

# Improving Product Question Answering in E-Commerce

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Recuperação de Informação - 2022/23



# Product Question Answering (PQA)



## Looking for specific info?

Q Does this TV have bluetooth connection?

All

### Product Information

## Customer O&A's

### Customer Reviews

**Connect** all your devices - Use the 3 HDMI inputs to **connect** to cable or satellite and video game consoles. The HDMI eARC lets you add audio equipment for enhanced sound.

Hands-free **TV** with Alexa - With built-in microphones, just ask to turn on the **TV**, and find, launch, and control content, so you can put down the remote.

[See 6 matches from product info >](#)

## Customer questions & answers

**Q: Does this TV offer built-in Bluetooth?**

**A:** Yes it does. You can **connect** your **Bluetooth** headset, earbuds. I paired my headphones with my TV, now when I'm watching late at night, I don't bother my family. Hope this helps.

By [johnewltrs](#) on July 12, 2022

**Q: Is this tv Bluetooth?**

**A:** Yes, this television has bluetooth.

By [GeorgeAndy](#) on March 8, 2022

[See 20 matching Q&A >](#)

### Customer Reviews

★★★★☆ remote and tv difficult to connect

By [Lucille D. Salgado](#) on July 26, 2022

Overall to connect the TV to remote and reset failed difficult!

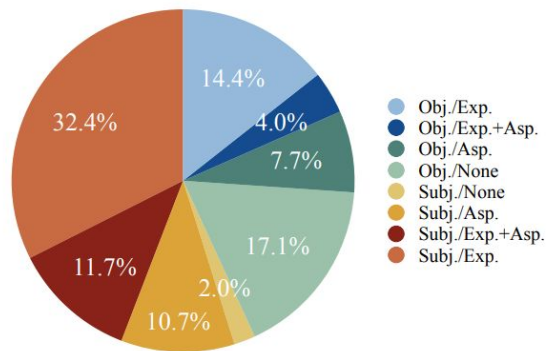
★★★★★ connecting direct tv controller to tv does not show tv on setup screen

By [Raleigh Benjamin](#) on December 29, 2021

it's hard to connect to direct tv no tv name or model # on set up

[See 20 matching customer reviews >](#)

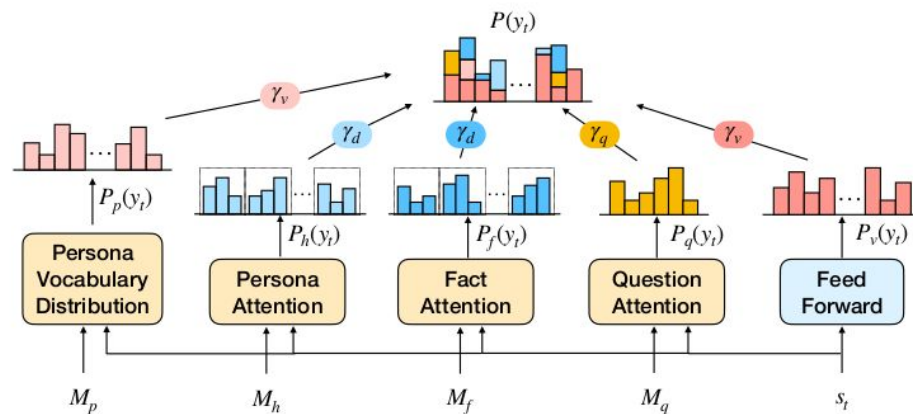
# Personalized Answering GEneration (PAGE)



Subjective questions (56.8%) > Objective questions (43.2%)





80.9% of answers reflect personalized information

Perspectives of user preference: personal experience and product aspects

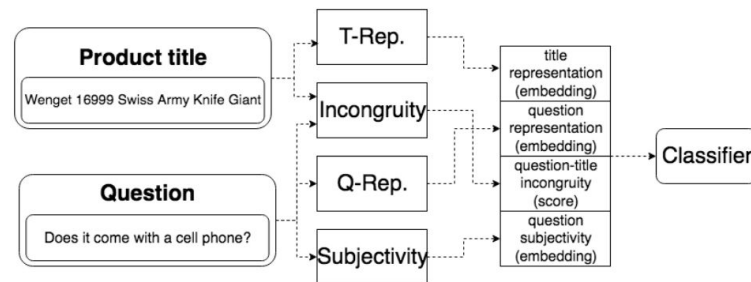


Persona Information Summarizer module

# Humor Detection in PQA Systems

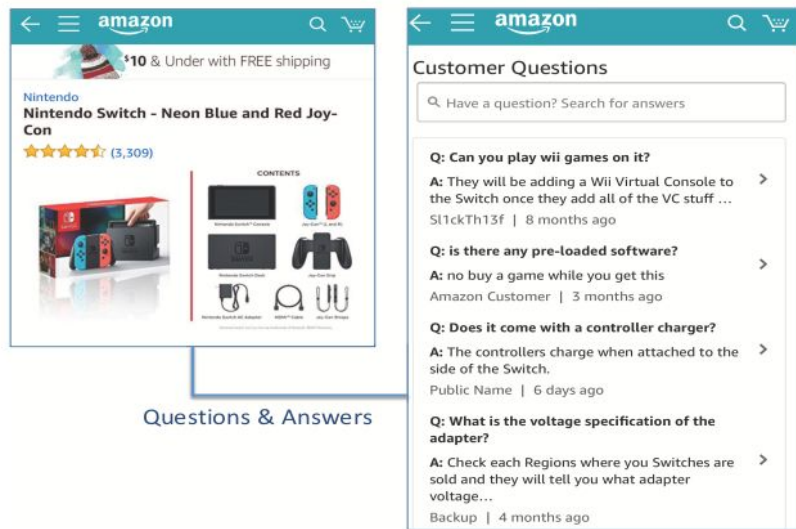
Product	Image	Humorous Questions	Non-Humorous Questions
Nintendo Switch Gray Joy-Con		<ul style="list-style-type: none"> <li>Can i use this to hack into the matrix and save humanity?</li> <li>Can I trade one of my kidneys?</li> <li>What if the princess wants to be with Bowser and Mario keeps kidnapping her?</li> </ul>	<ul style="list-style-type: none"> <li>What do the ports on the side of the console do?</li> <li>How much money will the system cost?</li> <li>How do I know if this is the neon or gray version?</li> </ul>
Echo Show - 1st Generation Black		<ul style="list-style-type: none"> <li>Will this help me find the meaning of life?</li> <li>Can Alexa show me my future?</li> <li>Does it cook breakfast?</li> </ul>	<ul style="list-style-type: none"> <li>Can you see YouTube videos?</li> <li>Can you see your Echo Show camera on the cloud app?</li> <li>Can it connect to music speakers?</li> </ul>
Sovaro Luxury Cooler		<ul style="list-style-type: none"> <li>Will this thing make me fly? It seems due to the price that it has to do something special</li> <li>Which organ should I sell to finance this ice box?</li> <li>Just how insecure do you have to be to buy one?</li> </ul>	<ul style="list-style-type: none"> <li>Will this fit in the trunk of my Lambo?</li> <li>Where do you plug it in?</li> <li>What is the country of origin?</li> </ul>
Hutzler 571 Banana Slicer		<ul style="list-style-type: none"> <li>I set it down in my kitchen, my bananas have stopped talking to me. What now?</li> <li>What if the banana bends the other direction?</li> <li>Is there a model for left-handed people?</li> </ul>	<ul style="list-style-type: none"> <li>Can this be used on cucumbers?</li> <li>Does it only come in yellow?</li> <li>Seriously, though - does this thing really work?</li> </ul>

Products associated with humorous and non-humorous questions

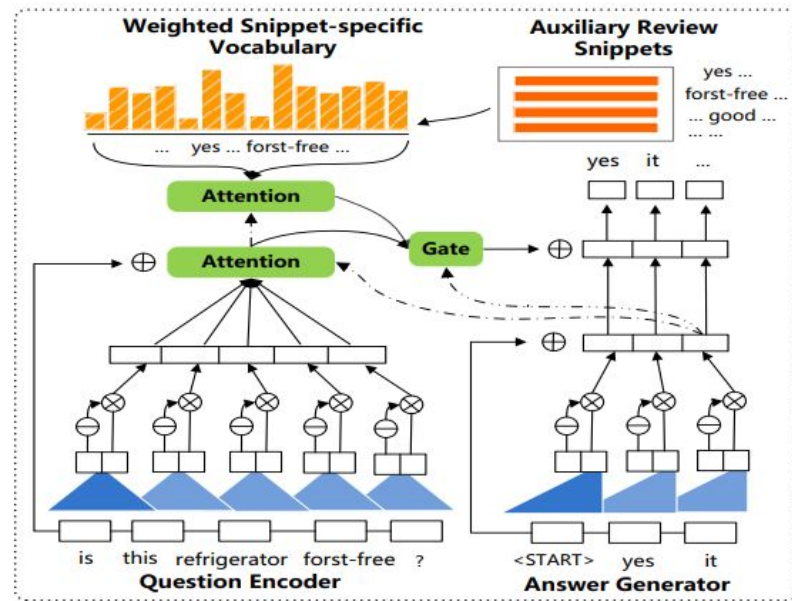


Humor Detection Framework

# Review-driven Answer GEneration (RAGE)



Example of a product-related community questions of Amazon



RAGE method architecture

# Results & Discussion

Model	R-1	R-2	R-L	ES-Ext.	ES-Gre.	ES-Ave.
BM25	13.2	1.8	11.7	35.4	66.6	84.7
S2SAR [23]	13.5	2.3	12.5	35.8	65.6	78.9
RAGE [10]	13.2	2.1	12.0	35.6	65.5	80.2
TFMR [47]	14.8	2.5	13.2	36.1	65.1	85.2
Per-S2SAR [66]	14.0	2.5	13.0	35.6	65.5	82.6
Per-CVAE [54]	13.3	2.0	11.9	35.1	63.4	85.0
PAGen [59]	13.5	2.1	12.0	35.5	64.4	84.6
Per-TFMR	15.1	2.7	13.5	36.3	66.9	85.0
KOBE [9]	15.0	2.5	13.3	36.8	67.4	84.9
<b>PAGE</b>	<b>16.9<sup>†</sup></b>	<b>3.5<sup>†</sup></b>	<b>15.1<sup>†</sup></b>	<b>38.3<sup>†</sup></b>	<b>67.7<sup>†</sup></b>	85.0
- w/o PHI	16.2	3.3	14.5	37.5	67.1	85.1
- w/o PPM	16.3	3.5	14.6	<b>38.6</b>	<b>67.9</b>	<b>85.3</b>
- w/o PIS	15.7	2.8	13.9	37.1	66.6	85.2

**RAGE vs PAGE**

Configuration	Method	unbiased	biased
<i>Baseline Methods</i>	Logistic Regression	82.11	87.21
	Naive Bayes	81.64	87.62
	$LSTM_Q$	83.52	88.59
	$CNN_Q$	83.26	88.69
<i>Partial Configuration</i>	$LSTM_{Q+T}$	83.42	89.74
	$CNN_{Q+T}$	83.63	89.58
	$LSTM\_INC_{Q+T}$	83.58	89.8
	$CNN\_INC_{Q+T}$	83.26	90.34
	$LSTM\_SUB_{Q+T}$	83.81	90.08
	$CNN\_SUB_{Q+T}$	83.71	90.23
<i>Complete Framework</i>	$LSTM\_INC\_SUB_{Q+T}$	<b>84.41*</b>	90.26
	$CNN\_INC\_SUB_{Q+T}$	84.13	<b>90.76*</b>

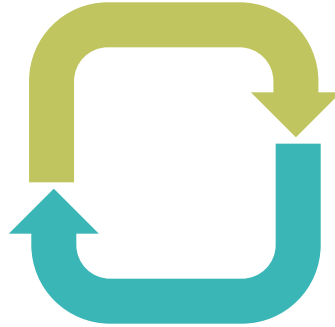
**Humor Detection PQA**

# Conclusion



## USER PROFILING

Understand and serve  
customers better



## DATA COLLECTION

Retrieving information is the  
pillar of PQA systems

# E-Commerce Infographics

## MERCURY

It's the smallest planet in the Solar System



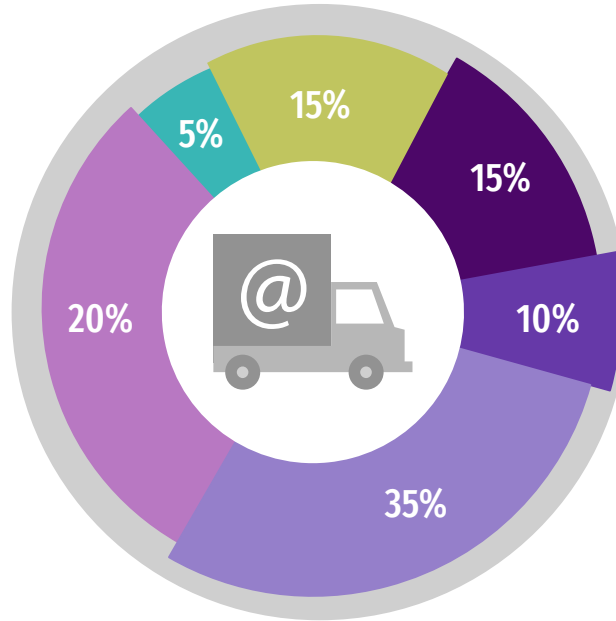
## SATURN

It's composed mostly of hydrogen and helium



## VENUS

Venus has a very poisonous atmosphere



## JUPITER

It's the biggest planet in the Solar System



## MARS

It's a cold place. It's full of iron oxide dust



## NEPTUNE

It's the farthest planet from the Sun





# E-Commerce Infographics

## MERCURY

It's the smallest planet in the Solar System



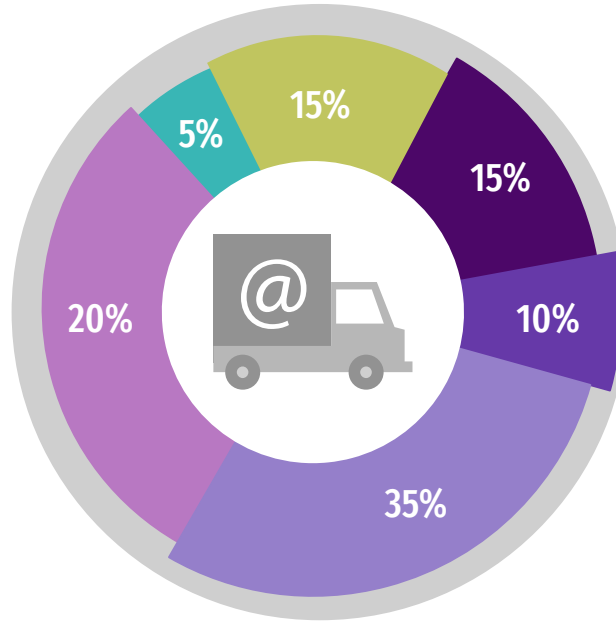
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It's the farthest planet from the Sun



# E-Commerce Infographics

		2018	2019	2020
	<p><b>Mercury</b></p> <p>Mercury is the closest planet to the Sun and also the smallest one</p>	25%	45%	85%
	<p><b>Mars</b></p> <p>Despite being red, Mars is a cold place full of iron oxide dust</p>	10%	25%	30%
	<p><b>Jupiter</b></p> <p>It's a gas giant and the biggest planet in the Solar System</p>	15%	40%	55%

# E-Commerce Infographics

01



Jupiter is a gas giant and the biggest planet in the Solar System

02



Despite being red, Mars is actually a cold place. It's full of iron oxide dust

03



Venus has a beautiful name and is the second planet from the Sun

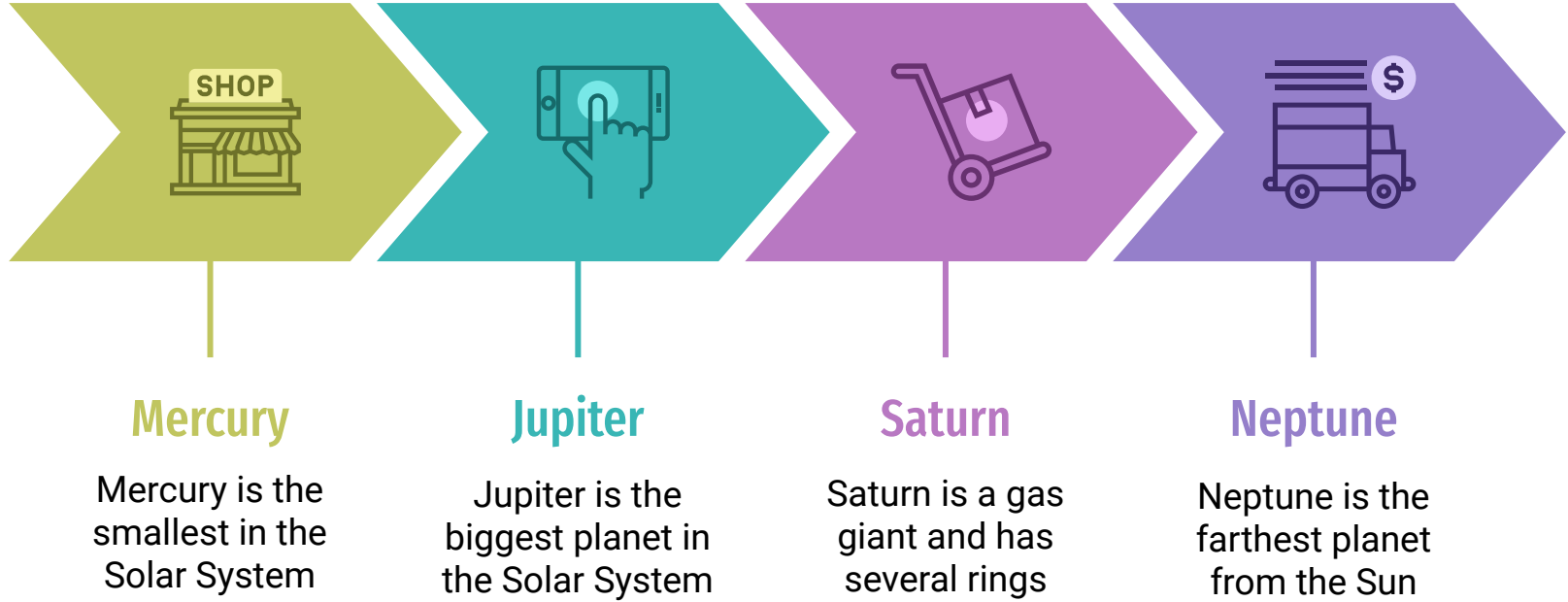
04



Mercury is the closest planet to the Sun and the smallest of them all



# E-Commerce Infographics



# E-Commerce Infographics



20%  
MERCURY

Planet Mercury is the  
closest planet to the Sun

50%  
MARS

Despite being red,  
it's a very cold place

30%  
SATURN

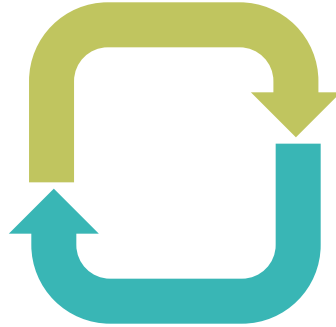
Saturn is a gas giant and  
has several rings

# E-Commerce Infographics



## MERCURY

Mercury is the smallest planet in the Solar System and the closest to the Sun



## MARS

Despite being red, Mars is actually a very cold place full of iron oxide dust

# E-Commerce Infographics

## Earth

Earth is the third planet from the Sun

A

## Neptune

Neptune is the farthest planet from the Sun

B

## Saturn

Saturn is composed of hydrogen and helium

C



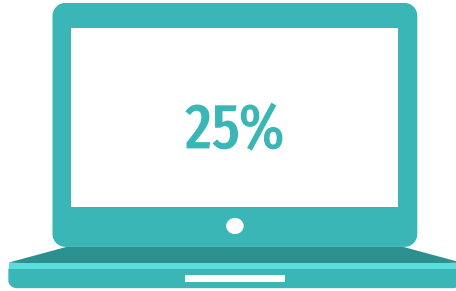
TOP SALE E-COMMERCE ITEMS

# E-Commerce Infographics



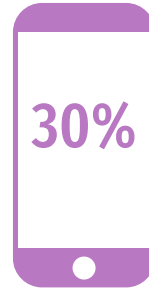
## MERCURY

Planet Mercury is the closest planet to the Sun



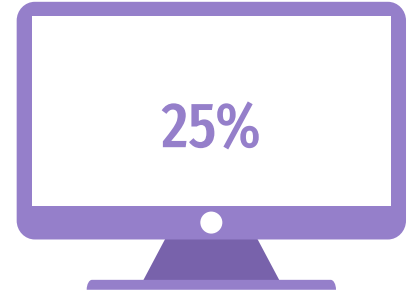
## MARS

Despite being red, Mars is actually a cold place



## SATURN

Planet Saturn is a gas giant and has several rings

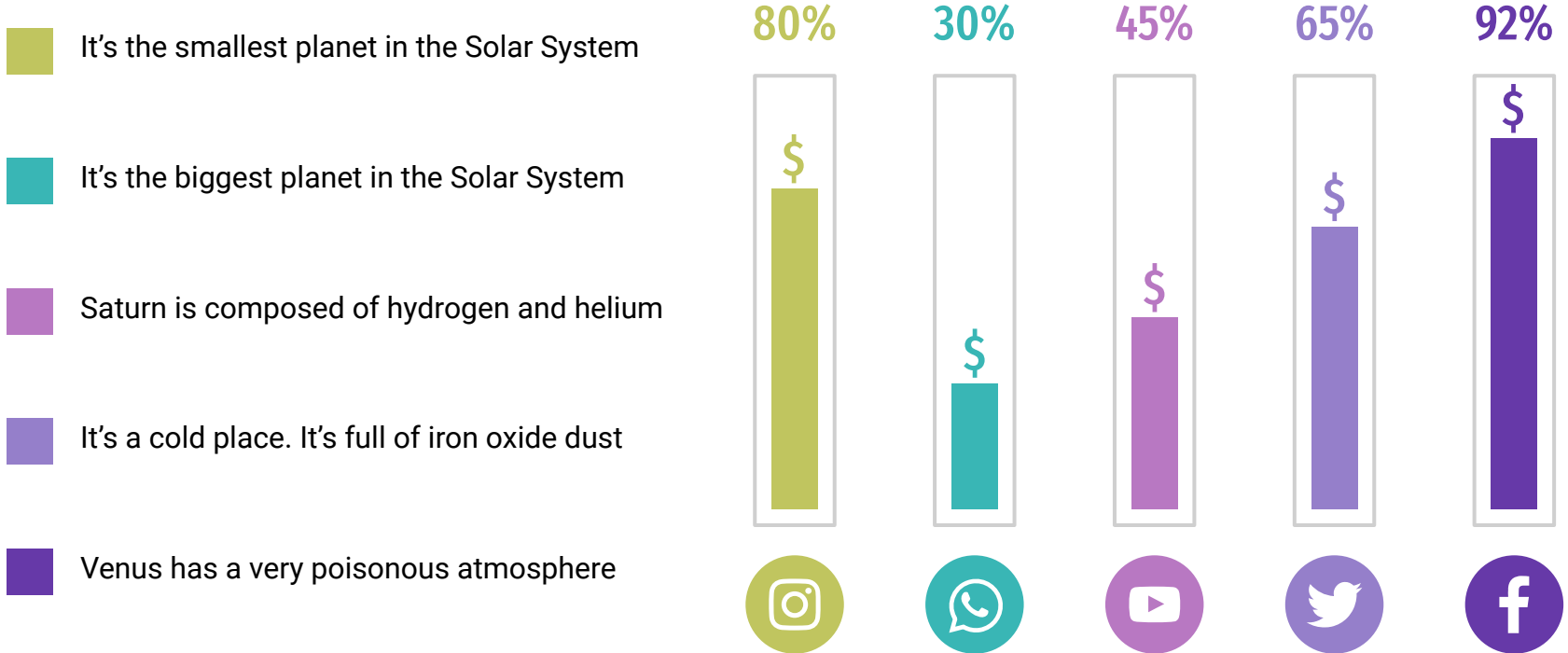


## NEPTUNE

Neptune is the farthest planet from the Sun




# E-Commerce Infographics



# E-Commerce Infographics

**A**



**Mercury**

It's the smallest planet in the Solar System

**B**



**Mars**

It's a cold place.  
It's full of iron oxide dust

**C**



**Neptune**

Neptune is the farthest planet from the Sun

**D**



**Jupiter**

It's the biggest planet in the Solar System

# E-Commerce Infographics

20%

## MERCURY

Mercury is the closest planet to the Sun and smallest one

25%

## MARS

Mars is actually a cold place. This planet is full of iron oxide dust

15%

## VENUS

It has a beautiful name and is the second planet from the Sun

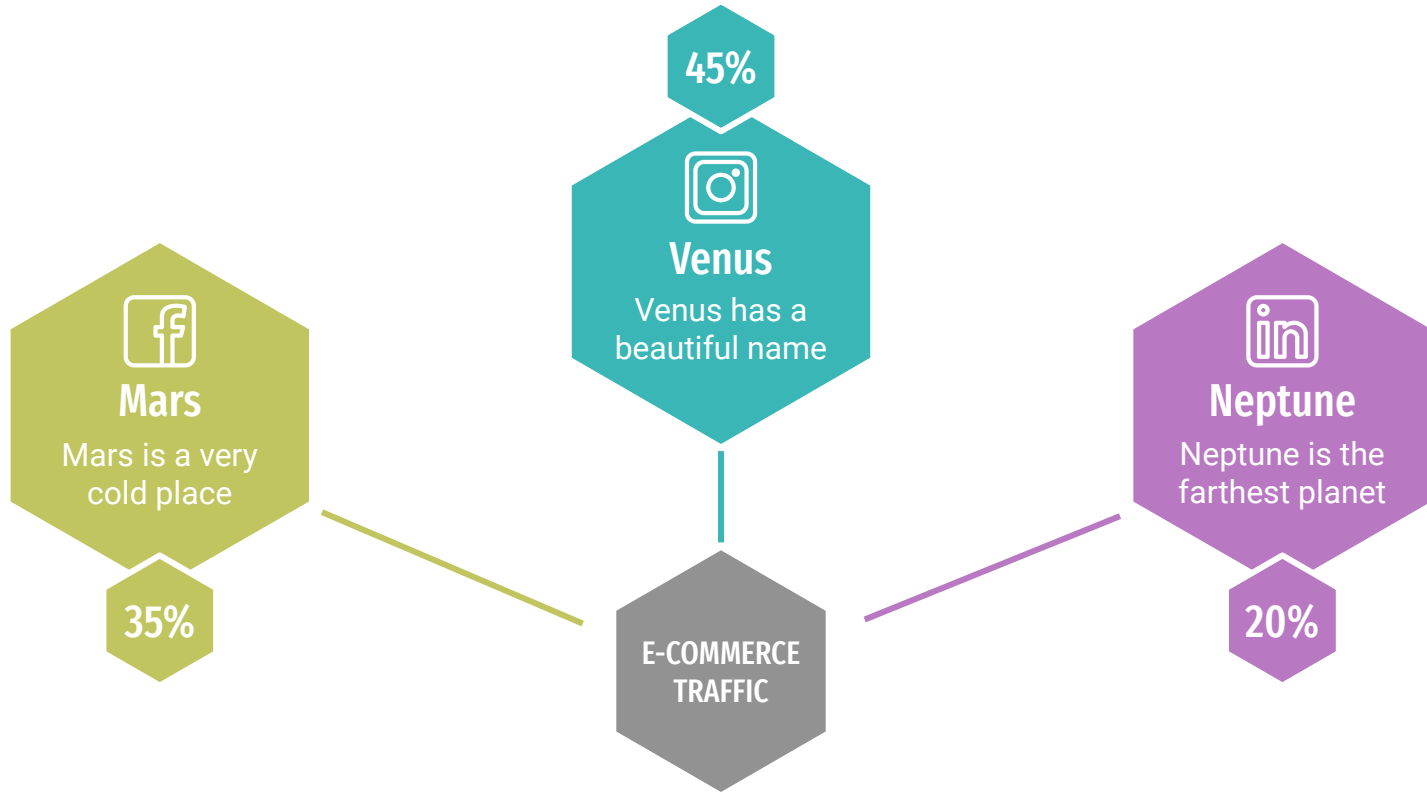
30%

## JUPITER

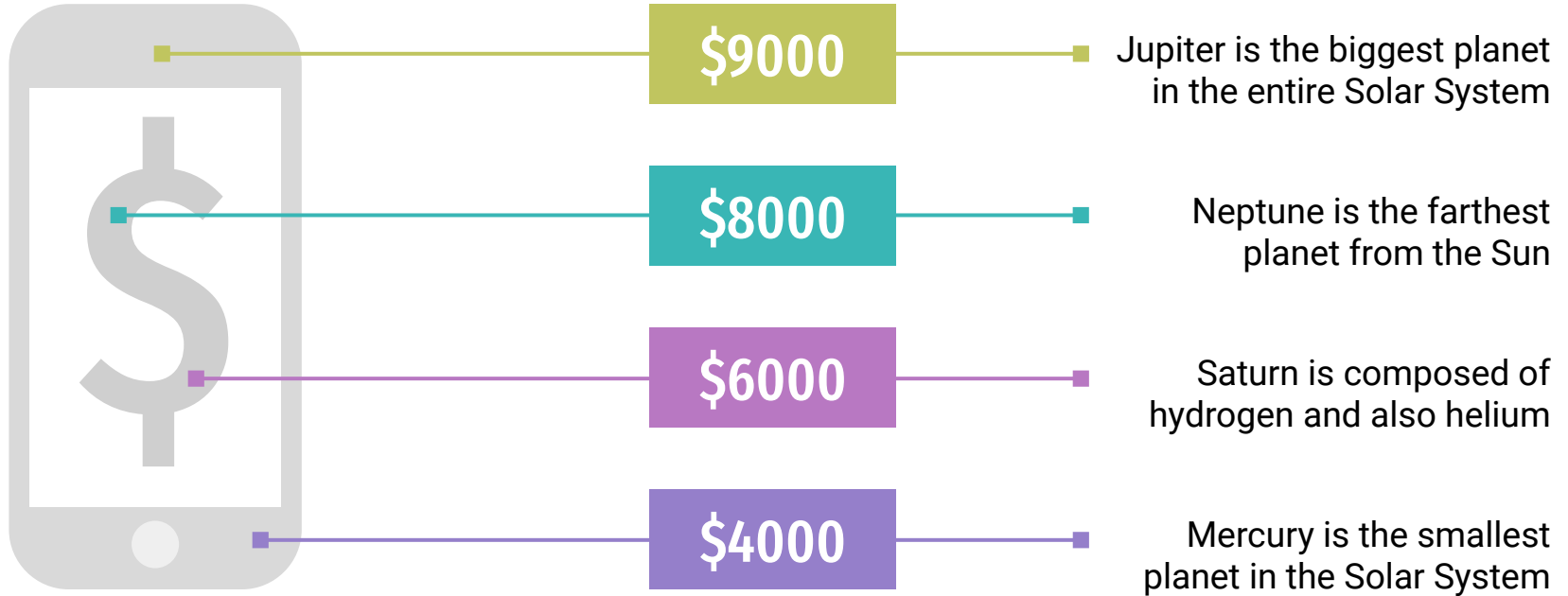
Jupiter is a gas giant and the biggest planet in the Solar System



# E-Commerce Infographics



# E-Commerce Infographics



# E-Commerce Infographics

It's the smallest planet in the Solar System

Mercury



It's the biggest planet in the Solar System

Jupiter



It's composed of hydrogen and helium

Saturn



It's a cold place. It's full of iron oxide dust

Mars



Venus has a poisonous atmosphere

Venus



# E-Commerce Infographics

2,000 \$

## Earth

Earth is the third planet from the Sun

7,000 \$

## Saturn

Saturn is composed of hydrogen and helium



4,500 \$

## Mercury

Planet Mercury is the closest object to the Sun

8,500 \$

## Jupiter

Jupiter is a gas giant and the biggest planet

# E-Commerce Infographics



**60%**  
**MARS**

Despite being red, Planet Mars is actually a very cold place



**75%**  
**JUPITER**

Jupiter is a gas giant and also the biggest one in the Solar System



**45%**  
**SATURN**

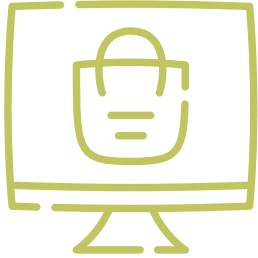
It's the ringed planet and also It's composed of hydrogen and helium





# E-Commerce Infographics

2017



15%

**VENUS**

It has a beautiful name and is the second planet from the Sun

2018

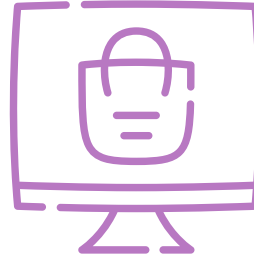


20%

**MERCURY**

Mercury is the closest planet to the Sun and smallest one

2019

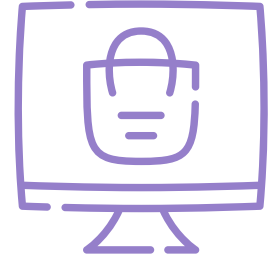


25%

**JUPITER**

Jupiter is a gas giant and the biggest planet in the Solar System

2020



30%

**MARS**

Mars is actually a cold place. This planet is full of iron oxide dust

# E-Commerce Infographics

## VENUS

Venus has a beautiful name and is the second planet from the Sun

## MERCURY

Mercury is the closest planet to the Sun and the smallest one



## MARS

Despite being red, Mars is a very cold place full of iron oxide dust

## JUPITER

Jupiter is a gas giant and the biggest planet in the Solar System

# E-Commerce Infographics

## MERCURY

Planet Mercury is the smallest one in the entire Solar System

## MARS

Despite being red, Mars is actually a cold place full of iron oxide dust



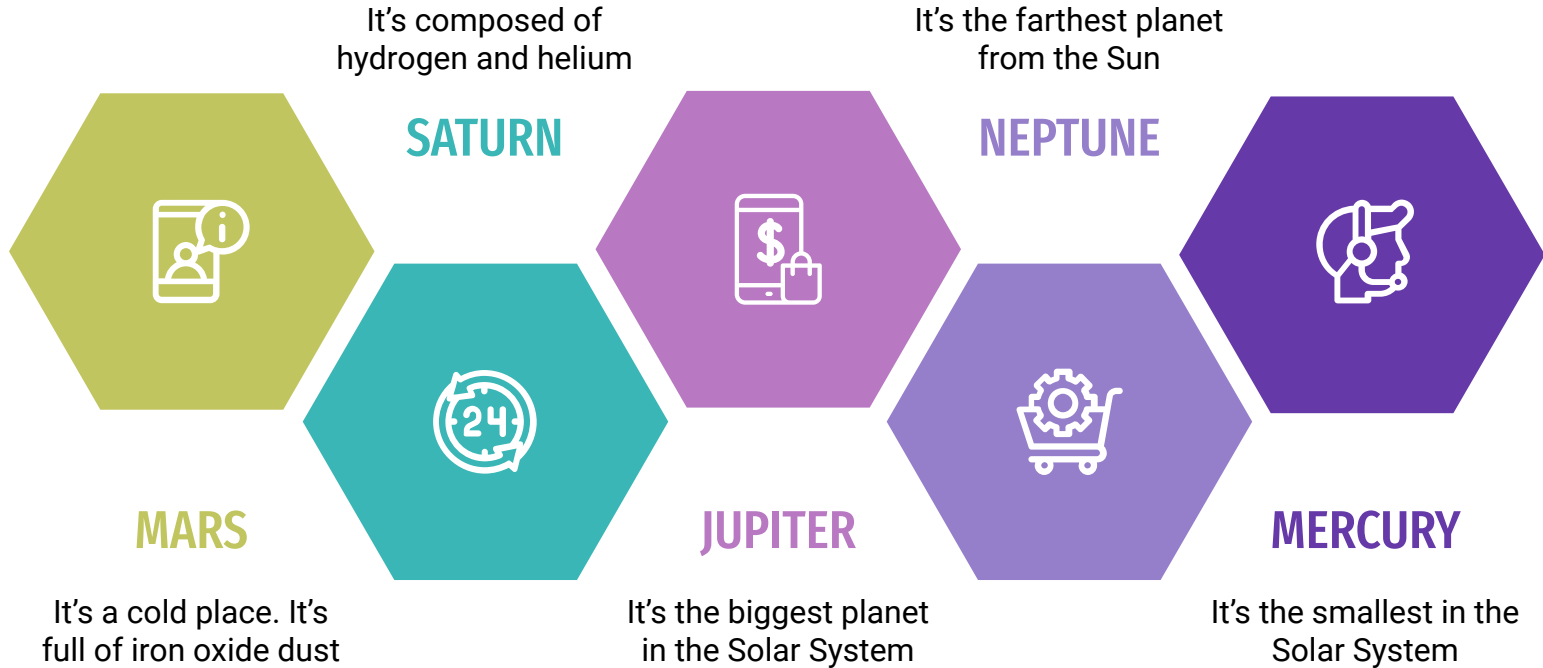
## NEPTUNE

Neptune is the eighth and farthest-known planet from the Sun

## JUPITER

Planet Jupiter is a gas giant and the biggest one in the Solar System

# E-Commerce Infographics



# E-Commerce Infographics

01

## Venus

Venus has a beautiful name and high temperatures

02

## Mars

Despite being red, Mars is a cold place full of iron oxide dust

04

## Jupiter

It's a gas giant and the biggest planet in the Solar System

03

## Saturn

Saturn is a gas giant made of hydrogen and also of helium



# E-Commerce Infographics

2019



20%

**MERCURY**

Mercury is the closest planet to the Sun and also is the smallest one

2020



40%

**VENUS**

Venus has a beautiful name and is the second planet from the Sun

# E-Commerce Infographics

1



Mercury is the  
closest planet  
to the Sun

2



Jupiter is a gas  
giant and the  
biggest planet

3



Saturn is a gas  
giant and has  
several rings

4



Neptune is the  
farthest planet  
from the Sun

# E-Commerce Infographics

## Mars

Despite being red, Mars is a cold place full of iron oxide dust

## Venus

Venus has a beautiful name and has also very high temperatures



## Neptune

It's the farthest planet from the Sun and the fourth-largest one

## Mars

Despite being red, Mars is a cold place full of iron oxide dust



# E-Commerce Infographics



## MERCURY

Mercury is the closest planet to the Sun

20%



## MARS

Despite being red, Mars is a cold place

40%



## JUPITER

Jupiter is a gas giant and the biggest

60%



## SATURN

It's composed of hydrogen and helium

80%

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