

# Developing an application for calculating the MERIS score from real-world data

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## The MERIS calculation

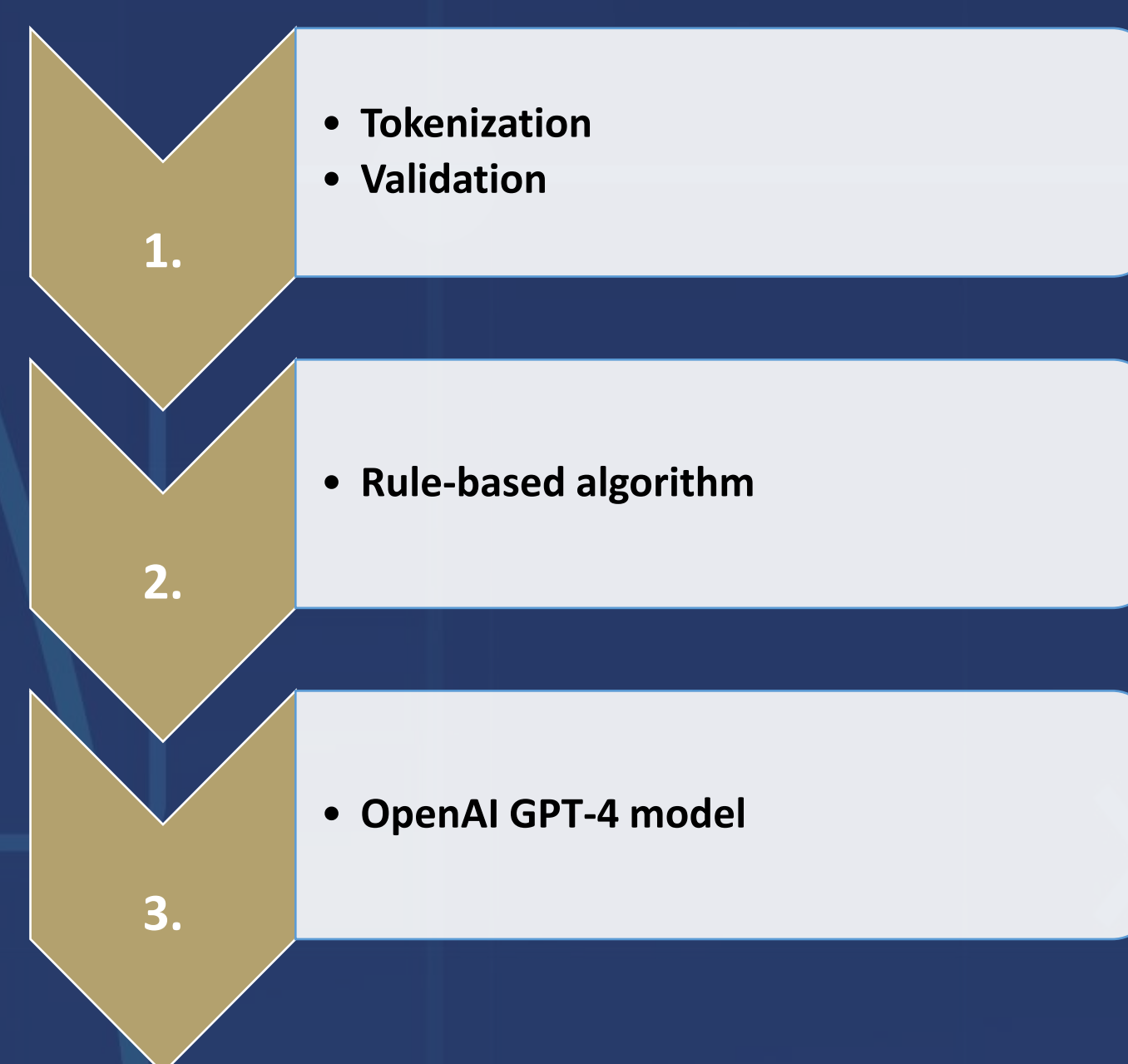
The MERIS (Medication Risk Score) algorithm was developed by Eva Saedder and her colleagues at Aarhus University in Denmark. It is based on the risk categorization developed by her, and the aim of its development was to create a medication risk score that is as accurate as possible using the least amount of strictly objective data. This algorithm can be automated by classifying medications into one of the 54 risk categories declared by the Danes based on their ATC codes. For the calculation, only the ATC codes of the concurrently used medications and the patient's eGFR value are required. It is an innovative medical decision-support tool for the profession.



Medication Risk Score (MERIS)		
Variable	Interval	Points
 Impaired renal function	eGFR > 60	0
	60 > eGFR > 30	5
	eGFR < 30	10.6
 Total number of drugs	0–5	0
	6–11	5
	>12	10.6
 Number of drugs with	Low risk of harm (Max. number of drugs = 3)	0.25
	Medium risk of harm (Max. number of drugs = 8)	0.5
	High risk of harm (Max. number of drugs = 7)	1
	Low + medium risk of interaction (Max. number of drugs = 12)	0.25
	High risk of interaction (Max. number of drugs = 2)	0.5

## Hybrid data miner

To generate ATC codes from free text, we employ a hybrid text processing module that combines the reliability of rule-based algorithms with the flexibility of Artificial Intelligence. This enables us to generate data required for MERIS evaluation with high accuracy, even from real-world data. The process involves tokenization followed by token validation, and only then does ATC code generation commence. The rule-based algorithm runs first, and if there are any "remaining" tokens, we use the GPT model to identify them.



## The application

To test the tool, we have created a Python application using a streamlit framework in which users can try the MERIS evaluation on their own or their patient's medication. For the calculation, the system asks for an eGFR value and a free text therapy description. Thus, the user does not need to know the ATC codes of medicines. We have placed a lot of auxiliary information on the interface so that the procedure can be understood by laypeople and the explanation of the risk category can be viewed when evaluating the outcome. In addition to displaying the MERIS subpoint numbers, the ratio of subpoints is also represented using a circular chart. The medicines taken into account in the calculation can be viewed by the user in tabular form, where we also indicate which method of the hybrid data miner recognized the drug. In two additional pages, you can view time statistics on the use of the app and the distribution of activity across continents.



### MERIS calculator

- MERIScalculator Menu
- Calculator
- Usage Statistics
- Activity Atlas

#### INFORMATION

##### About the operation

The application asks the user for the eGFR value for measuring kidney function and a list of drugs used simultaneously. It identifies drugs using artificial intelligence, which can take a few seconds. After identification, it uses the MERIS algorithm to calculate the patient's medication risk index.

##### Developed by

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##### About MERIS score

MERIS is calculated from Renal function, Quantity of drugs, and Quality of drugs.

Calculation #92

Renal function (Please enter eGFR value.)

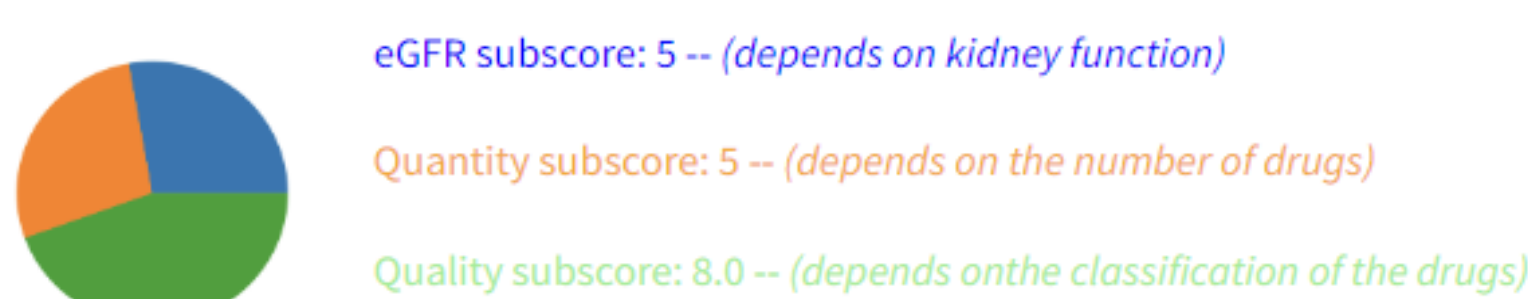
35

Therapy description (Please enter the names of the active ingredients or the drugs with comma separator. Do not enter anything else.)

Meromen, Bisogamma, Xeter, Emetron, Milurit, Clexane, Metfogamma, Curidol, Enterol, Laresin

OK

Expand the bar to view how the MERIS algorithm operates.



**MERIS score: 18.0** **HIGH RISK**

0 LOW 14 HIGH 26 EXTREME 36.2

The response time was 2.15s

Expand the bar to view the medications that the AI has recognized and taken into the calculation.

	Name	ATC code	Processing type
1	olmesartan	C09CA08	locally
2	liofilizált	A07FA02	locally
3	tramadol	N02AJ13	locally
4	metformin	A10BA02	locally
5	enoxaparin	B01AB05	locally
6	allopurinol	M04AA01	locally
7	ondansetron	A04AA01	locally
8	rosuvastatin	C10AA07	locally
9	bisoprolol	C07AB07	locally
10	meropenem	J01DH02	AI

The list of tokens we couldn't use in the calculation:

Try me!



[meriscalculator.streamlit.app](https://meriscalculator.streamlit.app)

## References

- Saedder, Eva Aggerholm, et al. "Classification of drugs with different risk profiles." Dan Med J 62.8 (2015): 1-6.
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