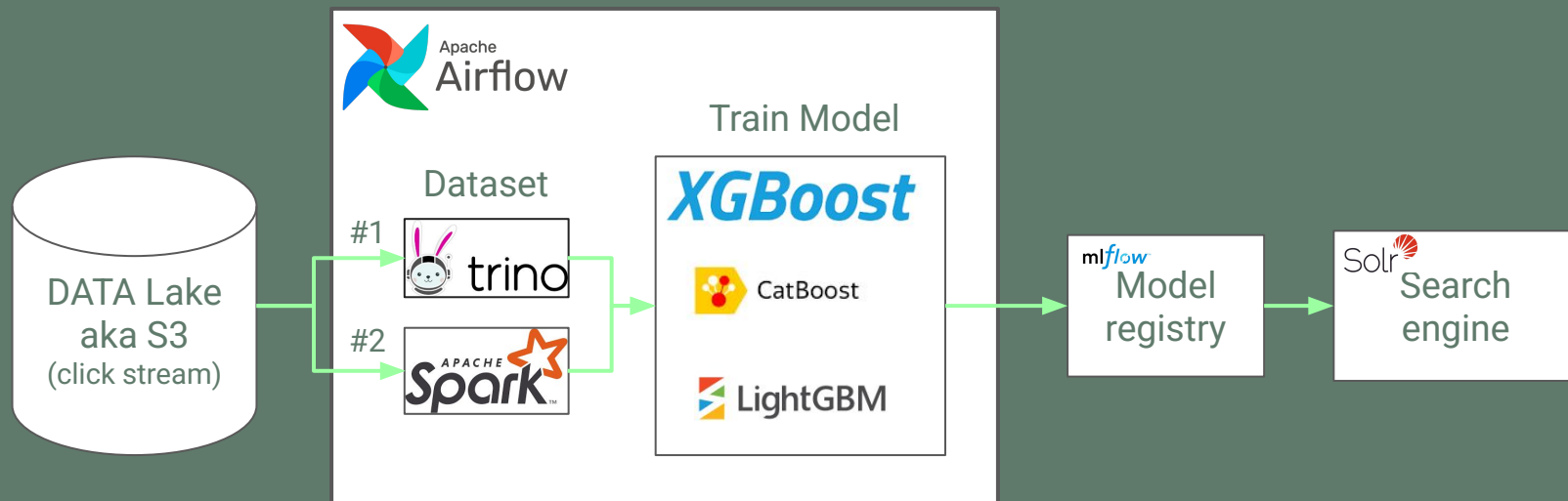
Price with OLX Shipping

**PLN 3,274** + delivery from PLN 12 [Price details](#)

Buttons: Buy, Send a message, Call



# Usual LTR pipeline





02

# Challenges in OLX Group



Core

otodom

Real Estate

OTOMOTO

Motors



# #1 challenge


Many Targets to optimize...

Delivery ad



VAS type #1





**iPhone 14 pro max 512GB idream insurance gold gold set**

Used


Łódź, Białuty - Refreshed on June 9, 2024

**PLN 4,500**

Service service with OLX Parcel

FEATURED

Heart icon



**iPhone 14 pro black, battery 92%, proof of purchase**

Used

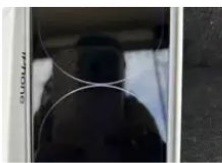
Scarves - June 9, 2024

**PLN 3,300**

Service service with OLX Parcel

FEATURED

Heart icon



**I will sell an iPhone 14 pro max, 256GB memory, Space Black**

New

Brenna - June 10, 2024

**PLN 1,800**

Heart icon



VAS type #2

VAS type #1



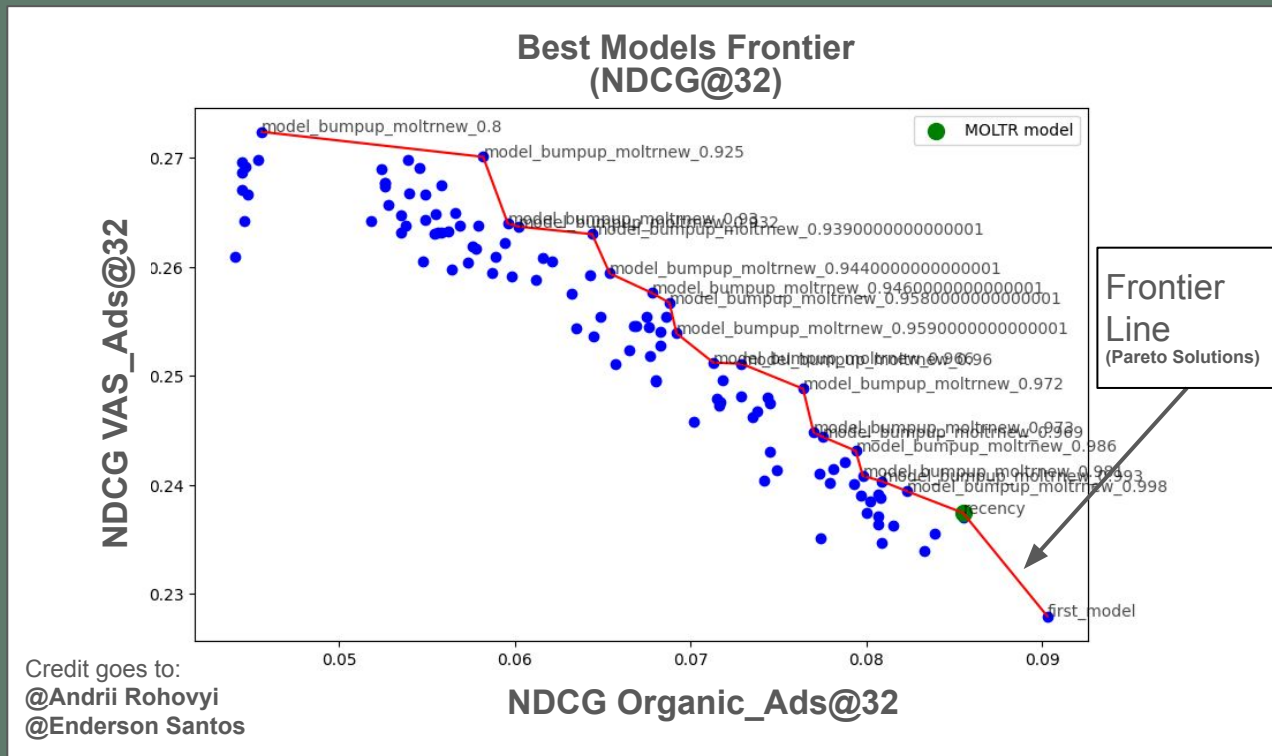
Organic ad



\*VAS - value added-service

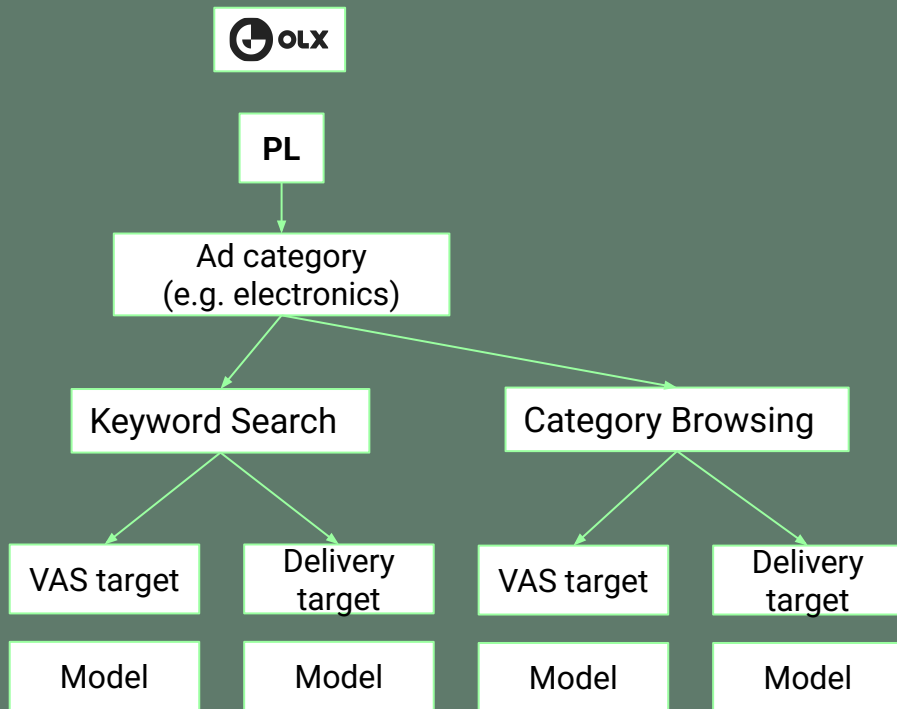
# #1 challenge

# Multi objective-optimization



## #2 challenge

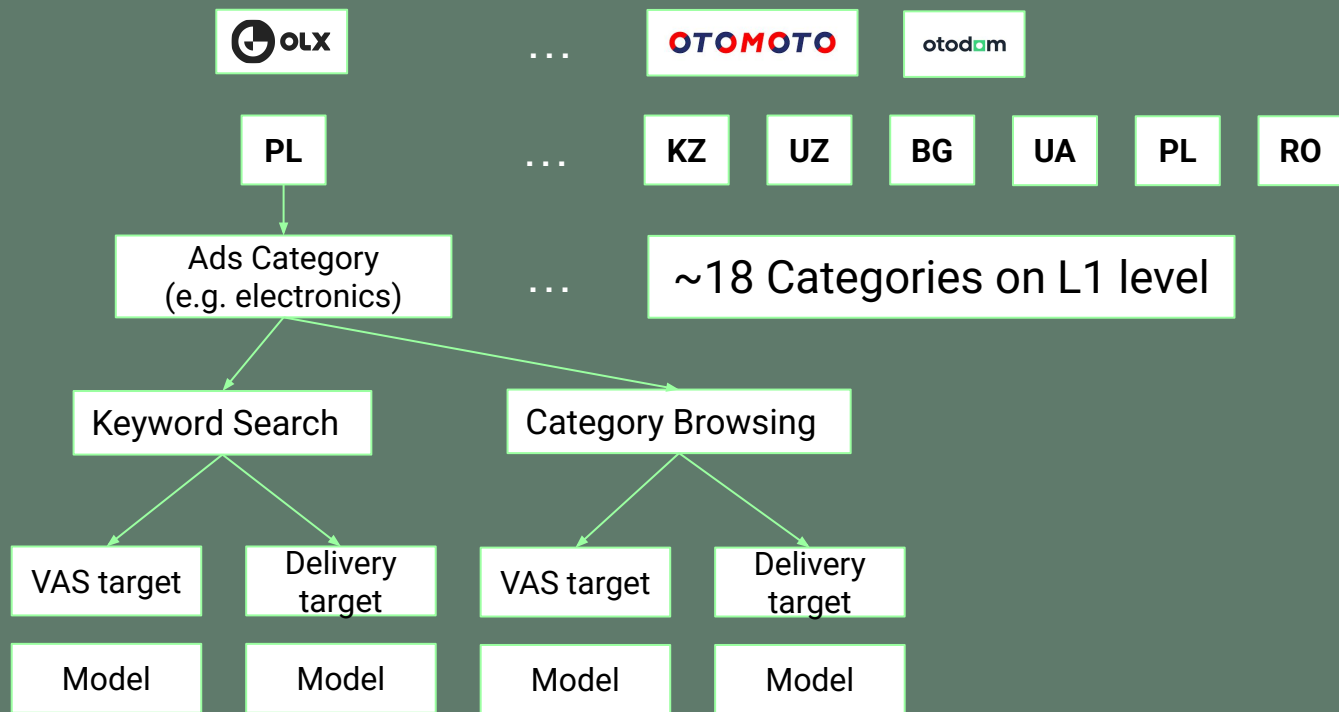
# Multiple models





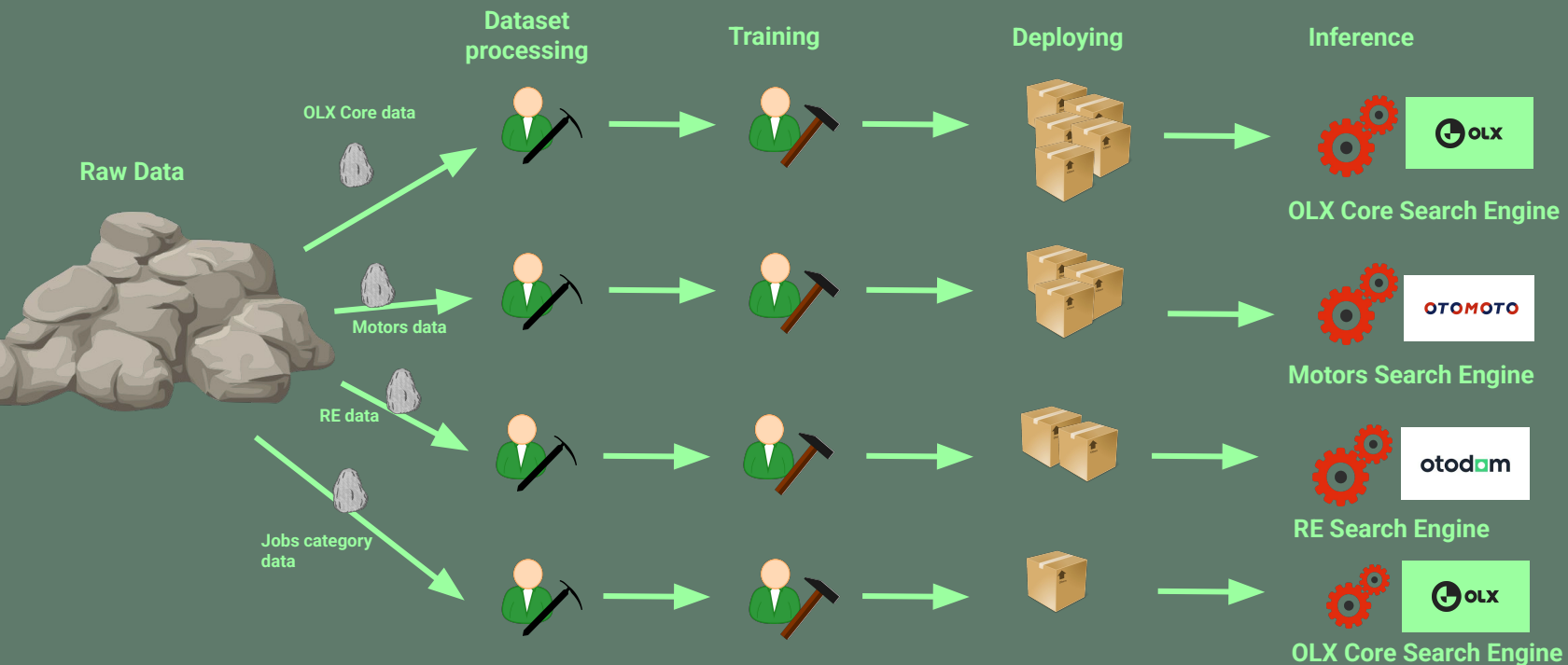
## #2 challenge

# Multiple models



## #3 challenge

# The pipelines hell



# Ctrl+C, Ctrl+V





# LTR Framework **motivation**

- stop **duplicating efforts** for rankings



- stop growing **technical debt** 

- add **synergy** to the LTR projects 

- enable **rapid experimentation** 

- **reduce costs** across teams 

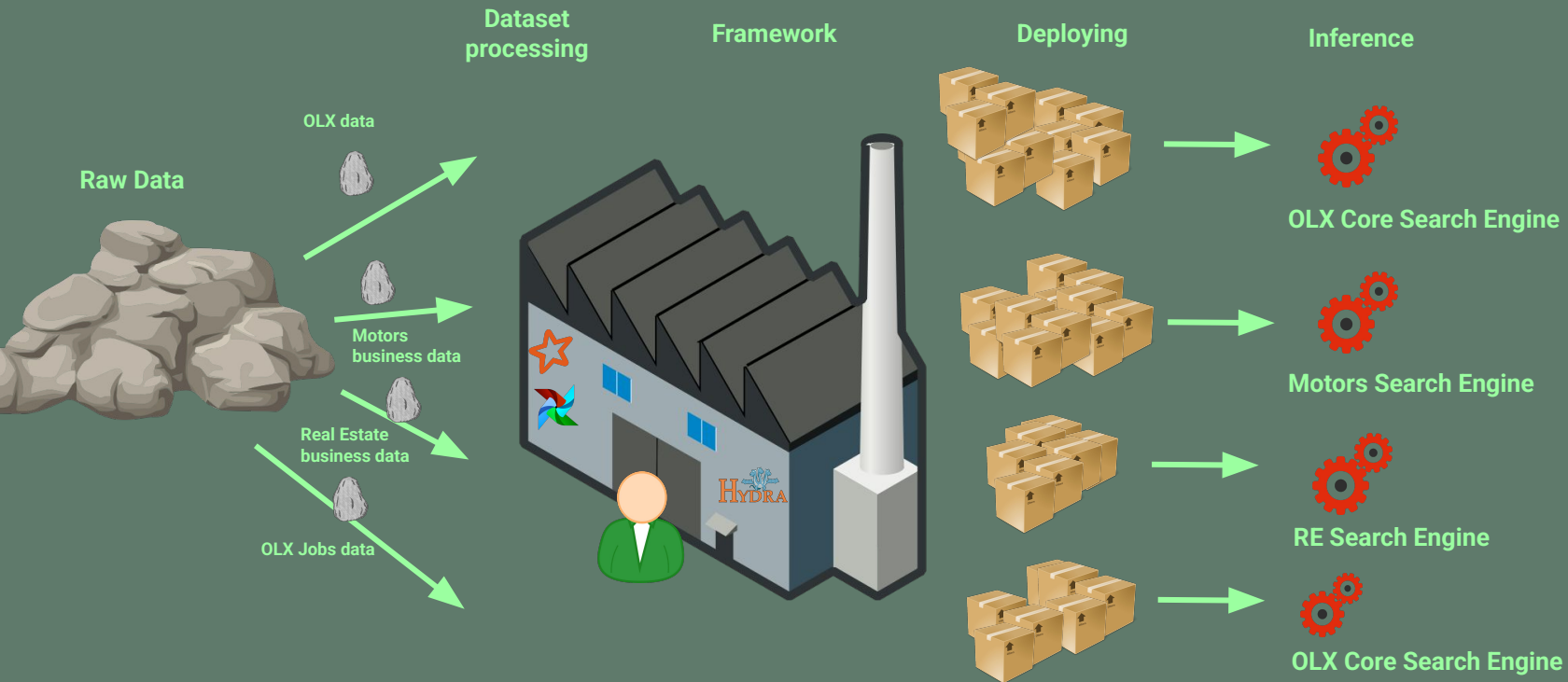


03

# LTR Framework



# LTR Framework



# Configuration Setup



**3** units   

**1+** model

**3+** countries

**1+** target

**3** environments

## GOAL

**Increase Flexibility**

**Enhance Experimentation**

**Better Organization**

# LTR framework **speeding up the development**



Adding **new features**  
to dataset

**75%**  
**faster**

Adding new features  
(ENTIRE PROCESS)

**25%**  
**faster**

**Model Training**

UP TO  
**75%**  
**faster**

**OLD WAY** VS **LTR FRAMEWORK**

**Percentual impact** on **time needed** to conclude each step



# LTR framework

## Motivation

## Overview

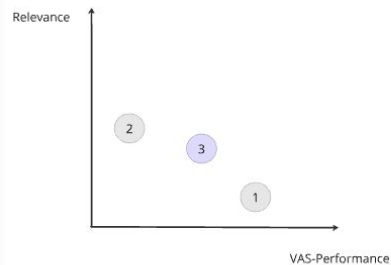


MOTIVATION 🚀	Status
Stop <b>duplicating efforts</b>	✓
Stop growing <b>technical debt</b>	✓
Add <b>synergy</b> to the LTR projects	✓
Enable <b>rapid experimentation</b>	✓
<b>Reduce costs</b> across teams	✓

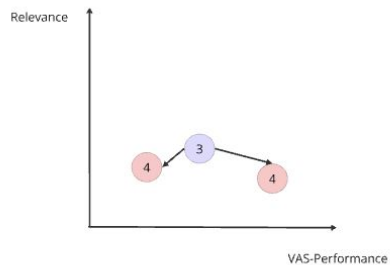




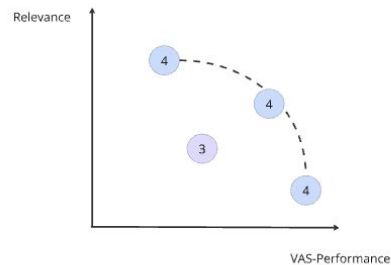
# Directions for improvement



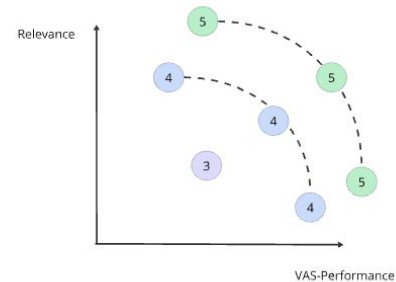
- 1 Pure freshness sorting
- 2 Pure relevance with LTR
- 3 VAS LTR



- 3 Non-binary VAS LTR
- 4 Changes directly in VAS-LTR



- 3 VAS LTR
- 4 VAS-Relevance Next Gen



- 3 VAS LTR
- 4 VAS-Relevance Next Gen
- 5 Personalization, Hybrid Search or other improvements on top of VAS-Relevance Next Gen



# Business Use Cases


1. Ranking personalisation
2. Package / group kickers

# Personalisation


## Improving relevance for our customers



# Classic problem, looking for “golf”



[Czat](#) [♡](#) [🔔](#) [👤](#) [Twoje konto](#) [Dodaj ogłoszenie](#)



**WYRÓŻNIONE**


Volkswagen Golf •Gwarancja w Cenie• 1.4 125 km • 94 tys. kilom. •  
Auto z Niemiec •

48 000 zł

Lipno - 13 czerwca 2025

🔒 2014 - 94 000 km

[♡](#)



**WYRÓŻNIONE**


Golf 6 Black Shadow 1.4 Turbo 160 KM !! Kompresor !! Z Niemiec

15 900 zł

Świeradów-Zdrój - Odświeżono dnia 15 czerwca 2025

🔒 2009 - 220 000 km

[♡](#)



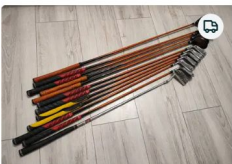
Alufelgi 18 5x112 VW Golf Passat Tiguan Jetta Touran Atreón T-Roc 218#

1 699 zł

Używane

Żory - Odświeżono Dzisiaj o 14:17

[♡](#)



Kije golfowe Wilson Multi Metal S Flex Iron Driver Putter kij do golfa

500 zł

🛡️ 523.50 zł z Pakietem Ochronnym

Bielawa - Dzisiaj o 10:38

[♡](#)

# Some example where it will be useful

## “Golf”

Here, we can disambiguate the meaning or the “intent” of the search

## “Bike”

For a bike, a close location to the seller is crucial. Personalization would help bring closer results up the list

## “Halloween costume”

If the user visited male cloth of size M in the past, that query will be able to bring matching costumes up

## “Brake disc”

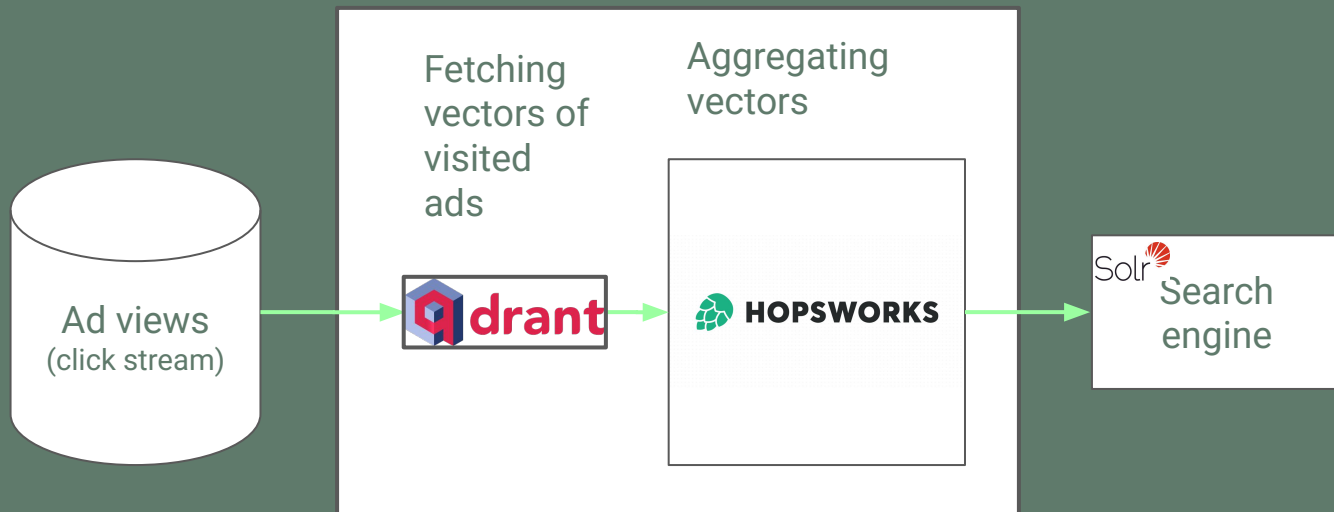
Personalisation will help us display brake disc ads of the right type according to ads previously seen.



# Why only vectors ?

- Feature engineering on history showed encouraging results, vectors will do better
- Using PII data would increase costs, time and complexity of building such pipeline while the performance gains would be uncertain
- Using real-time history base profiling allows for very quick response of our re-ranking algorithms

# Architecture overview





# Previous experiments related to the solution

## **Personalisation with basic features**

- +4,33% of successful events
- No impact on paid traffic performance

## **Vector search experiment**

- +4.99% ad views from search



# Package/group Kickers

**Fine grain  
control over  
monetization  
strategy**

# New challenges



Hey Ranking Team,  
The rules have changed



# New challenges



Hey Ranking Team,  
The rules have changed

There are more things  
to optimize for



# New challenges




ASAP

Hey Ranking Team,  
The rules have changed

There are more things  
to optimize for

# The problem





**Mitsubishi Lancer 1.8 Inform**  
1798 cm<sup>3</sup> - 140 KM - Mitsubishi Lancer sportback 2010

[Wyróżnione](#) [Zweryfikowane dane](#)


/! 238 000 km [Benzyna](#) [Manualna](#) [2010](#)

Zabrzeżowice (Śląskie)  
Podbite 7 minut temu

[Prywatny sprzedawca](#)

14 700 PLN

[Sprawdź możliwości finansowania](#)



**Skoda Superb**  
1798 cm<sup>3</sup> - 165 KM - Sprzedam Skodę Superb

[Wyróżnione](#) [Zweryfikowane dane](#)


/! 180 000 km [Benzyna](#) [Manualna](#) [2015](#)

Zabeków (Śląskie)  
Podbite 8 minut temu

[Prywatny sprzedawca](#)

39 900 PLN

[W granicach średniej](#)  
[Sprawdź możliwości finansowania](#)



**BMW Seria 2 M235i sport**  
2879 cm<sup>3</sup> - 326 KM - M235i Sport

[Wyróżnione](#)


/! 93 900 km [Benzyna](#) [Automatyczna](#) [2016](#)

Warszawa (Mazowieckie)  
Podbite 8 minut temu

[Prywatny sprzedawca](#)

89 700 PLN

[Sprawdź możliwości finansowania](#)



**Opel Astra 1.3 CDTI DPF Active**  
1248 cm<sup>3</sup> - 90 KM - stan idealny

[Wyróżnione](#)


/! 350 000 km [Diesel](#) [Manualna](#) [2011](#)

Zary (Lubuskie)  
Podbite 9 minut temu

[Prywatny sprzedawca](#)

15 375 PLN

[W granicach średniej](#)  
[Sprawdź możliwości finansowania](#)



**Subaru WRX**  
2407 cm<sup>3</sup> - 310 KM - Subaru WRX STI

[Wyróżnione](#)


/! 32 000 km [Benzyna](#) [Manualna](#) [2021](#)

Mogilany (Mazowieckie)  
Podbite 9 minut temu

[Prywatny sprzedawca](#)

145 000 PLN

[Sprawdź możliwości finansowania](#)



**Lexus RX 200t / 300 Prestige**  
1988 cm<sup>3</sup> - 238 KM - Lexus 200t 300 Prestige Gwarancja, Oferta Dealera

[Wyróżnione](#)

/! 133 979 km [Benzyna](#) [Automatyczna](#) [2016](#)

Chłęgów (Dolnośląskie)  
Podbite 9 minut temu

[Sprawdź możliwości finansowania](#)

[Toyota Długosielca](#) [Toyota Długosielca](#) [Toyota Długosielca](#)

119 900 PLN

[W granicach średniej](#)  
[Sprawdź możliwości finansowania](#)

Group 1

Group 2

Group 3

# The problem

**Group 1**

- Mitsubishi Lancer 1.8 Inform**  
1798 cm<sup>3</sup> - 140 KM - Mitsubishi Lancer sportback 2010  
14 700 PLN  
Wyżnione Zweryfikowane dane  
/! 238 000 km Benzyna Manualna 2010  
Zabrzeżowice (Śląskie)  
Podbite 7 minut temu  
Prywatny sprzedawca
- Skoda Superb**  
1798 cm<sup>3</sup> - 160 KM - Sprzedam Skodę Superb  
39 900 PLN  
Wyżnione Zweryfikowane dane  
/! 180 000 km Benzyna Manualna 2015  
Zabrzeżowice (Śląskie)  
Podbite 8 minut temu  
Prywatny sprzedawca
- BMW Seria 2 M235i sport**  
2479 cm<sup>3</sup> - 320 KM - M235i Sport  
89 700 PLN  
Wyżnione  
/! 93 900 km Benzyna Automatykczna 2016  
Warszawa (Mazowieckie)  
Podbite 8 minut temu  
Prywatny sprzedawca

**Group 2**

- Opel Astra 1.3 CDTI DPF Active**  
1248 cm<sup>3</sup> - 90 KM - stan idealny  
15 375 PLN  
Wyżnione  
/! 350 000 km Diesel Manualna 2011  
Zary (Lubuskie)  
Podbite 9 minut temu  
Prywatny sprzedawca

**Group 3**

- Subaru WRX**  
2407 cm<sup>3</sup> - 310 KM - Subaru WRX STI  
145 000 PLN  
Wyżnione  
/! 32 000 km Benzyna Manualna 2021  
Mogilany (Mazowieckie)  
Podbite 9 minut temu  
Prywatny sprzedawca
- Lexus RX 200t / 300 Prestige**  
1988 cm<sup>3</sup> - 238 KM - Lexus 2007-2008 Prestige Gwarancja, Oferta Dealera  
119 900 PLN  
Wyżnione  
/! 133 979 km Benzyna Automatykczna 2016  
Długosłupa (Dolnośląskie)  
Podbite 9 minut temu  
TOYOTA DŁUGOSŁUBA Subaru długosłuba

Help us distribute Ad Leads in the following way

**Leads**

~0.1x Group 1

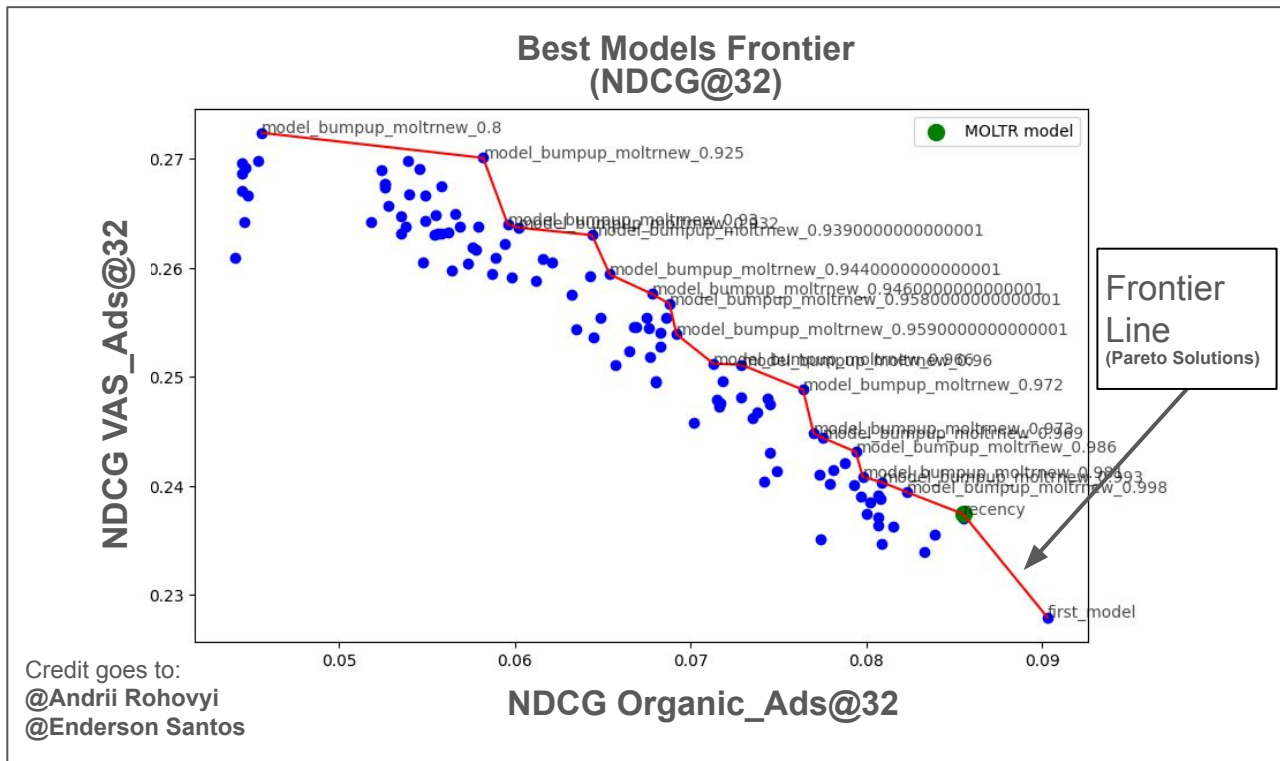
~0.5x Group 2

~0.4x Group 3



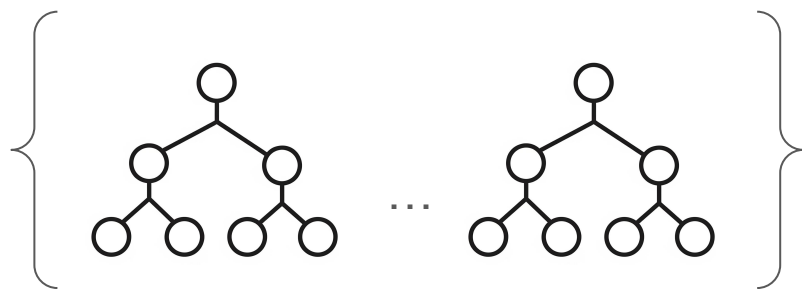


# Multi-objective optimization

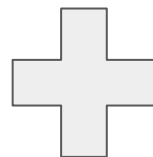




# Apply Group/Package kickers



Multi-additive Tree Model  
(our existing MOO model)



w1 x Group 1  
w2 x Group 2  
w3 x Group 3



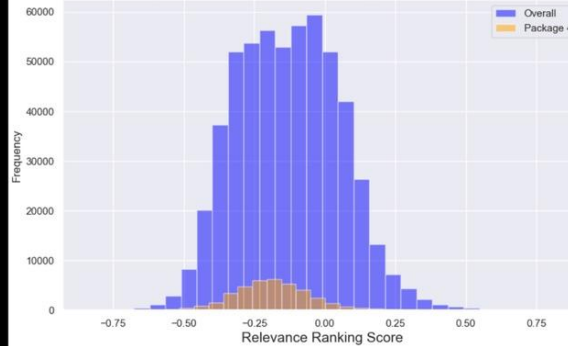
# Package Kickers



Histogram of Relevance Ranking Scores - Without Kickers



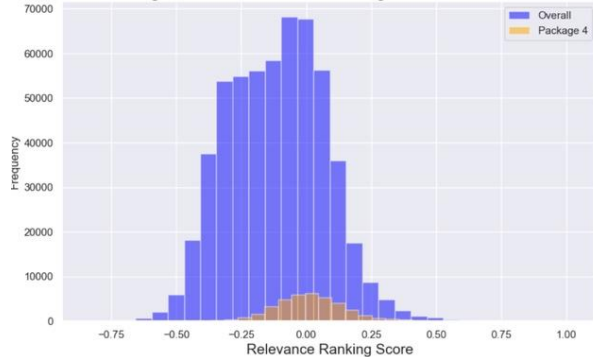
Histogram of Relevance Ranking Scores - Kicker 0.1



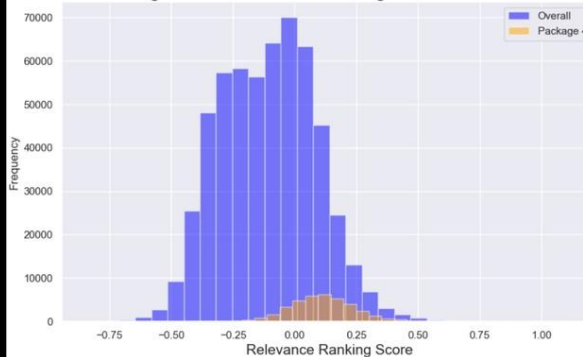
Histogram of Relevance Ranking Scores - Kicker 0.2



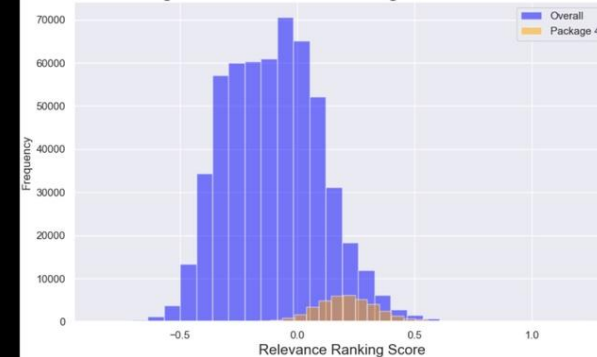
Histogram of Relevance Ranking Scores - Kicker 0.3



Histogram of Relevance Ranking Scores - Kicker 0.4



Histogram of Relevance Ranking Scores - Kicker 0.5



Credits to @Anderson Santos

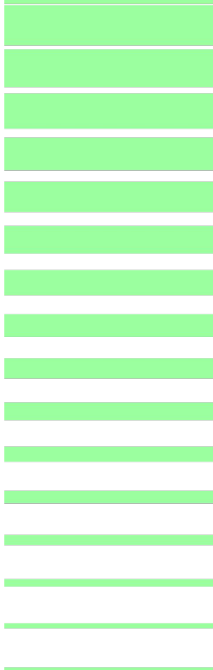
# LTR Framework for Package kickers

- Help train multiple ranking models 100
- Use past configurations and add only new kickers 🔄
- Rely on existing models that fulfilled Multi-objective criteria 💰
- Run 4 A/B experiments to evaluate different kickers values 

A	B
C	D
- Help business decision regarding paid traffic 📦



## Go to market



# Special thanks

**Enderson Santos** is the initiator of the talk and leads the Kicker project. Here's his blog post about LTR at OLX:



# Hiring (also in )

We are looking for a **Lead Data Scientist** position on all ranking topics



# Q&A

Any questions?





**OLX**