Xylem Global Student Innovation Challenge

WATER

impacts our lives every day, from meeting our personal needs to influencing the global economy and the well being of our planet. Factors like climate change, pollution and aging infrastructure threaten global water supplies and water security.

Xylem is a leading water technology company committed to "solving water“ by creating innovative and smart technology solutions to meet the world's water, wastewater and energy needs.

Urban Flood Prediction

PROBLEM STATEMENT

As extreme weather and rain events become more frequent due to climate change, waterways and drainage systems can become overloaded by an influx of water. This results in flooding that can potentially cause massive property damage and even loss of life. According to the World Bank[1], about 1.5 billion people globally face flood risk. The problem intensifies in urban environments with dense population and infrastructure. It is imperative for us to have better solutions to predict and manage floods.

Take on this challenge to examine datasets from Clean Water Services including rainfall, temperature, surface elevation, and level from sensors installed in rivers. Predict occurrence of flood events by creating models utilizing AI/ML or other appropriate technology. Create applications to enhance public awareness and community engagement.

Clean Water Services

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Urban Flood Prediction

PAIN POINTS

- **Flooding affects around 250 million people and results in USD 40 billion in losses on an annual basis.**
- **Occurrence and losses from floods have increased significantly over the years due to more extreme weather events and accumulation of assets in areas affected by floors**
- **Many urban cities face threats of flooding, but they lack a prediction system on flood events in place to inform them of the pending disasters**
- **Even when cities are able to predict floods, they may not have tools to utilize the information to reduce losses from flood events**

Urban Flood Prediction

OPPORTUNITY AREAS

- Using the example datasets provided by Clean Water Services, perform analysis to predict the occurrence of flood events. One way of doing so is to create models using artificial intelligence and machine learning methods
- Include any external, publicly available datasets that you may find relevant to the flood prediction problem
- Understand the various factors that affect the potential occurrence of flood events
- Design/create a platform (e.g. interactive website, mobile app) that allows two-way communication for both the utility and community to report flood events
- Design other solutions that increase public awareness of potential floods and engage community to reduce impact of floods

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RESOURCES AND DATA PROVIDED

By accessing and utilizing datasets for Challenge #3 Urban Flood Prediction, the participant acknowledges that the datasets cannot be shared and will not be shared externally. The datasets will only be used in conjunction with the Xylem Global Student Innovation Challenge.

1. **Rain Gauge Locations: fanno_rain_gauges.shp**

2. **Rainfall CSV: fanno_rain_stations.csv**

3. **USGS Station Locations: USGS_Stations.shp**

4. **River data:**
   - **Gauge Height and Discharge: FannoCreek56th.csv**
   - **Gauge Height, Discharge, Temperature, Turbidity: FannoCreekDurham.csv**

   4a. Flood stage for USGS Station "Fanno Creek at Durham": 9.1 ft. ***(Link 1)***

5. **Flooding occurrences: flooding_reports.xlsx**

6. **Hydrologic Basin Outline: Fanno_HUC12.shps**

7. **Surface Digital Elevation Model (DEM): bareearth.tif**

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RESOURCES AND DATA PROVIDED (Cont'd)

GIS Visualization Software:

ArcGIS (Requires software license) *(Link 1)*
QGIS (Open source) *(Link 1)*

Programming Environment:

Examples: Python, R Programming, Matlab
*Participants are not restricted to any programming language.

Data Analytics Software:

Examples: PyTorch, Keras, TensorFlow, GeoPandas
*Participants are not restricted to any data analytics software packages.

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