Supplementary Materials

A Comparison of Linear and Non-linear Machine Learning Techniques (PCA and SOM) for Characterizing Urban Nutrient Runoff

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Contents:

SM-1: Rain gauge and bubble flowmeter specifications.

Rain Gauge

Type:	Tipping bucket
Compatible equipment:	Teledyne ISCO 6700, 6712, and Avalanche Samplers, 4200 Series Flowmeters, 4100 Series Flow Logger, Signature Flowmeters
Connect cable:	50 ft. (15.2 m), 2 conductor with 4-pin plug
Bearings:	Spring-loaded sapphire jewel
Orifice Diameter:	8 in. (20 cm)
Sensitivity:	English - 0.01 inch; Metric 0.1 mm
Accuracy:	English - ±1% at 2 in/hour; +3%/-4% up to 5 in/hour. Metric - ±1.5% at 5 cm/hour; +3.5%/-9% up to 13 cm/hour
Capacity:	English – 22 inches/hour; Metric – 38 cm/hour
Output Signal:	Contact closure of at least 50 millisecond duration
Switch Type:	Normally open, encapsulated reed; 10 watts, 200V DC, 0.5 A maximum
Height:	13 in. (33 cm)
Diameter:	9.5 in. (24 cm) (at mounting base)
Weight:	10 lbs. (4.5 kg)
Operating Temperature:	32° to 140°F (0° to 60°C)
Storage Temperature:	-40° to 140°F (-40° to 60°C)

For a full list of product specifications, see the datasheet.

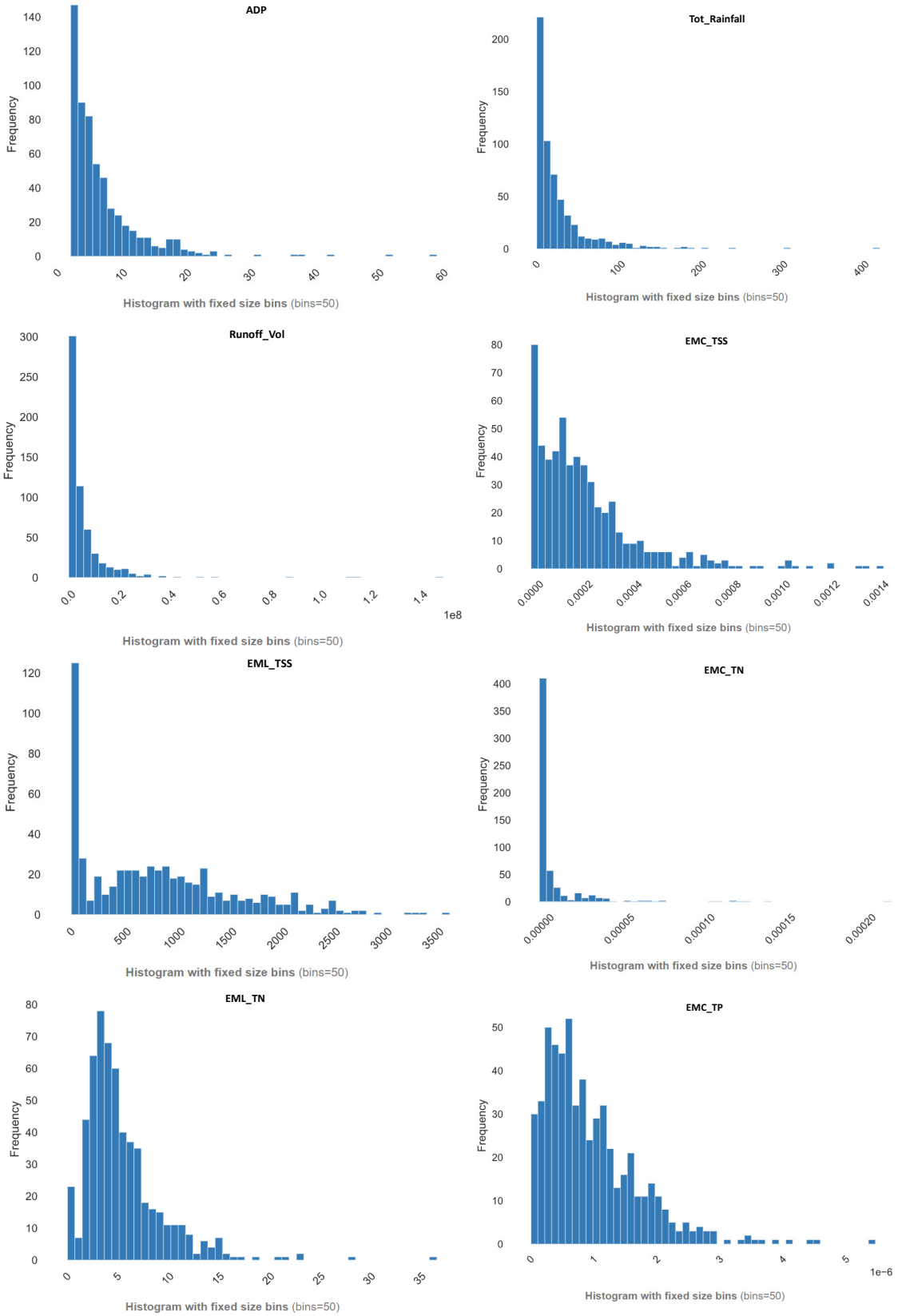
730 Bubbler Flow Module

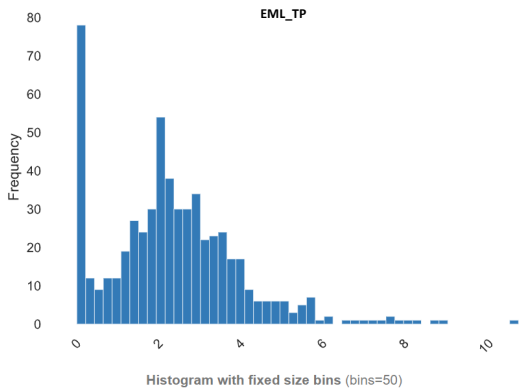
Size (HxWxD):	4.9 x 5.7 x 2.0 in (12.4 x 14.5 x 5.1 cm)
Weight:	1.1 lbs (0.5 kg)
Material:	Polystyrene
Enclosure:	NEMA 4X, 6 IP67
Power:	9 to 14V DC (provided by 6700 Series Sampler)
Program Memory:	Non-volatile, programmable flash; can be updated via interrogator port on 6700 Series Sampler using a PC
Operating Temperature:	32° to 120°F (0° to 49°C)
Storage Temperature:	0° to 140°F (-18° to 60°C)

Bubbler

Range:	0.1 to 10 ft (0.03 to 3.05 m)
Level Measurement Accuracy (Non-linearity, repeatability, and hysteresis at 25°C (77°F). Max error (±) for indicated level range.	
0.1 to 5.0 ft (0.03 to 1.52 m):	±0.005 ft (±0.002 m)
0.1 to 7.0 ft (0.03 to 2.13 m):	±0.01 ft (±0.003 m)
0.1 to 10 ft (0.03 to 3.05 m):	±0.035 ft (±0.011 m)
Temperature Coefficient (Maximum error (±) per degree of temperature change over compensated range)	
For level in feet:	±0.0003 x level x temperature change from 72°F
For level in meters:	±0.0009 x level x temperature change from 22°C
Automatic Drift Correction:	After a 5 minute warm-up period, zero level is corrected to ±0.002 ft. (±0.0006 m) at intervals between 2 and 15 minutes
Long-Term Level Calibration Change:	Typically 0.5% of reading per year
Ambient Operating Temperature Range:	0° to 140°F (-18° to 60°C)
Compensated Temperature Range:	32° to 140°F (0° to 60°C)

SM-2: Frequency histograms of all the variables involved in the system.




EML_TP
Frequency
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
Histogram with fixed size bins (bins=50)

SM-3: Correlation plots among variables.