

# ***Virtual Bartender: A Dialog System Combining Data-Driven and Knowledge-Based Recommendation***

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# Which Wine would you choose?



£20.50

QTA DA PACHECA  
COLHEITA WHITE

Young and very aromatic  
this Pacheca have 30% of  
Moscatto.

REGION DOURO



£20.50

QTA DA PACHECA  
COLHEITA RED

An intense red color and a  
nose rich in floral notes,  
black fruit and delicate  
hints of spice followed by a  
hint of chocolate.

REGION DOURO



£22.50

ESTEVA  
RED

Dominated by notes of ripe  
red fruit accented with  
hints of violet and rose.

REGION DOURO



£27.50

CALLABRIGA  
RED

Deep red in colour with  
lively aromas of fresh with  
some notes floral, spicy  
and balsamic notes.

REGION DOURO



£30.50

DUAS QUINTAS  
WHITE

Sweet bouquet of yellow  
roses, peaches and  
apricots.

REGION DOURO



£27.50

PAPA FIGOS  
RED

Deep ruby colour, very  
intense aroma and soft  
red fruits notes of cocoa  
and resin, wood  
characteristics.

REGION DOURO



£27.50

CABECA DE  
BURRO RED

Classic Douro wine

REGION DOURO



£28.00

VALE RAPOSA  
RESERVA RED

Smooth, soft tannins and  
a fruity finish. If you  
know the Douro this wine  
will make you start have  
an opinion.

REGION DOURO

# Which Whiskey do you like?



# Product Recommendations



# Collaborative Filtering

## Customers also bought

Neu



Talisker Skye Single Malt Scotch Whisky 70cl mit Etui und 2 Rocking Gläsern

CHF 58.00



The Ultimate Mortlach 2008 Single Malt Scotch Whisky 70cl

CHF 68.00



Talisker Port Ruighe Single Malt Scotch Whisky 70cl mit Etui

CHF 65.00



Kopfgetriebeöl 10T30 Nuss-Karamell Likör 50cl

CHF 24.90

"Why?"

# Problems

Cold Start

Explanations



# Chat with an Expert



# Chat with a Bot – A Virtual Bartender




Hi, I'm your barkeeper. I'd like to recommend you some whiskies. Are you familiar with whiskies?

nope unfortunately not!

Okay, pal - that's not a problem. I love to introduce guests to the world of whisky. I'd recommend an starter whisky, that is normaly a sweeter one. Is it okay or do you want to proceed with attribute selection?


starter-whisky

Okay pal, you'd probably start with a sweeter whisky like Glenmorangie. However you'll find some more sweet ones below.



**Glenglassaugh**  
This whisky comes from the northern Scottish provinces, where it was distilled a...

select Glenglassaugh



**Talisker**  
This noble drop w...

Let me know which one you'd like to choose by clicking on the appropriate card

select Glenglassaugh

Excellent choice, Let me know how you liked it.

it was not that good

Thank you for your feedback. I will remember your preferences!



# Why Chatbot Recommender

- Emotional
- Trust
- Explanation
- «Small Talk»

# Content-Based Recommendation

- Mapping attributes of a product with preferences of a user
- Example:
  - ◆ Michaela rated the “Lagavulin 16y” whisky high
  - ◆ “Lagavulin 16y” has attributes taste “smokey” and region “Islay” as also “Ardbeg 12y”
  - ◆ “Ardbeg 12y” can be recommended to Michaela

Problems

- Cold Start
- Attributes

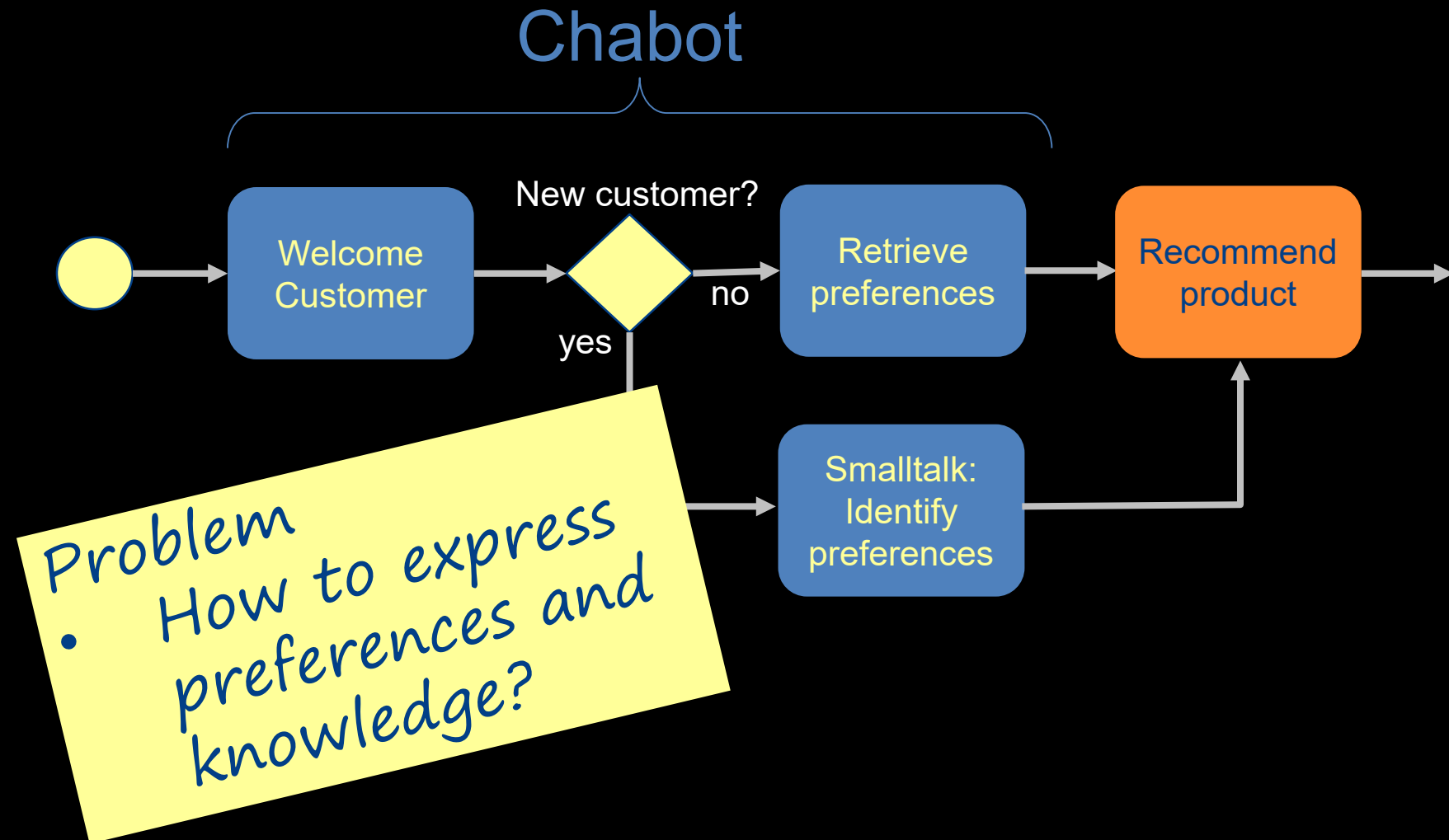
# Knowledge-based Recommendation

- Deep knowledge about the underlying domain
- Match attributes of products with customers' preferences

Problem

- How to express preferences?

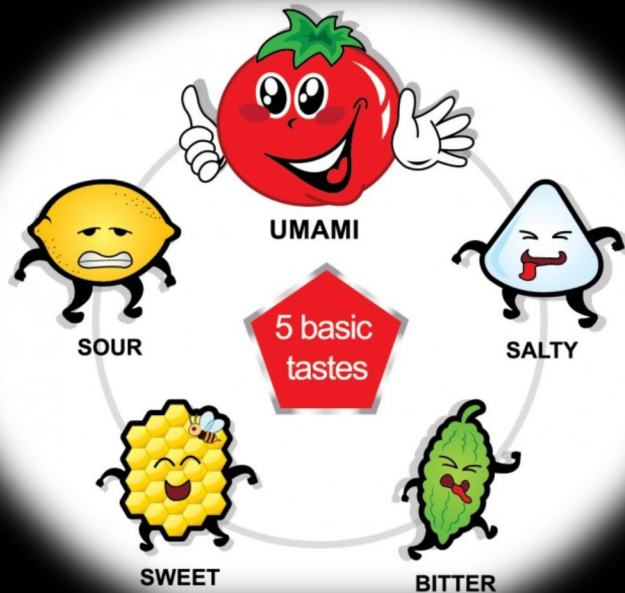
# Knowledge/Content-Based Recommendation Process



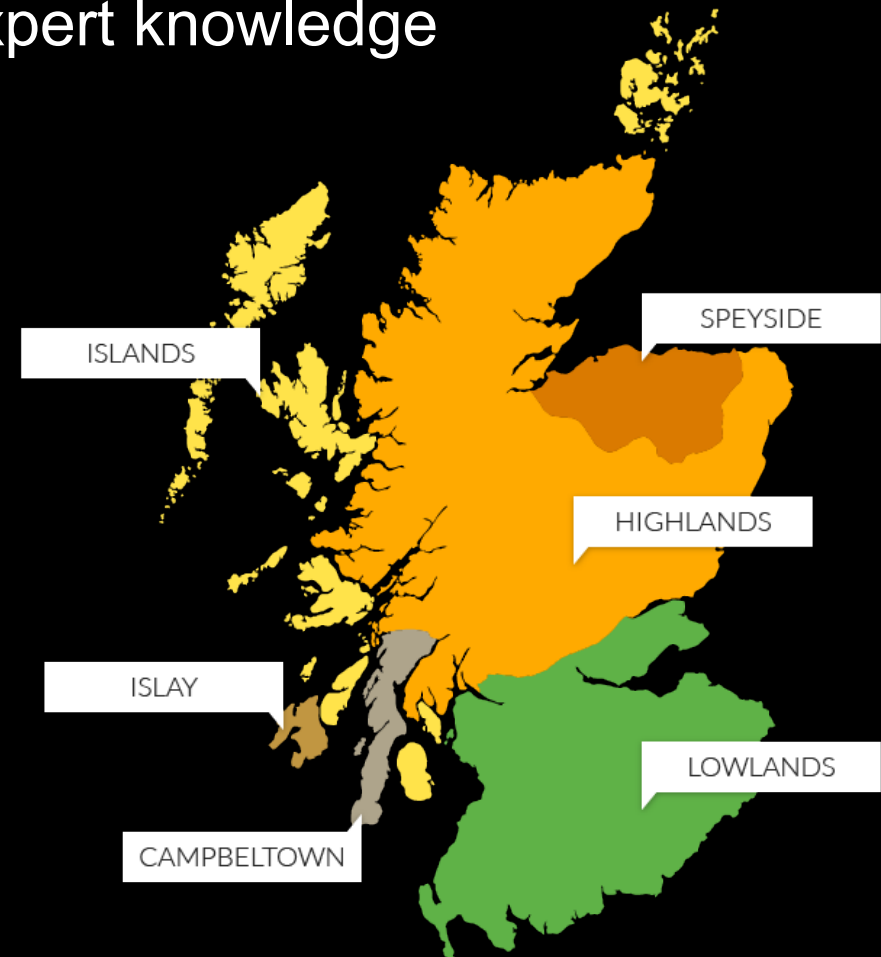


# Problem: How to express Preferences and Knowledge?

Taste



Expert knowledge



# Describing Taste - Profiles

## Flavour Profiles

Young & Spritely

Sweet, Fruity & Mellow

Spicy & Dry

Deep, Rich & Dried  
Fruits

Old & Dignified

Light & Delicate

Juicy, Oak & Vanilla

Oily & Coastal

Lightly Peated

Heavily Peated

Peated

Spicy & Sweet

### Deep, Rich & Dried Fruits

Deep, Rich & Dried Fruits offers a wonderful selection of aromas and flavours. Our Tasting Notes describe fruity whisky profiles on the nose such as marmalade, balsamic glazed fruits and demerara. If you discover flavours of rum, truffles, treacle toffee and salted caramel, you're probably not far off for this profile.

### Oily & Coastal

Our Oily & Coastal flavour profile certainly contains coastal whiskies, but it isn't limited to them. That's because the Society challenges traditional whisky convention to focus on flavour as the main guide. The flavours in this category remind us of coastal settings and the foods and experiences available there, with oysters, barbecued prawns and beach bonfires.

(Source: Website of the Scotch Malt Whisky Society [www.smws.com](http://www.smws.com))

# Describing Taste – Individual Whiskies

The palate is bathed in a **sunshine glow of tropical fruits (banana, custard apple, monstera)** – intensely sweet, mouth-watering and lip-smacking, but with Victory V's and **salt and pepper crisps** reminding us it has slept long in oak.

The air was filled with **cinder toffee, raisins, dates, Brazil nuts, balsamic vinegar** and a rich Malmsey Madeira wine. On the palate we nibbled **sweet, salty and spicy roasted party nuts** whilst we chatted, sharing a laugh and a drink with friends.

We were foraging for **berries in bushes**, drank a **cranberry orange prosecco cocktail** and distilled **sandalwood oil**. On the palate neat it was just like a Caribbean black cake, a boozy **rum-soaked fruit cake** with a good dose of molasses, brown sugar and browning (burnt sugar) sauce. With **water polished mahogany**, sweet myrrh incense and salty liquorice were followed by zesty Indian lime pickle and extra dark honey vanilla cornbread.

(copied from whisky descriptions of the Scotch Malt Whisky Society [www.smws.com](http://www.smws.com))

# Data-driven Recommendation

Collaborative Filtering  
- compare tastes



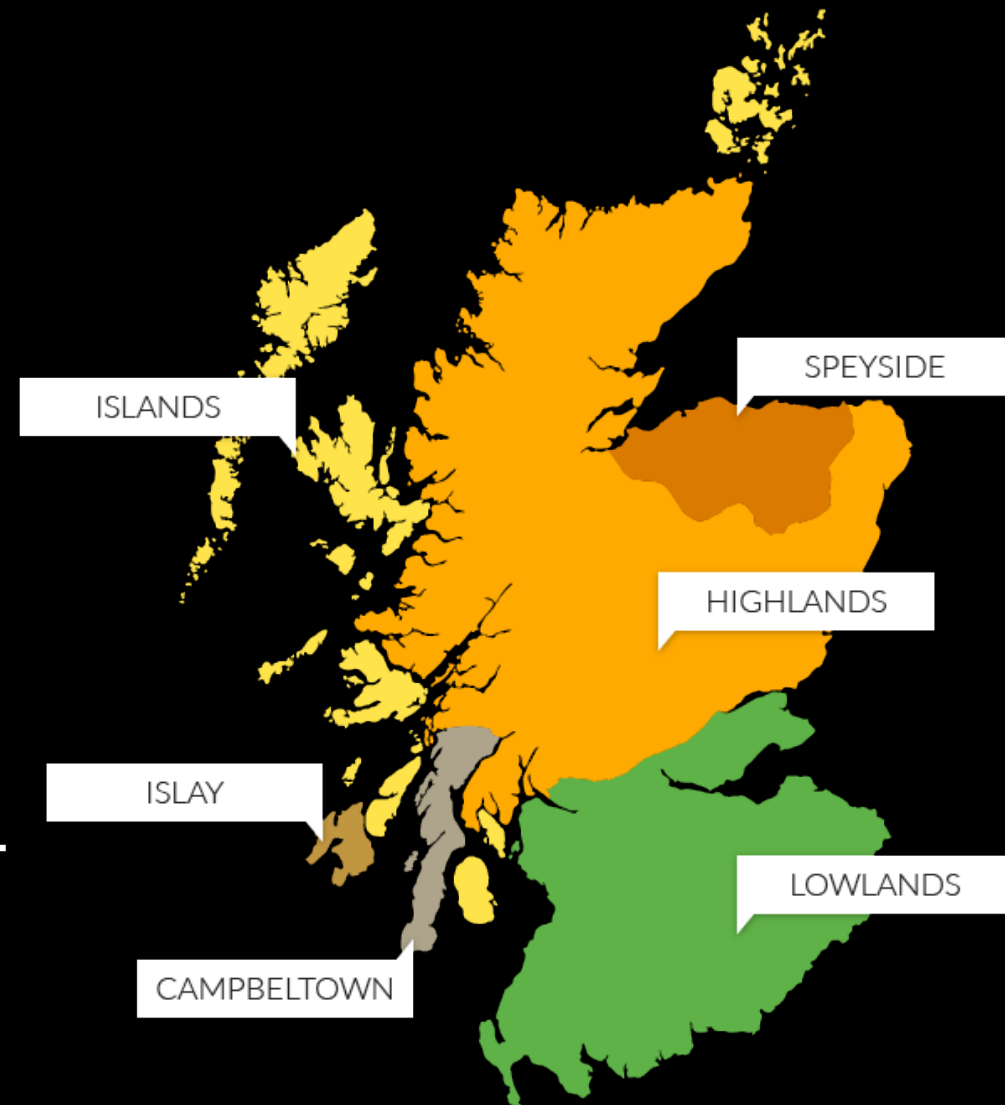
Purchase Data





# Knowledge

- Ontology:
  - ◆ Lagavullin and Ardbeg are from Islay
  - ◆ Whiskies from Islay are typically smokey
- Rules:
  - ◆ Whiskies can be finished in other casks: Sherry, Port, ...
- Fuzzy Rules:
  - ◆ Oak casks give a vanilla flavour



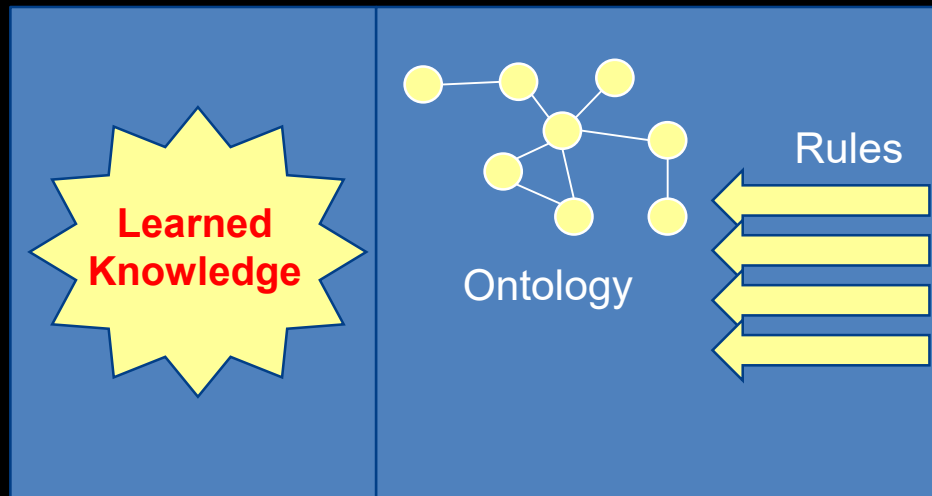
# Combining Data-driven and Knowledge-based Recommendation

Collaborative Filtering  
- compare tastes

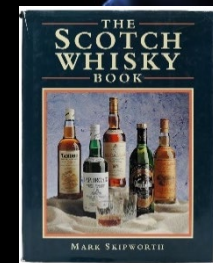
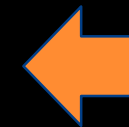
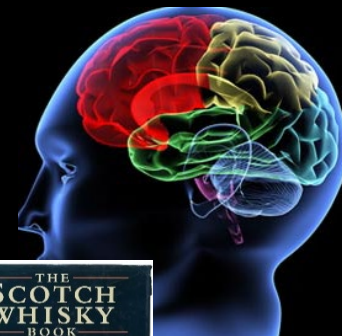


Knowledge Base  
- explanations

Purchase Data



Human



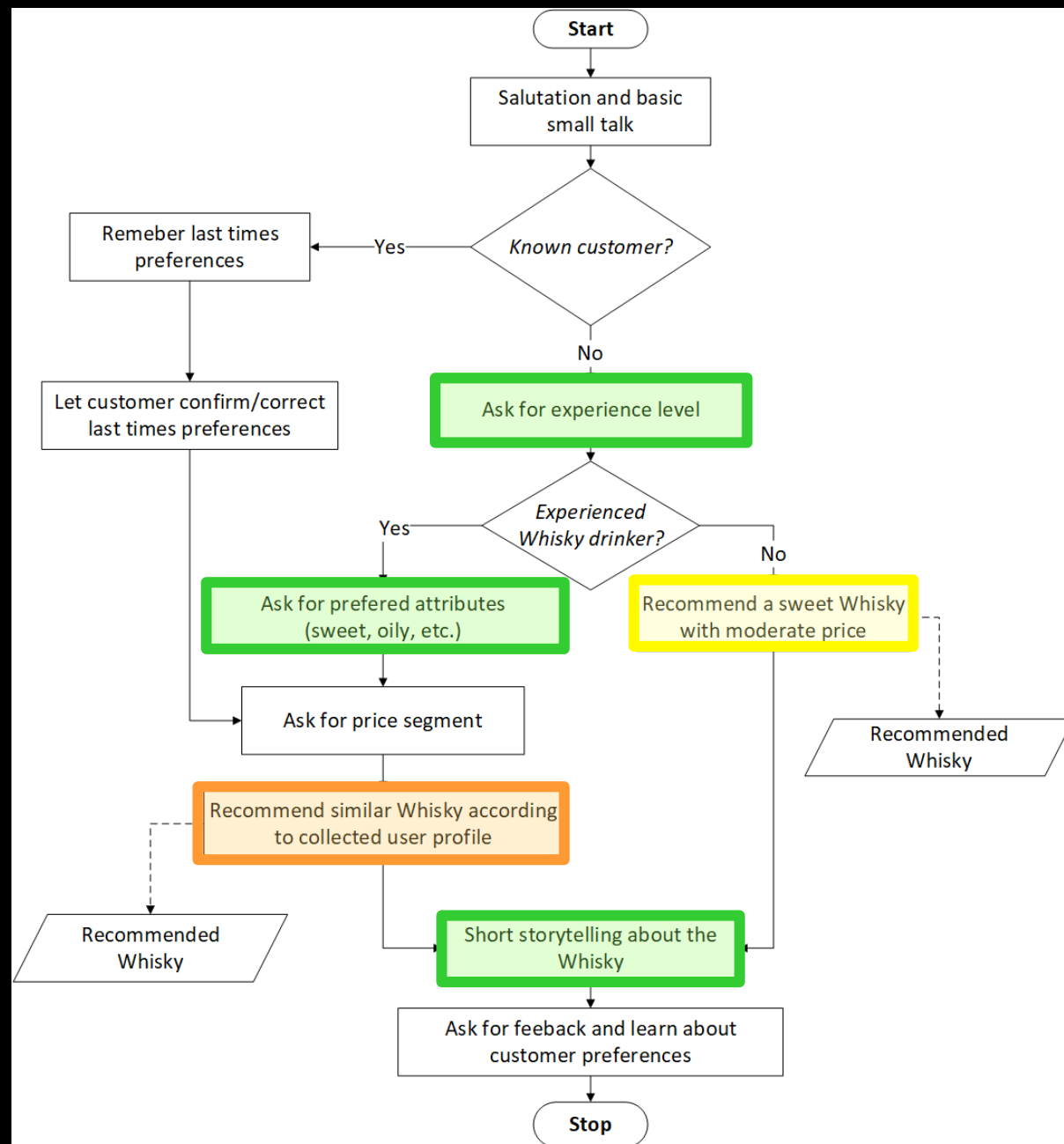
# Some Findings

## ■ Experience

- ◆ Novice: cannot describe preferences
  - Use knowledge, recommend a «good fit»
- ◆ Experienced : Know their preferences and can describe
  - Explain the recommendation

## ■ Conversation

- ◆ Welcome, smalltalk
- ◆ Explanations
- ◆ Teaching



- Knowledge-based
- Colaborative filtering
- Content-based



# First Prototype

Hi, I'm your barkeeper. I'd like to recommend you some whiskies. Are you familiar with whiskies?

1

2

nope unfortunately not!

Okay, pal - that's not a problem. I love to introduce guests to the world of whisky. I'd recommend an starter whisky, that is normally a sweeter one. Is it okay or do you want to proceed with attribute selection?

5

starter-whisky

Okay pal, you'd probably start with a sweeter whisky like Glenmorangie. However you'll find some more sweet ones below.

Glenglassaugh

This whisky comes from the northern Scottish provinces, where it was distilled a...

9

select Glenglassaugh

Talisker

This noble drop w

Let me know which one you'd like to choose by clicking on the appropriate card

select Glenglassaugh

Excellent choice, Let me know how you liked it.

1

it was not that good

Thank you for your feedback. I will remember your preferences!

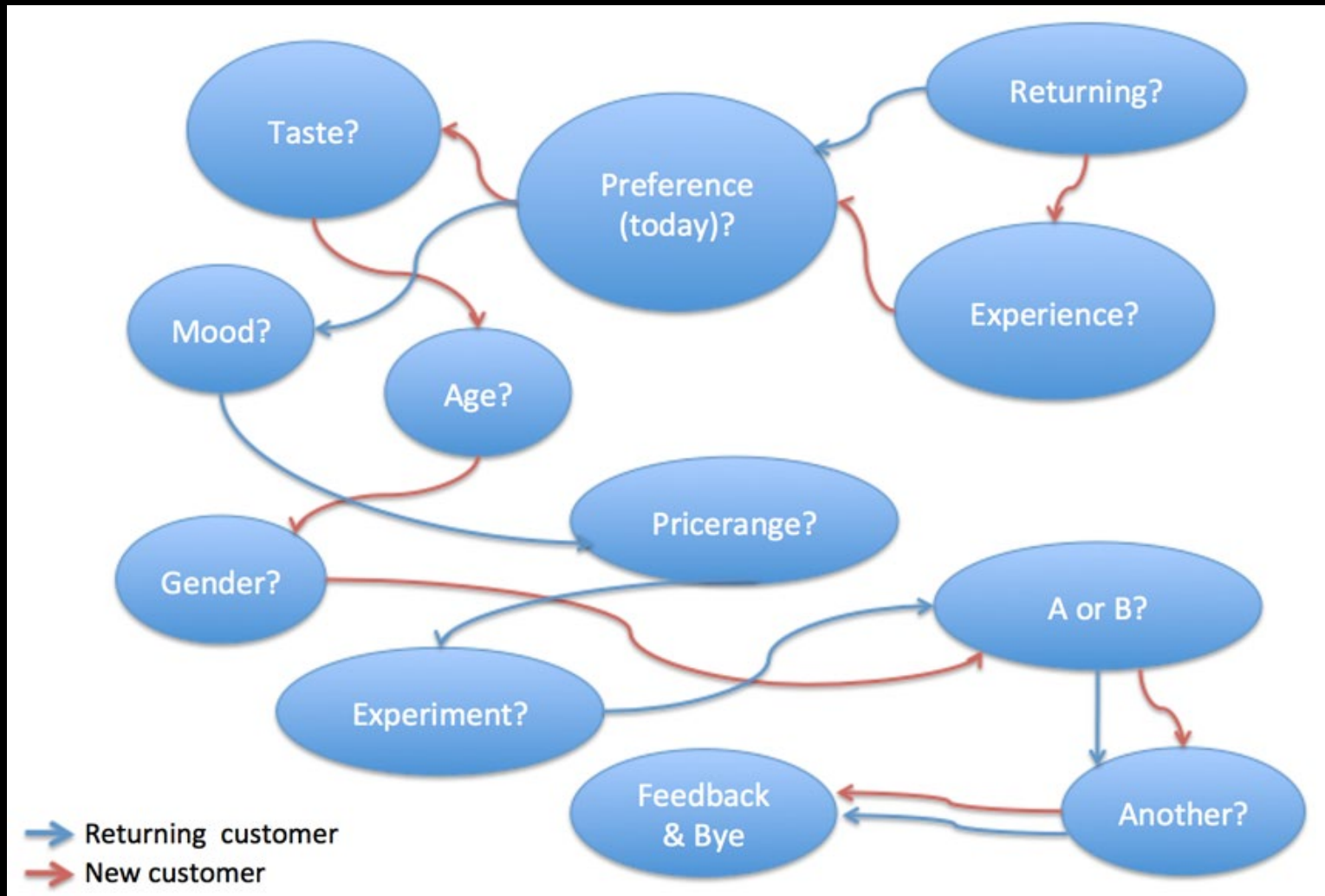
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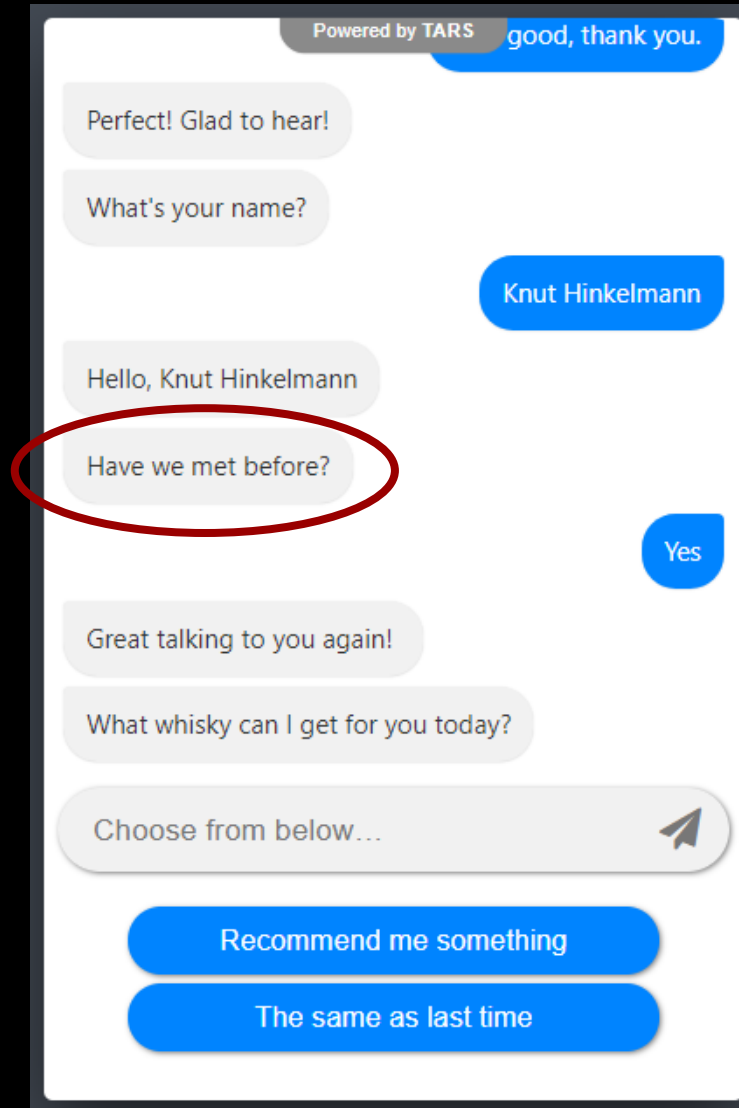
Prof. Dr. Knut Hinkelmann

WhiskAI - The Virtual Bartender, Cognitive Tank, 11th of March 2019

# Communication Flow with New and Returning Customers



# Second Prototype: Chat with a Bot – A Virtual Bartender



# Key Findings

- Combining data-driven and knowledge-based recommendations
  - ◆ Overcome cold-start problem
  - ◆ Vocabulary for preferences
  - ◆ Novice and experienced customers
- Dialog-based recommendations
  - ◆ Explanations