SMART WATER FOUNTAIN

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INNOVATION:

The project's goal is to enhance public water fountains by integrating IoT sensors for flow control and malfunction detection. The main aim is to offer real-time updates on fountain status to residents through a public platform.

SOLUTION:

- ✓ Determine the vital indicators (KPIs) indicating water fountain health, such as flow rate, pressure, temperature, and turbidity.
- ✓ Gather historical data on these KPIs from sources like existing monitoring systems, sensor networks, and public records.
- ✓ Utilize machine learning algorithms for predictive modeling. The model should forecast fountain malfunctions based on current KPI values.
- ✓ Integrate the predictive model into the fountain status platform. The platform identifies at-risk fountains and alerts maintenance personnel accordingly.

THE DETAILED OVERVIEW OF EACH STEP:

- **Identifying the key performance indicators (KPIs):**

  - The initial stage involves pinpointing the most relevant Key Performance Indicators (KPIs) indicative of water fountain health.
  - These KPIs must be measurable, quantifiable, and closely linked to fountain malfunctions. Examples of such KPIs for predictive maintenance encompass factors like:

- water flow rate
- pressure
- temperature
- turbidity
- pH levels
- conductivity
- total dissolved solids (TDS)

- **Collecting historical data:**

- After determining the Key Performance Indicators (KPIs), the subsequent step involves gathering past data related to these indicators.
- This information can be sourced from various outlets, including:

  - current fountain monitoring systems
  - sensor networks
  - public records

- In cases where no existing data is accessible, it might be essential to deploy IoT sensors on fountains to collect real-time KPI data.

- **Training a predictive model:**

- After gathering historical data, it can be utilized to train a predictive model with the objective of forecasting the likelihood of water fountain malfunctions based on current KPI values.

- Several machine learning algorithms, includes:
  - logistic regression
  - decision trees
  - random forests
  - support vector machines (SVMs), can be employed for predictive maintenance.
- The choice of the most suitable algorithm depends on the specific dataset and the desired model performance.

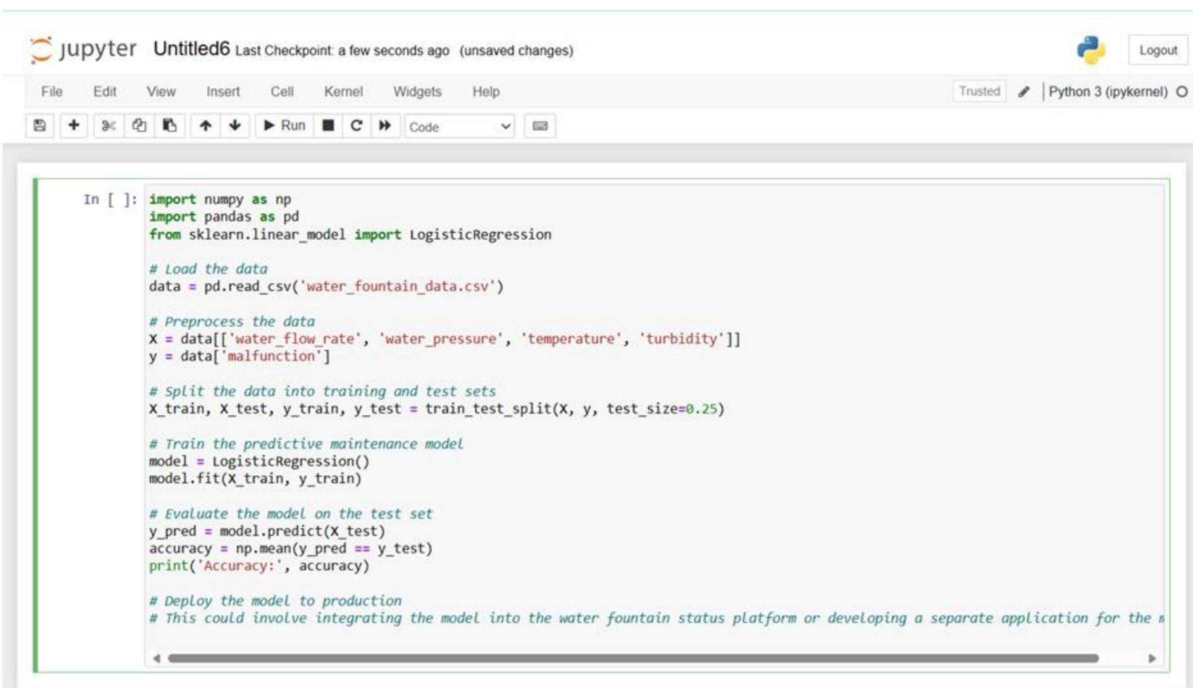
- **Implementing the Predictive Model:**

- Once the model is trained, it can be integrated into the water fountain status platform.
- This platform should utilize the model to recognize fountains at risk of malfunction and promptly alert maintenance staff.
- Python, a widely-used programming language, can be employed for the entire predictive maintenance system, covering tasks such as:

  - data collection
  - preprocessing
  - predictive modeling
  - model deployment
- Several Python libraries are available for various tasks in this process used For:

  - data collection, libraries like NumPy and Pandas can be utilized.
  - Data preprocessing can be accomplished using scikit-learn.
  - Both predictive modeling and model deployment can be handled through scikit-learn for modeling and Flask or Django for deployment.

Below is an example of how Python can be used to implement a basic predictive maintenance algorithm for water fountains using historical data and scikit-learn library for machine learning:




```
import numpy as np
import pandas as pd
from sklearn.linear_model import LogisticRegression

# Load the data
data = pd.read_csv('water_fountain_data.csv')

# Preprocess the data
X = data[['water_flow_rate', 'water_pressure', 'temperature', 'turbidity']]
y = data['malfunction']

# Split the data into training and test sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25)

# Train the predictive maintenance model
model = LogisticRegression()
model.fit(X_train, y_train)

# Evaluate the model on the test set
y_pred = model.predict(X_test)
accuracy = np.mean(y_pred == y_test)
print('Accuracy:', accuracy)

# Deploy the model to production
# This could involve integrating the model into the water fountain status platform or developing a separate application for the m
```

This serves as a basic illustration, and the actual design of the predictive maintenance system will differ based on your particular needs and specifications.

CONCLUSION:

Integrating predictive maintenance algorithms into your water fountain IoT system enables proactive detection and resolution of potential issues, enhancing fountain reliability and reducing maintenance expenses. This ensures residents' access to clean drinking water by preventing malfunctions before they happen.