Leveraging IoT and Machine Learning for Improved Monitoring of Water Resources - A Case Study of the Upper Ewaso Nyiro River.

CO-AUTHOR

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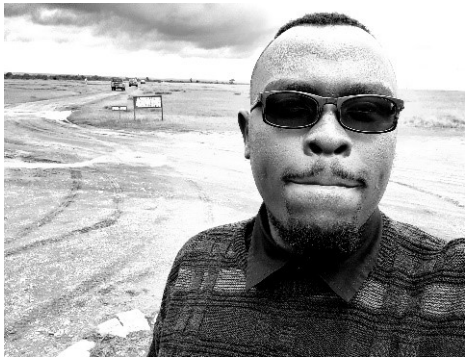
Key figure: Data Science Africa (DSA)

PRESENTER



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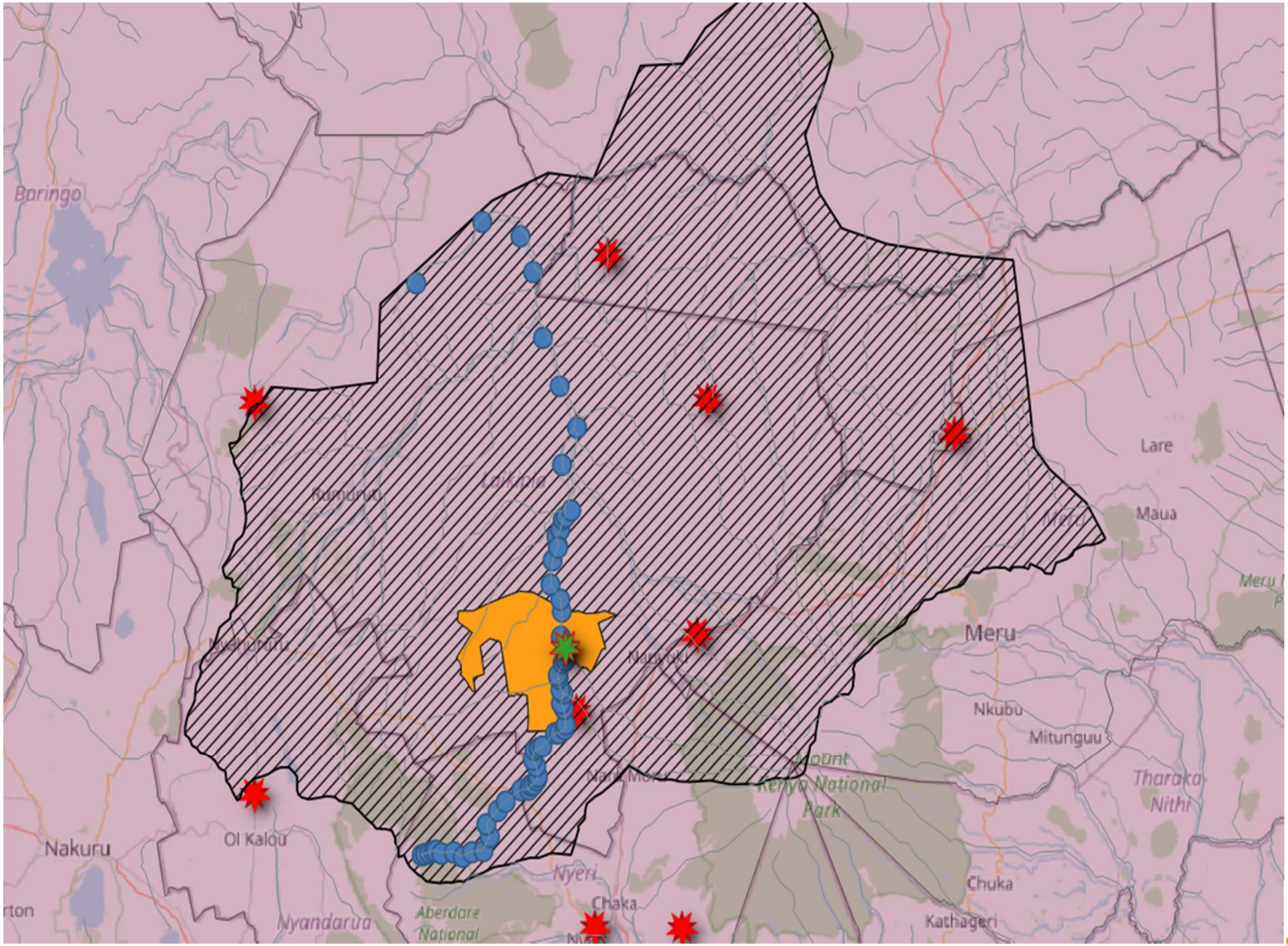
1 Location (A Little Geography)



- **River Ewaso Nyiro (in the Ewaso Nyiro basin in Central Kenya)**
- **Important part of the ecosystem in the Ewaso-Nyiro basin**

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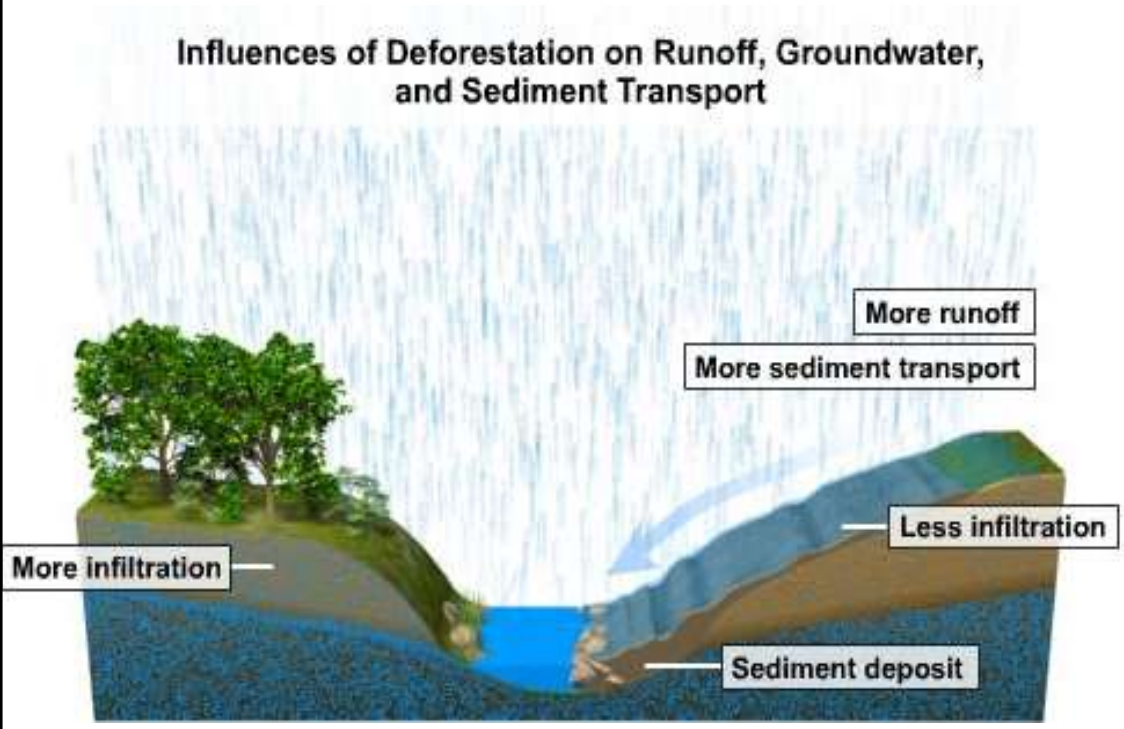
Motivation, problem area



- Equitable distribution and sustainable use of water.

Quantifying phenomena like catchment degradation.

- Data for environmental modelling

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Research objectives

- To design a sensor system to monitor water-level in a river channel.
- To deploy the LoRaWAN IoT network
- web infrastructure
- Machine learning
- Making conclusions

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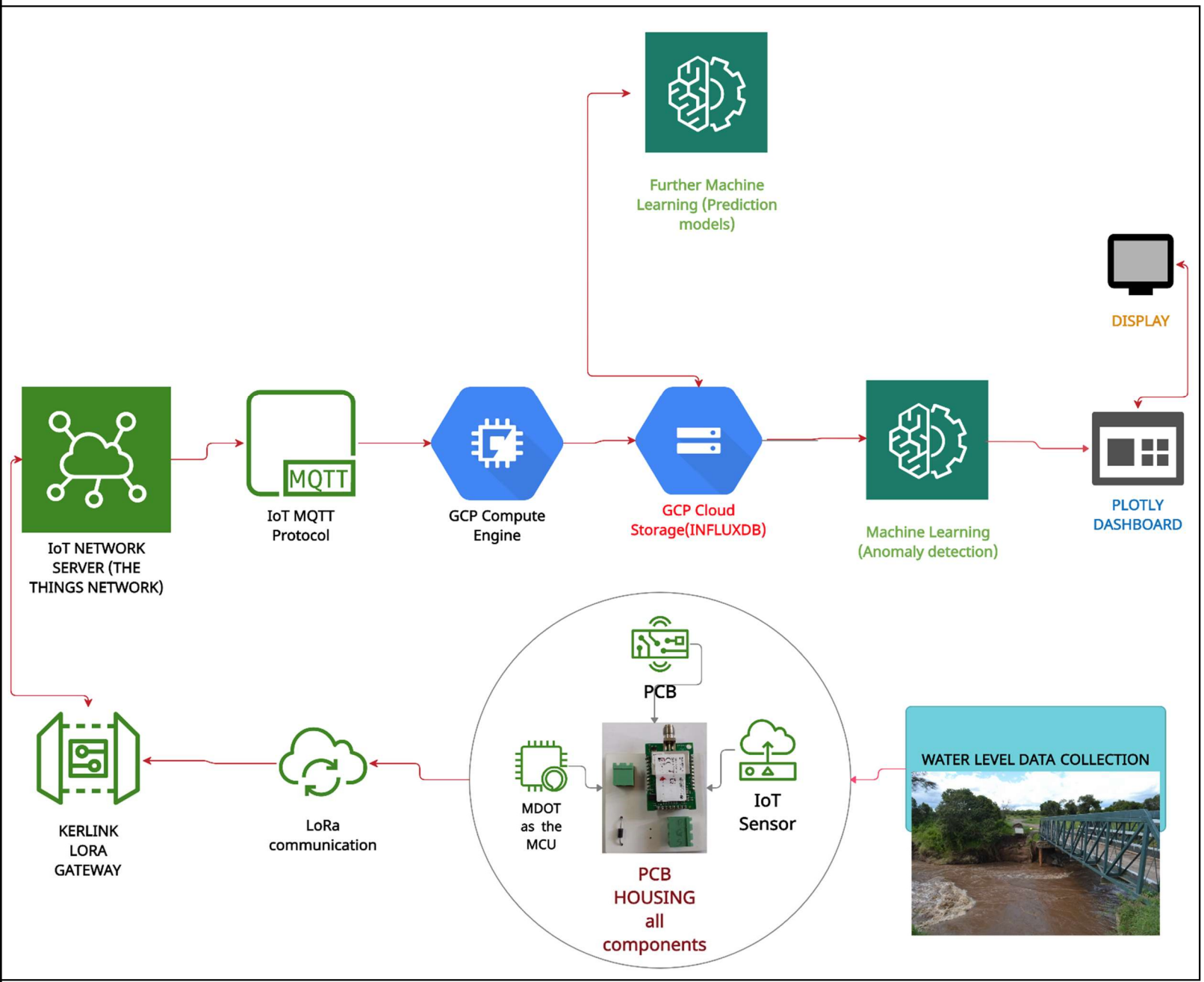
4 Research approach, methodology



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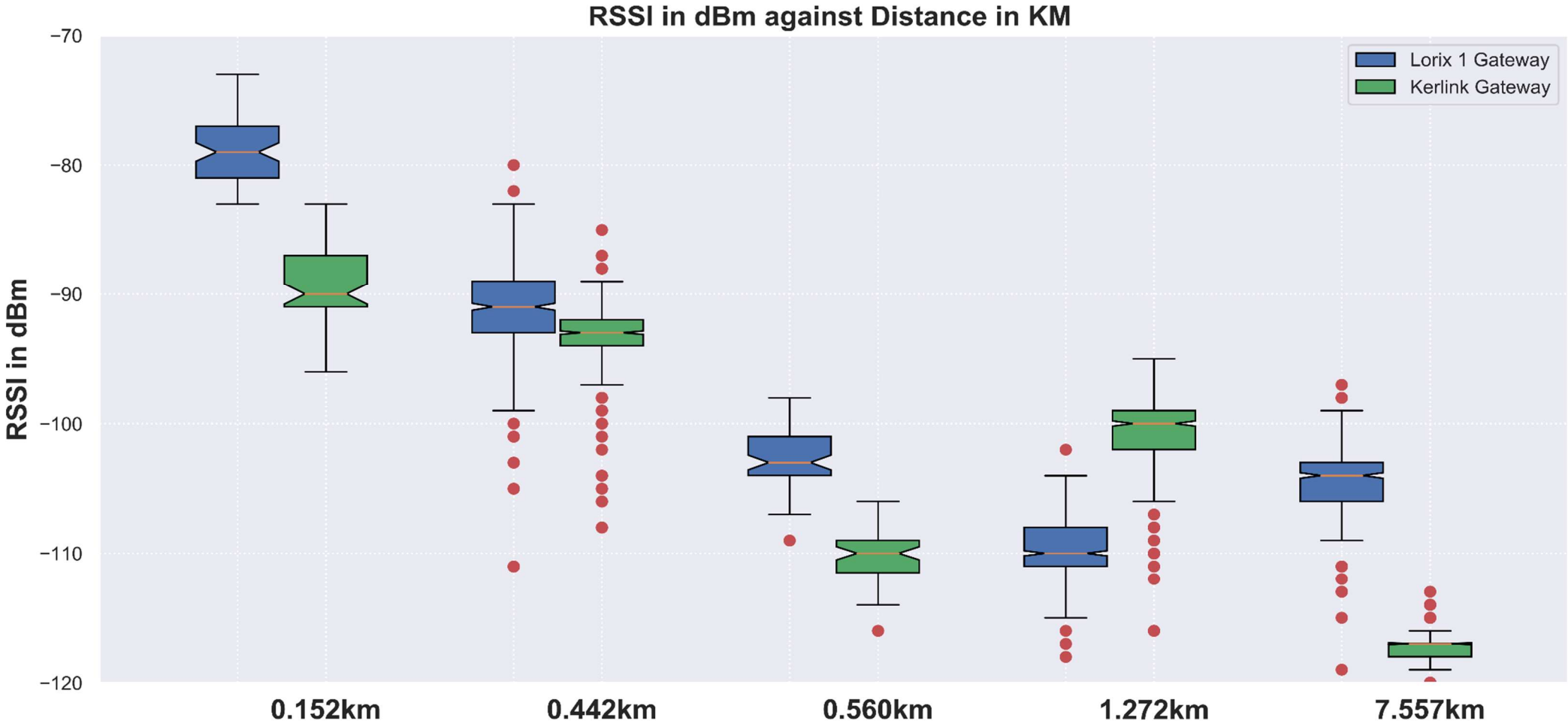
LoRa network installation/test

- Test and installation done at Ol-Pejeta conservancy (river Ewaso Nyiro runs through it).



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Why LoRa?

- Ref: Introduction to Internet of Things for Data Scientists – Data Science Africa 2018 talk by Jan Jongboom

Gateway installation

- Installed / deployed near Ol-Pejeta conservancy Techlab 18 meters above ground. Registered on TTN

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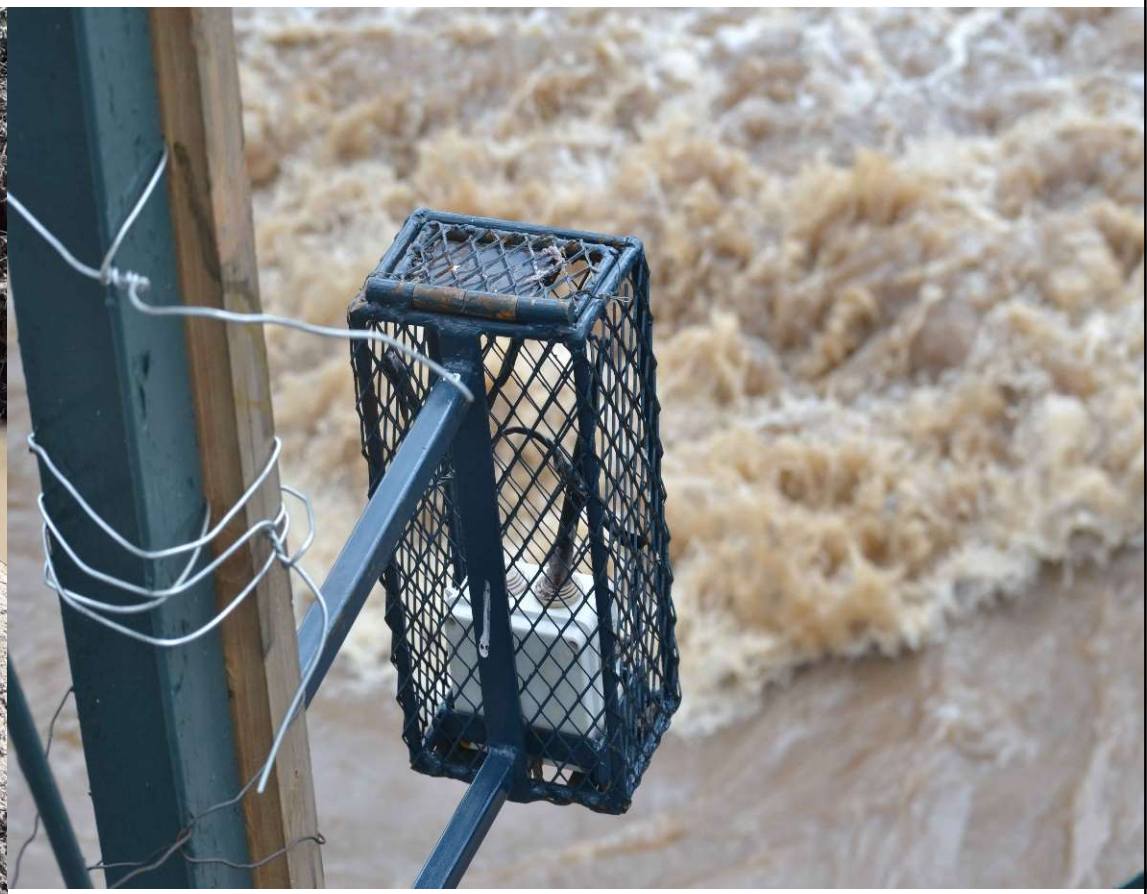
Prototypes

- Pcb design and the actual deploy system

The actual deploy system



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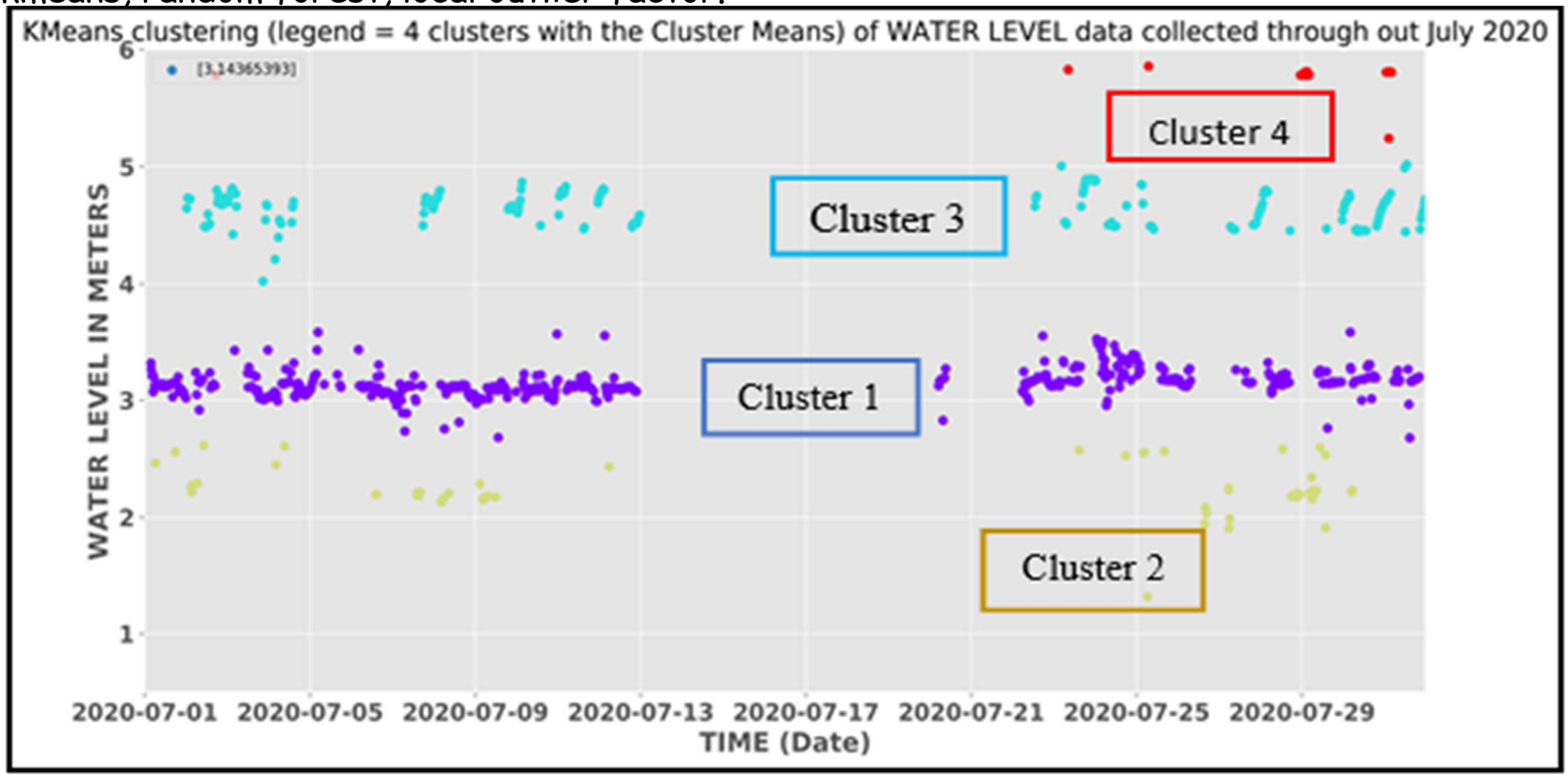
Anomaly Detection

Anomaly detection in the time series data collected. (un-supervised classification method) – kmeans, random forest, local outlier factor.



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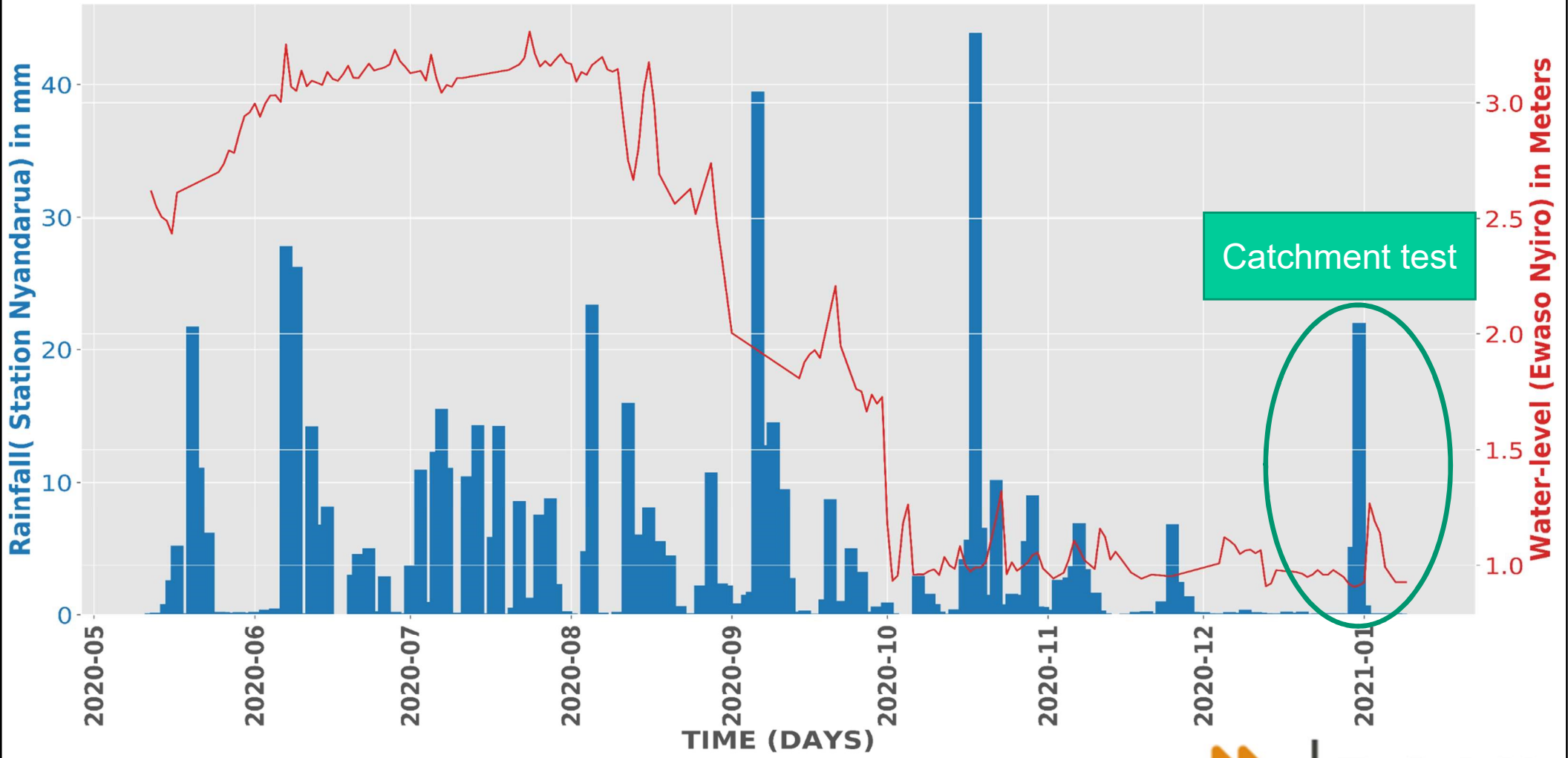
Major Outcomes/Results

Comparison of data collected from one prototype (from April 2020 to January 2021) to rainfall data from on the weather station in the basin from .(TAHMO)



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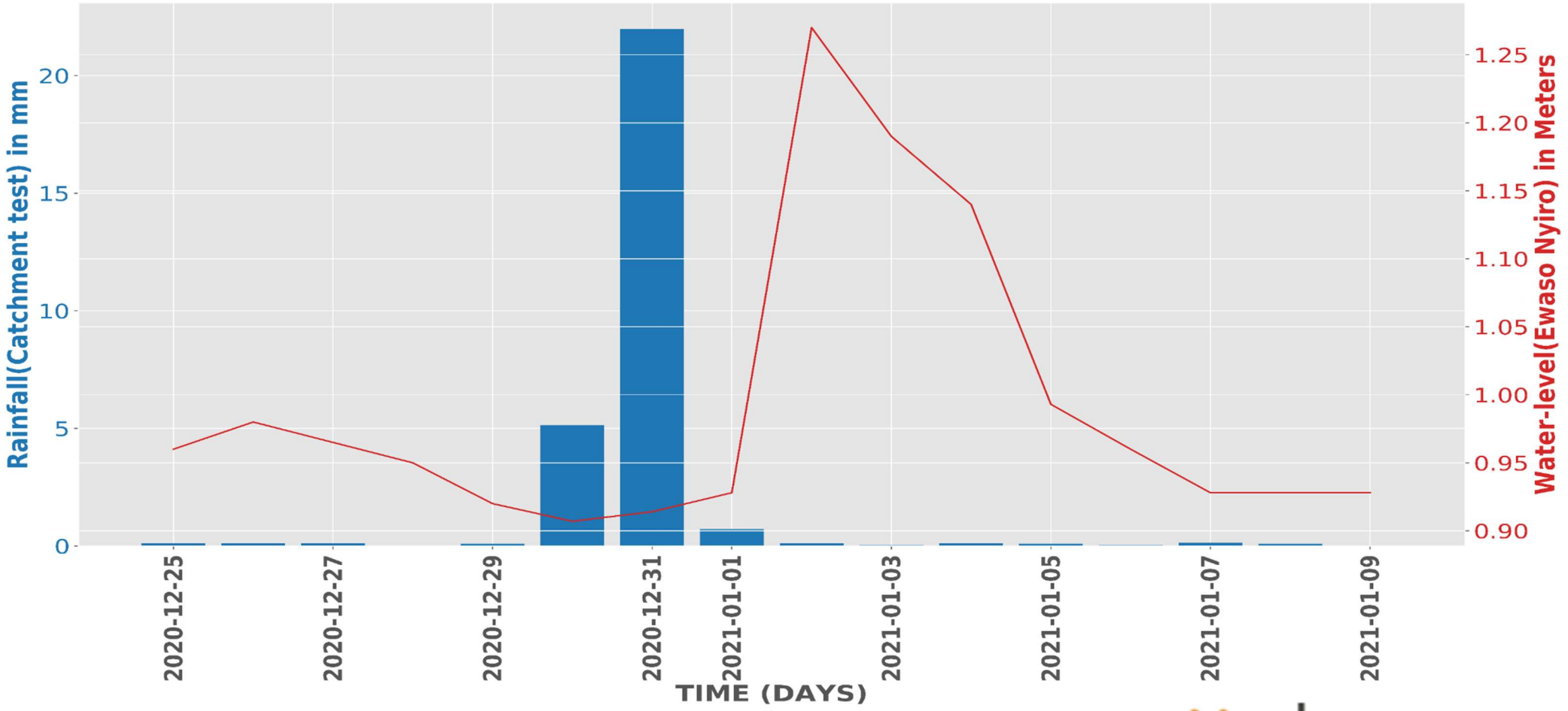
Major Outcomes/Results

Comparison of data collected from one prototype (from DEC 25 2020 to January 09 2021) to rainfall data from on the weather station in the basin. (Catchment test)



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Conclusion and outlook

conclusion

- We managed to deploy a water level monitoring system.
- Data collected can be used in decision making
- Data collection web app
- **LINK (https://water-monitoring-258811.wl.r.appspot.com)**

- Outlook.
- Development of prediction models using the data collected
- Development of simple inundation models
- Integration of our dataset with other datasets
- Expansion to other rivers
- Implementing other methods of anomaly detection
- Development and deployment of water turbidity sensors systems and water flow-rate systems

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END. THANK YOU

NRF KENYA NATIONAL RESEARCH FUND

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OL PEJETA CONSERVANCY

TAHMO

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