



UGANDA BUREAU OF STATISTICS



# Web scraping smartphone prices – the experience of Uganda

## Bureau of Statistics (UBOS)

**UN Regional Hub for Big Data and Data Science for Africa Webinar**

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# OUTLINE



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Objectives

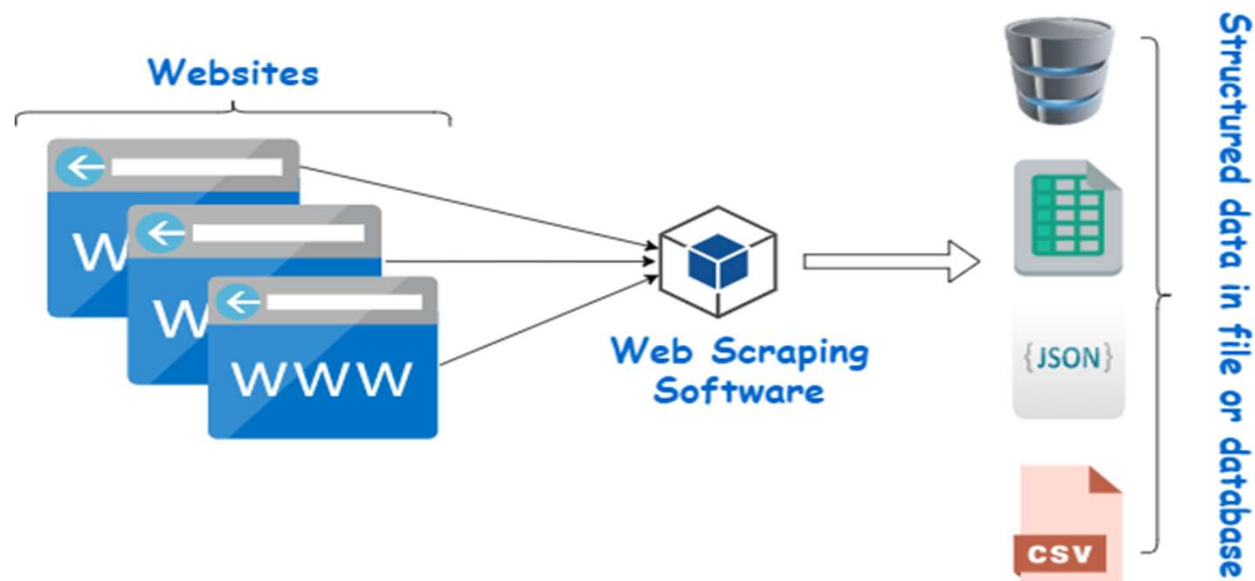
07

Conclusion

04

Methodology

Web scraping is the automated process of extracting data from websites by accessing web pages and reading HTML content to retrieve specific information.





## JUSTIFICATION FOR THE INNOVATION

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- COVID-19 Impact & Market Transformation: The pandemic accelerated online commerce, making web platforms primary marketplaces for most of products such as smartphones. Statistical agencies including Statistics Netherlands, UK's ONS, Statistics New Zealand, Statistics Canada and many EU agencies have begun web scraping price data.
- Need for Modernization: Smartphones being highly evolving products in Uganda calls for innovative methods to improve on its compilation, as demonstrated by leading NSOs.



## OBJECTIVES

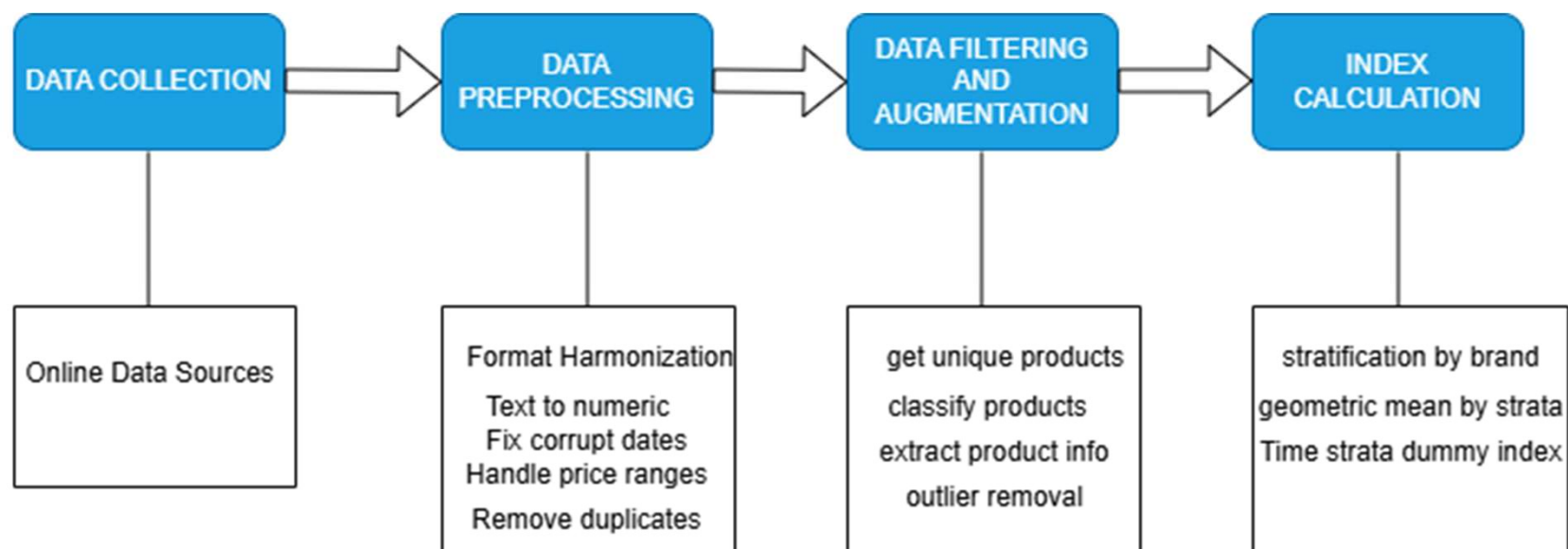
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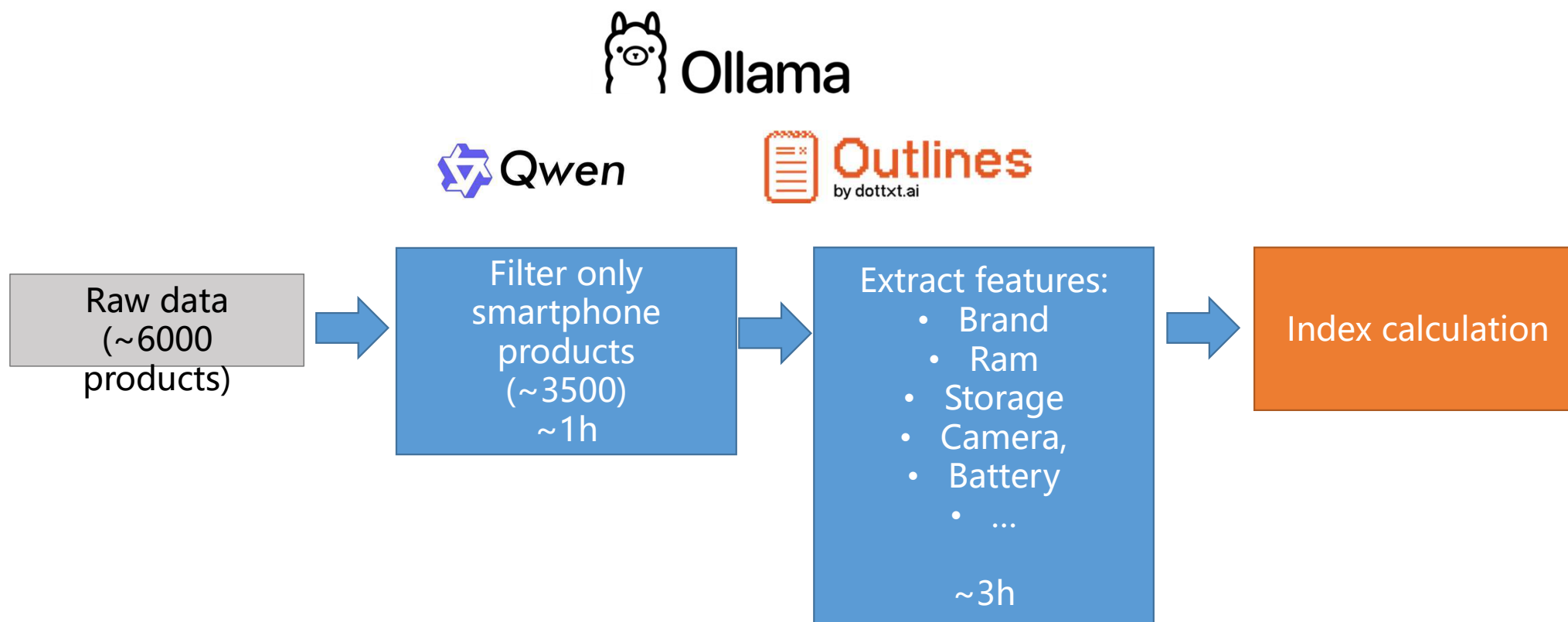
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- To review the current methodology used in computing the smartphone price index under COICOP Division of Consumer price index.
- To develop an improved, adaptive methodology for compiling the smartphone price index that is reflective of the dynamic nature of the market.
- To document the research findings and methodological advancements in a peer-reviewed academic paper, contributing to the global discourse on modernizing price indices..

The methodology followed the following stages



## Data Preprocessing Flow





## METHODOLOGY

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### Internal On-Premise Server

#### Install Required Softwares/Libraries

- PostgreSQL database.
- Python (Extraction, Transformation and Loading Data).
- Outlines
- Scheduling (Kestra, Apache Airflow).





## SAMPLE OF PRODUCTS SCRAPED



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ram	rom	battery	color	old_price	new_price	discount	rating	name	date_of_scraping
6GB RAM	n/a	4000mAh	Blue	UGX 435,000	UGX 280,000	36%	3.5 out of 5	SIMI C1 4G Smartphone Qualcomm	38:22.8
4GB RAM	32GB ROM	2000mAh	Light	UGX 250,000	UGX 159,500	36%	4.2 out of 5	ZTE Blade A35 Core 5" 32GB ROM 4G	38:22.8
n/a	n/a	n/a	Black	UGX 67,500	UGX 48,200	29%	4 out of 5	Nokia 105 DS 1.8" Dual Sim, FM Rad	38:22.8
4GB RAM	128GB RO	5000mAh	Black	UGX 725,000	UGX 470,000	35%	4 out of 5	Samsung Galaxy A05s 6.7" 4GB RAM	38:22.8
3GB RAM	32GB ROM	4050mAh		6 UGX 350,000	UGX 181,800	48%	3.7 out of 5	Oale IP15 PLUS - 6.52" (3GB RAM+32	38:22.8
12GB RAM	64GB ROM	5000mAh	Black	UGX 380,000	UGX 275,000	28%	3.8 out of 5	ZTE Nubia Blade A35 6.75â€ 5000m/	38:22.8
8GB RAM	256GB RO	5160mAh	Black	UGX 900,000	UGX 470,000	48%	4.2 out of 5	Redmi 14C 6.88" 8GB RAM 256GB RO	38:22.8
12GB RAM	64GB ROM	5000mAh	n/a	UGX 380,000	UGX 275,000	28%	3.9 out of 5	ZTE Nubia Blade A35 6.75â€ 5000m/	38:22.8
8GB RAM	256GB RO	n/a		6 UGX 1,500,000	UGX 850,000	43%	3.7 out of 5	Samsung Galaxy Note 10 - 6.3" 8GB I	38:22.8
6GB RAM	128GB RO	6000mAh		6 UGX 740,000	UGX 640,000	14%	3.8 out of 5	Samsung Galaxy M15 - 6.5" 6GB RAM	38:22.8
n/a	n/a	1050mAh	n/a	UGX 55,000	UGX 38,000	31%	3.6 out of 5	SIMI S102 1.77inch Feature Phone D	38:22.8
4GB RAM	64GB ROM	5000mAh	Black	UGX 580,000	UGX 435,000	25%	4.4 out of 5	Samsung Galaxy A05s 6.7" 4GB RAM	38:22.8
4GB RAM	128GB RO	5000mAh	Black	UGX 725,000	UGX 470,000	35%	4.3 out of 5	Samsung Galaxy A05s 6.7" 4GB RAM	38:22.8
6GB RAM	n/a	n/a		6 UGX 900,000	UGX 750,000	17%	3.9 out of 5	Samsung Galaxy Note 9 - 6.4", 6GB F	38:22.8
6GB RAM	256GB RO	n/a	n/a	UGX 600,000	UGX 418,000	30%	4.1 out of 5	ZTE Nubia V60 Design 256GB ROM/ €	38:22.8
n/a	n/a	n/a	n/a	UGX 90,000	UGX 58,100	35%	3.6 out of 5	Tecno T528 Display 2.8" Screen 16M	38:22.8
8GB RAM	n/a	n/a	Bronze	UGX 1,900,000	UGX 899,000	53%	3.6 out of 5	Samsung Galaxy Note 20 8GB RAM, :	38:22.8

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## SAMPLE OF PRODUCTS CLASSIFIED



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1	name	label	brand	model	screen	ram_gb	storage_gb	cpu	camera_mp	battery_mah	refurbished	true_smartphone
2	Itel A70 - 6.6"HD+ 8GB RAM 128GB ROM 13MP	smartphone	Itel	A70	6.6	8	128		13	5000		TRUE
3	Samsung Galaxy A15 - 6.5" 4GB RAM 128GB ROM 13MP	smartphone	Samsung	Galaxy A15	6.5	4	128		50	5000		TRUE
4	Itel A70 - 6.6"HD+ 8GB RAM 128GB ROM 13MP	smartphone	Itel	A70	6.6	8	128		13	5000		TRUE
5	Itel Awesome A70 - 6.6" 8GB RAM 128GB ROM	smartphone	Itel	Awesome A70	6.6	8	128		13	5000		TRUE
6	Tecno Spark 20 - 6.6" 8GB RAM 128GB ROM 50MP	smartphone	Tecno	Spark 20	6.6	8	128		50	5000		TRUE
7	Tecno Spark 20C 6.6" 8GB RAM 256GB ROM 50MP	smartphone	Tecno	Spark 20C	6.6	8	256		50	5000		TRUE
8	Tecno Pop 8 - 6.6" 3GB RAM 64GB ROM 13MP	smartphone	Tecno	Pop 8	6.6	3	64		13	5000		TRUE
9	Samsung Galaxy A15 4G - 6.5" 6GB RAM 128GB ROM	smartphone	Samsung	Galaxy A15 4G	6.5	6	128		50	5000		TRUE
10	SIMI C1 4G Smartphone Qualcomm Snapdragon	smartphone	SIMI	C1 4G	6.3	6	64	Qualcomm	28	4000	FALSE	TRUE
11	Infinix Smart 8 - 6.6" 3GB RAM 64GB ROM 13MP	smartphone	Infinix	Smart 8	6.6	3	64		13	5000		TRUE
12	Samsung Galaxy A05 6.7" 4GB RAM 64GB ROM	smartphone	Samsung	Galaxy A05	6.7	4	64		50	5000		TRUE
13	Tecno Spark 20 - 6.6" 8GB RAM 128GB ROM 50MP	smartphone	Tecno	Spark 20	6.6	8	128		50	5000		TRUE
14	Redmi 12 - 6.79" 8GB RAM 256GB ROM 50MP	smartphone	Redmi		12 6.79	8	256		50	5000		TRUE
15	Infinix Note 40 - 6.78" 8GB RAM 256GB ROM 108MP	smartphone	Infinix	Note 40	6.78	8	256		108	5000		TRUE
16	Mione AB6-Dual SIM 1.77" 1050mAh With Camera	smartphone	Mione	AB6-Dual SIM	1.77				1050	1050	FALSE	TRUE
17	Redmi 13C 6.74" 8GB RAM 256GB ROM 50MP	smartphone	Redmi	13C	6.74	8	256		50	5000		TRUE
18	Tecno Pop 8 - 6.6" 3GB RAM 64GB ROM 13MP	smartphone	Tecno	Pop 8	6.6	3	64		13	5000		TRUE
19	Tecno Spark 20 - 6.6" 8GB RAM 256GB ROM 50MP	smartphone	Tecno	Spark 20	6.6	8	256		50	5000		TRUE
20	Samsung Galaxy A05 - 6.7" 4GB RAM 64GB ROM	smartphone	Samsung	Galaxy A05	6.7	4	64		50	5000		TRUE

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## RESULTS



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67,000 elementary prices downloaded and cleaned in 8 months

- High attrition (in three months about 30% of the elementary items disappear).
- 6,180 unique products classified using AI.
- 3,027 smartphones identified and analyzed.
- 32% cumulative price increase over 8 months.
- Monthly CPI for phones computed using stratification and regression.





## RESULTS



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<b>MONTHS</b>	<b>CPI</b>	<b>Change (%age)</b>
2024-08	100.00	
2024-09	112.36	12.4
2024-10	116.90	4.0
2024-11	114.19	-2.3
2024-12	112.41	-1.6
2025-01	122.98	9.4
2025-02	123.02	0.0
2025-03	132.04	7.3



## LIMITATIONS

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- Changing brand of phones makes tracking over years difficult
- Data cleaning needed to exclude what is not smartphone



## CONCLUSION AND WAY FORWARD

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1. Comparison of results computed with different methodologies which are:  
simple strata, weighted strata, and hedonics.
2. Adding more products to scrape like television
3. Write a paper and have it published as a journal article.



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# Thank You



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