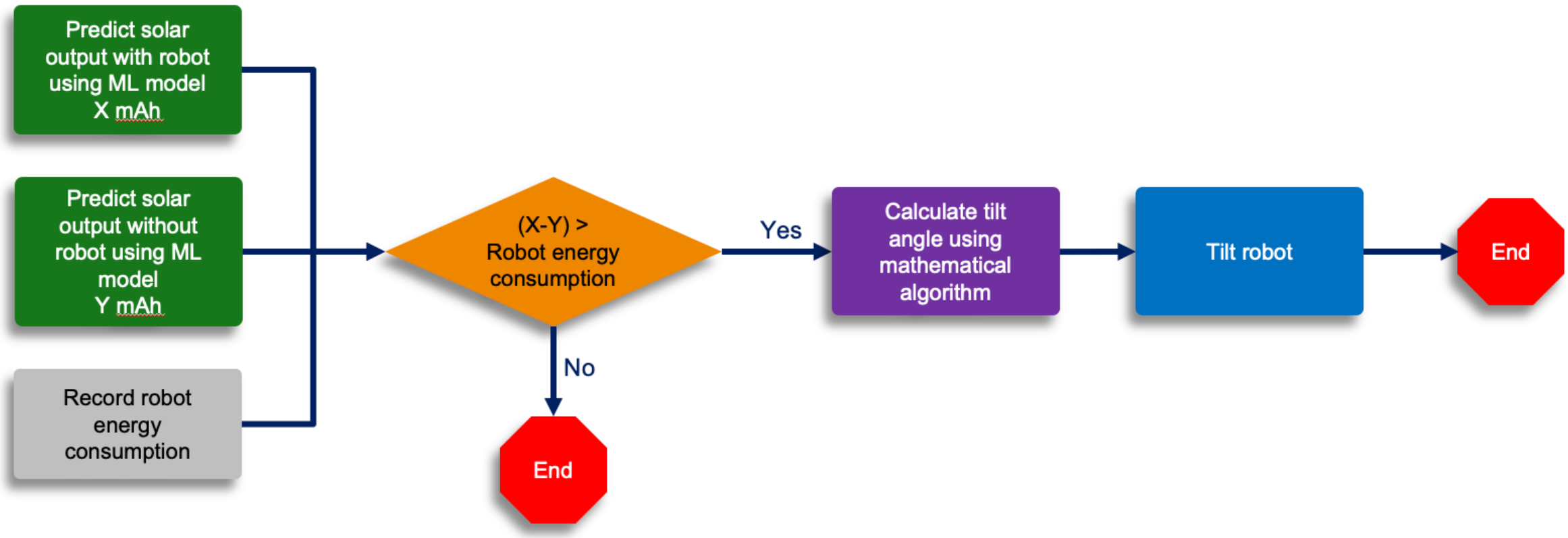
Predict solar output with robot using ML model X mAh
Predict solar output without robot using ML model Y mAh
Record robot energy consumption
(X-Y) > Robot energy consumption
Yes
No
End
Calculate tilt angle using mathematical algorithm
Tilt robot
End

Machine Learning | Python | Arduino

Prepare → Train → Predict → Calculate → Tilt

Collect past weather data using Dark Sky API

Collect past solar output data

Read combined weather and solar output data

Fit data into Gradient Boosting regression model using Scikit-Learn

Pick ML Variables to maximize accuracy

Train regression model for predicting solar output

ML Variables
- Hourly precipitation probability
- Hourly cloud cover
- Hourly temperature
- Time

Get current weather forecast using Dark Sky API

Predict solar output for next hour using trained regressor

Calculate Azimuth angle (A)

Calculate Zenith angle (Z)

Calculations

$$\cos\phi_s = \frac{\sin\delta - \cos\theta_s \sin\Phi}{\sin\theta_s \cos\Phi}$$

$$\cos\theta_s = \sin\alpha_s = \sin\Phi\sin\delta + \cos\Phi\cos\delta\cos h$$

- Φs is the azimuth angle
- θs is the zenith angle
- h is the hour angle
- δ is the sun declination
- Φ is the latitude

Set
Spin = A – 70°
Tilt = Z°

Is Tilt > 60°

Yes

Set
Tilt = 60°

No

Connect Servo 1 to port A3
Connect Servo 2 to port A1

Move Servo 1 to Tilt angle
Move Servo 2 to Spin angle