KING FAHD UNIVERSITY of PETROLEUM and MINERALS

College of Computer Sciences and Engineering
Systems Engineering Department
Control and Instrumentation Eng.

CISE-438
Process Instrumentation

A Combined Cycle Power Plant Investigation and Analysis

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Combined Cycle Power Plant

Regular Power Plant uses gas or oil to generate electricity

Regular Power Plants efficiency is around 30-33 %

Combined Cycle Power Plant introduces more complex processes to increase the efficiency, thus, generating more electricity
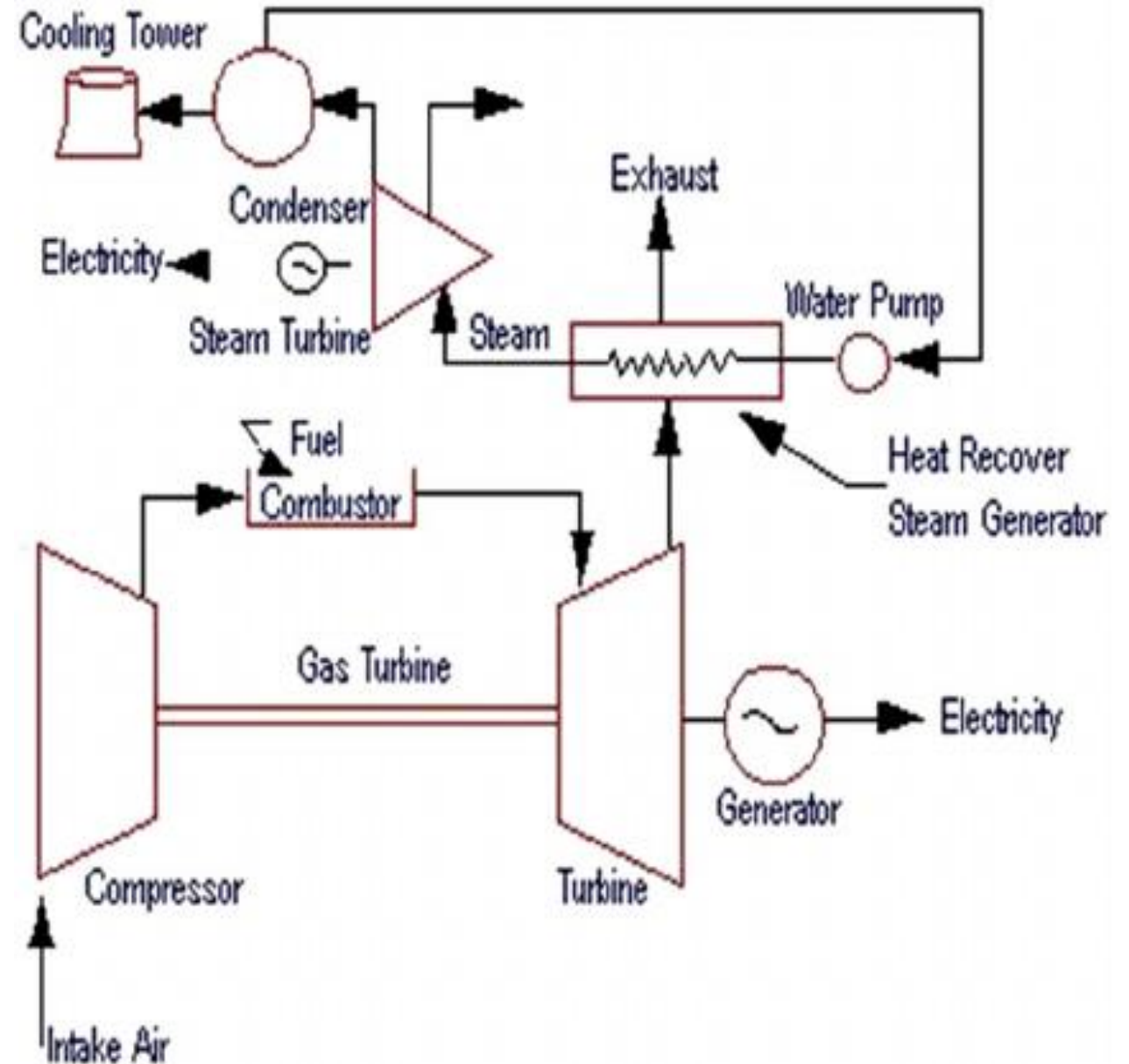
It uses a gas turbine in addition to a steam turbine

Its efficiency can reach up to 60%

Combined Cycle Power Plant Diagram

Combined Cycle Power Plant Dataset

✔ Characteristics: Multivariate

📊 Type: Real Data

🔬 Number of Samples: 9568 Measurements

⑤ Number of Variables: 4 Parameters

📚 Collection Time: 6 years (2006-2011)

Dataset Sample

	AT	V	AP	RH	EP
310	23.13	71.25	1002.49	94.59	431.91
4718	15.67	38.62	1015.76	66.29	463.17
5804	29.36	78.05	1011.12	64.17	434.29
9086	29.86	69.34	1007.76	54.12	433.57
5766	28.18	66.56	1005.69	65.67	426.79
3899	14.79	38.73	999.83	86.45	470.28
8210	33.75	64.96	1002.54	39.28	432.62
2951	9.27	42.02	1004.29	95.05	474.93

Attribute Information

AMBIENT TEMPERATURE RANGE [1.81 37.11] °C
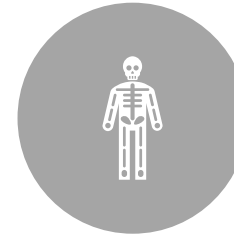
AMBIENT PRESSURE RANGE [992.89 1033.3] MILLIBAR
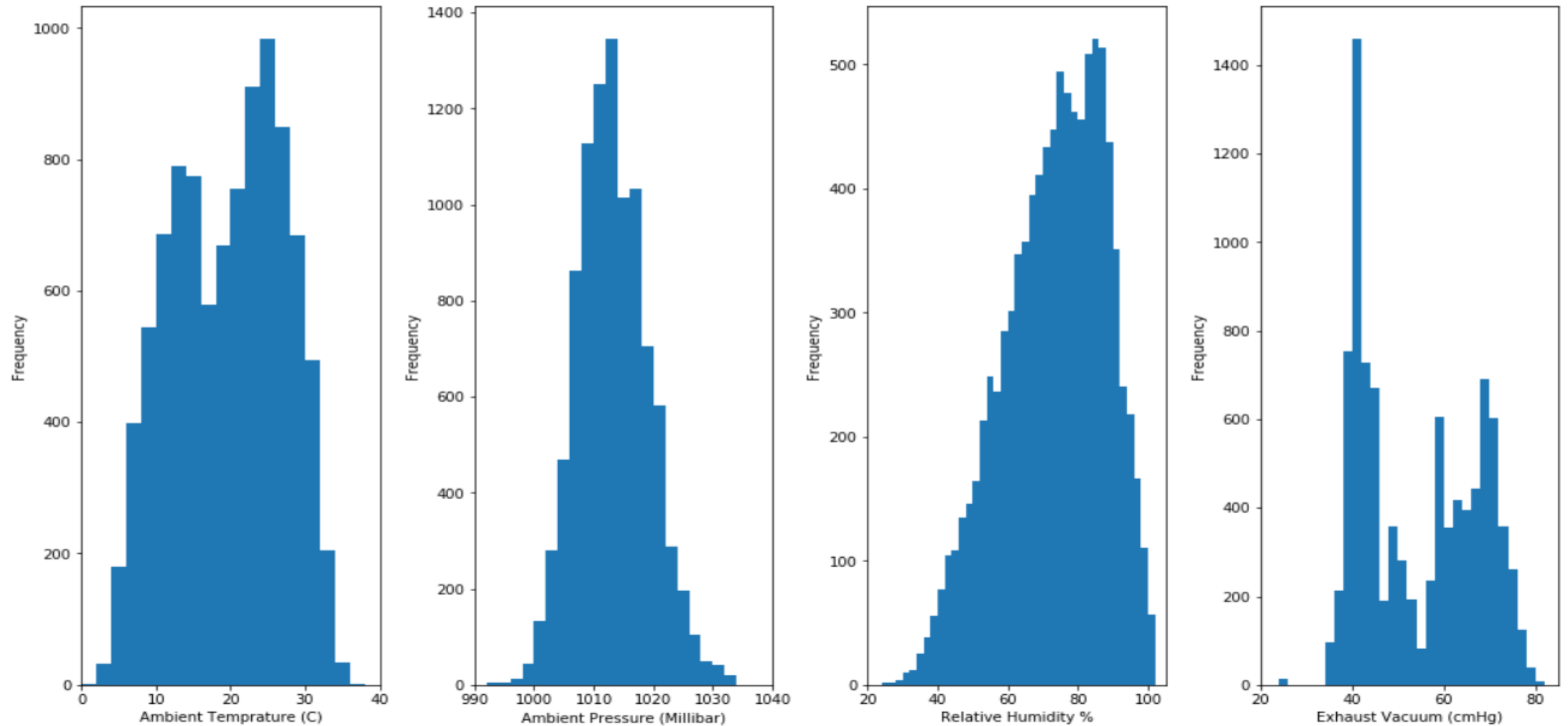
RELATIVE HUMIDITY RANGE [25.56 100.16]%
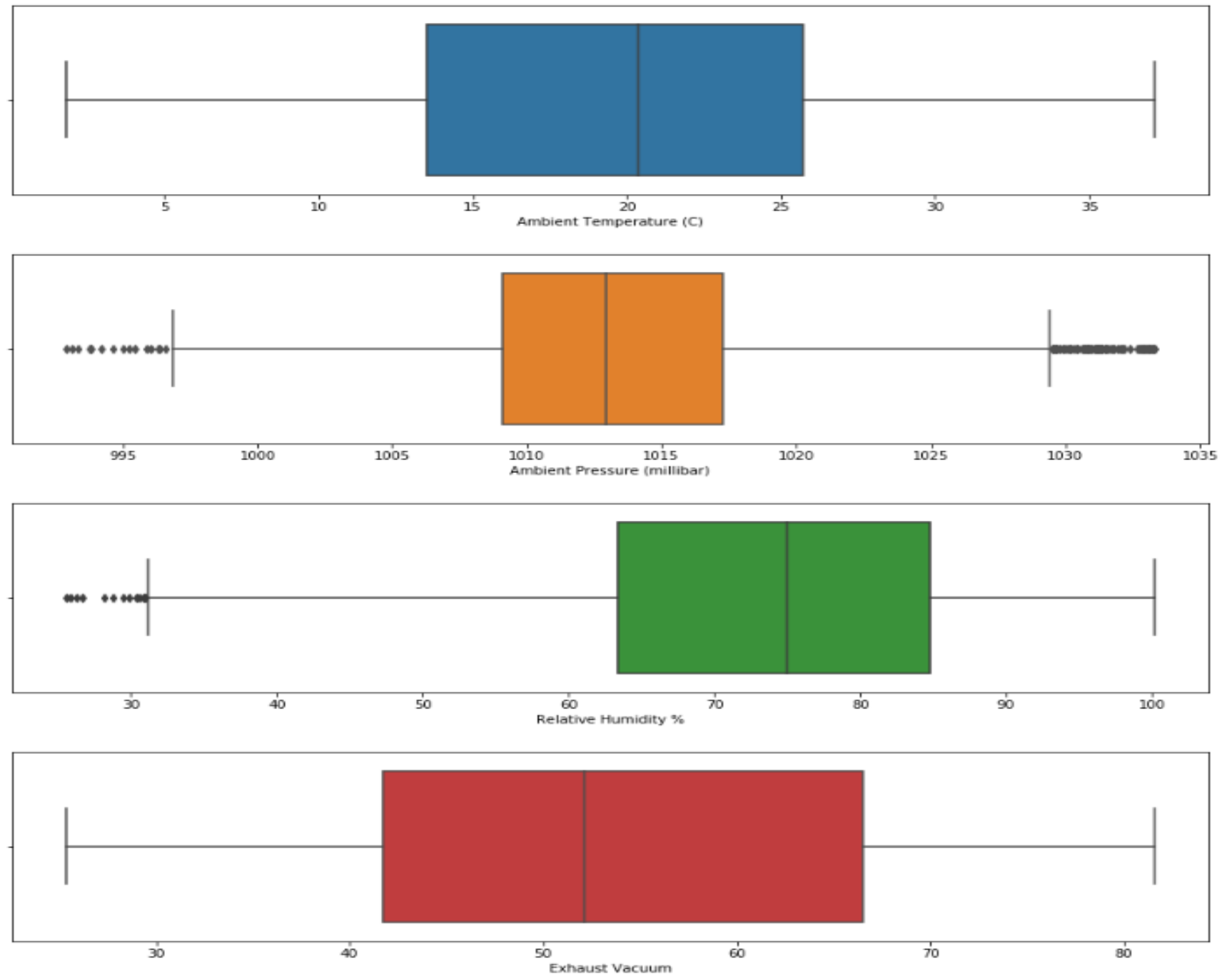
EXHAUST VACUUM RANGE [25.36 81.56] CM HG

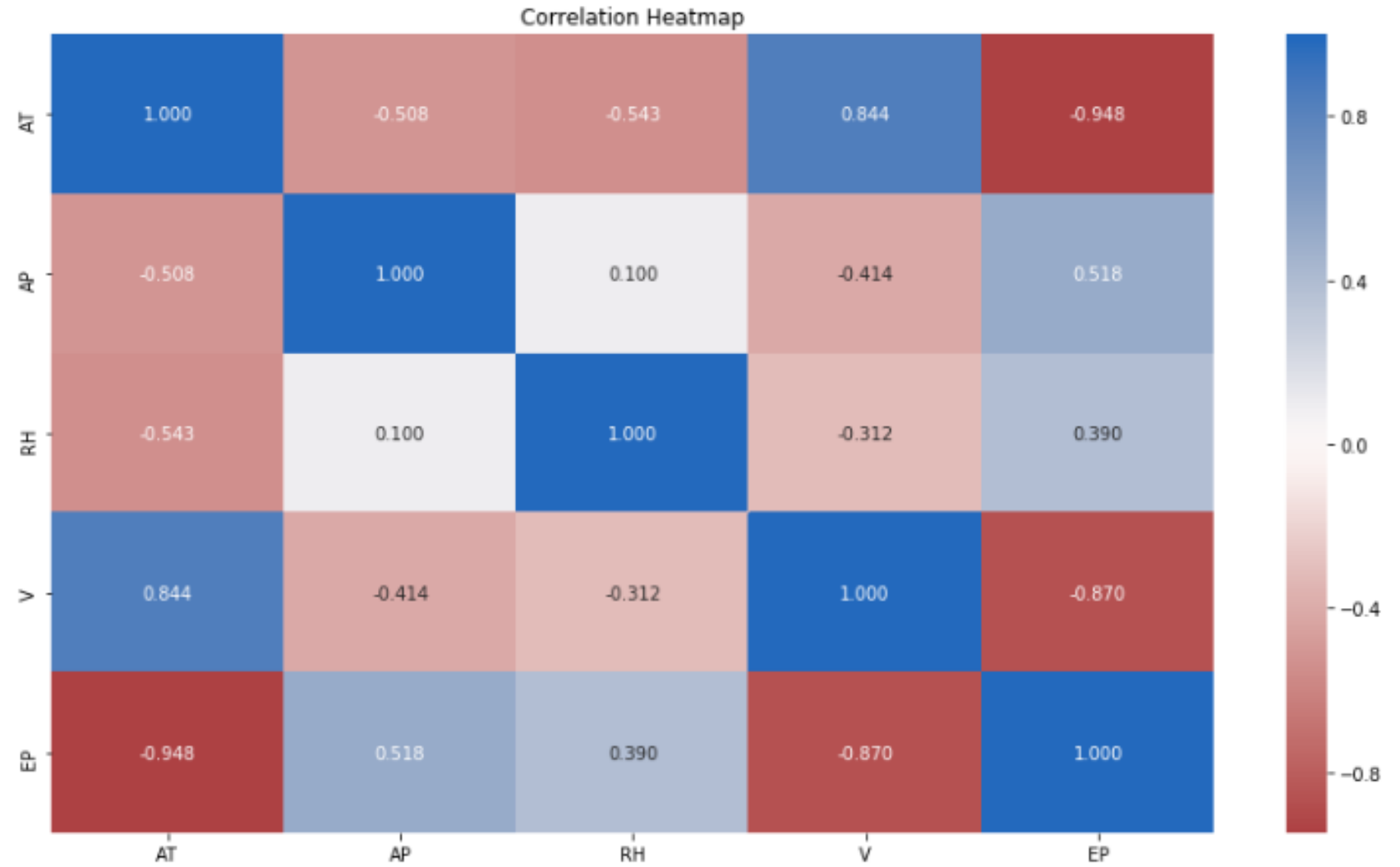**NET HOURLY ELECTRICAL ENERGY**

RANGE [420.26 495.76] MW

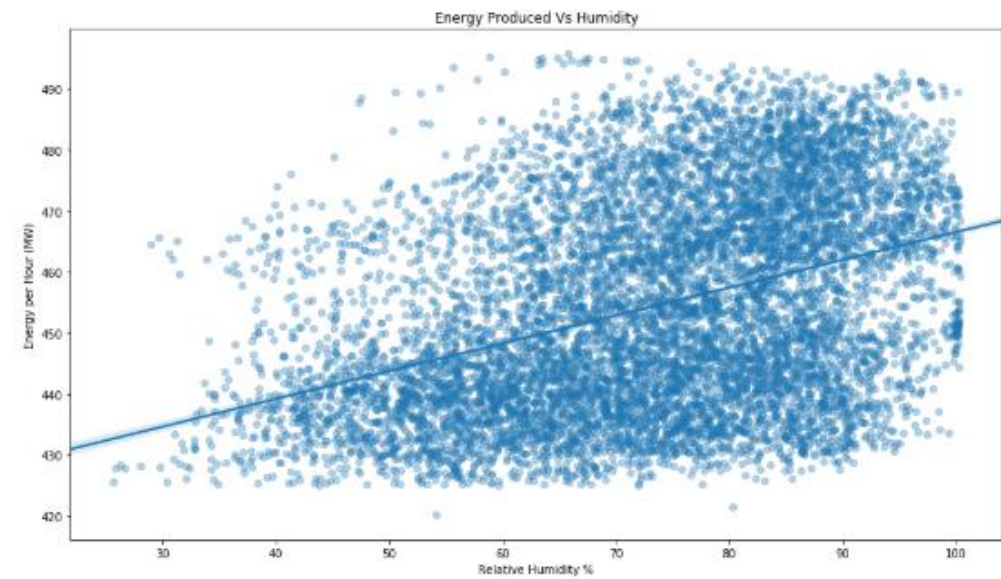Investigation & Analysis
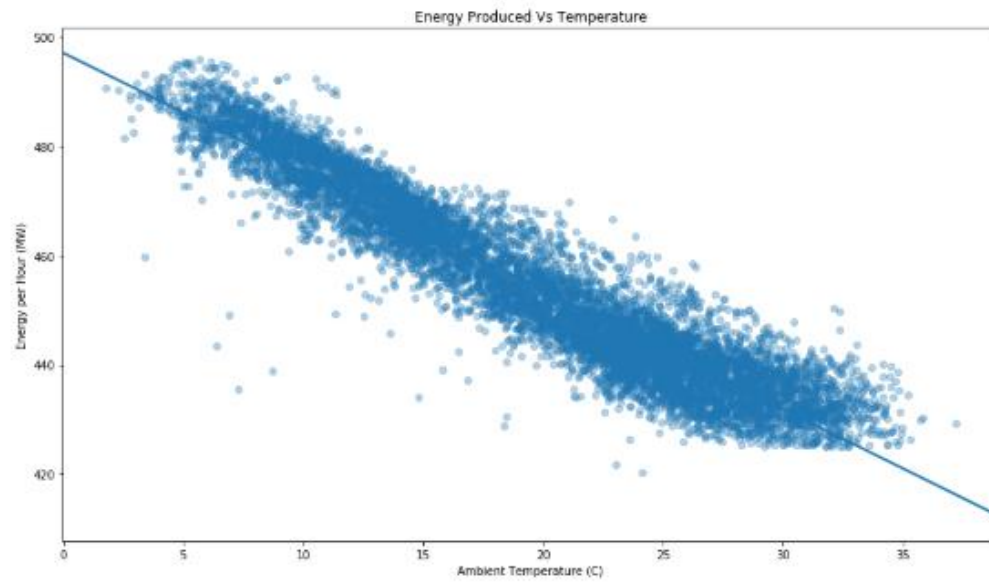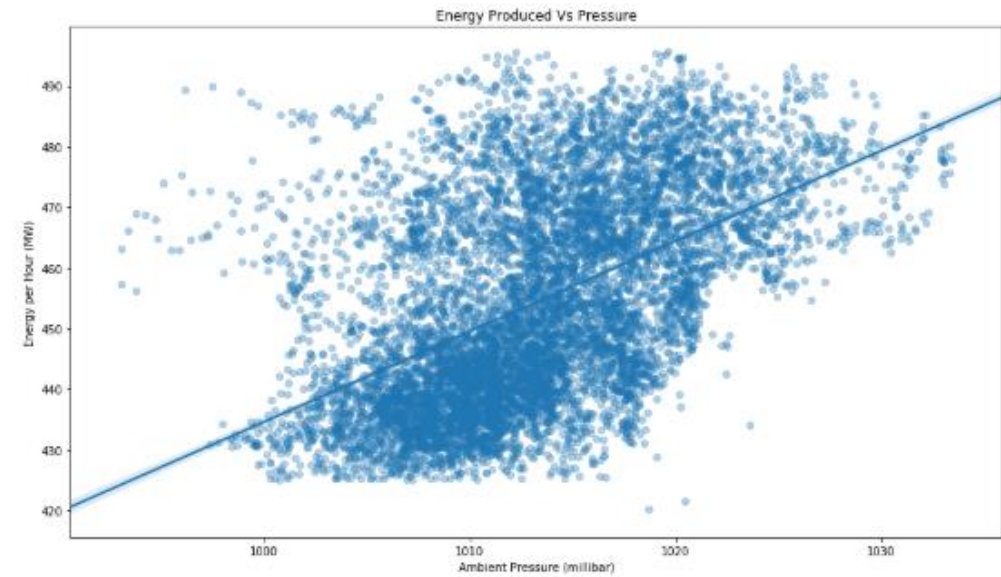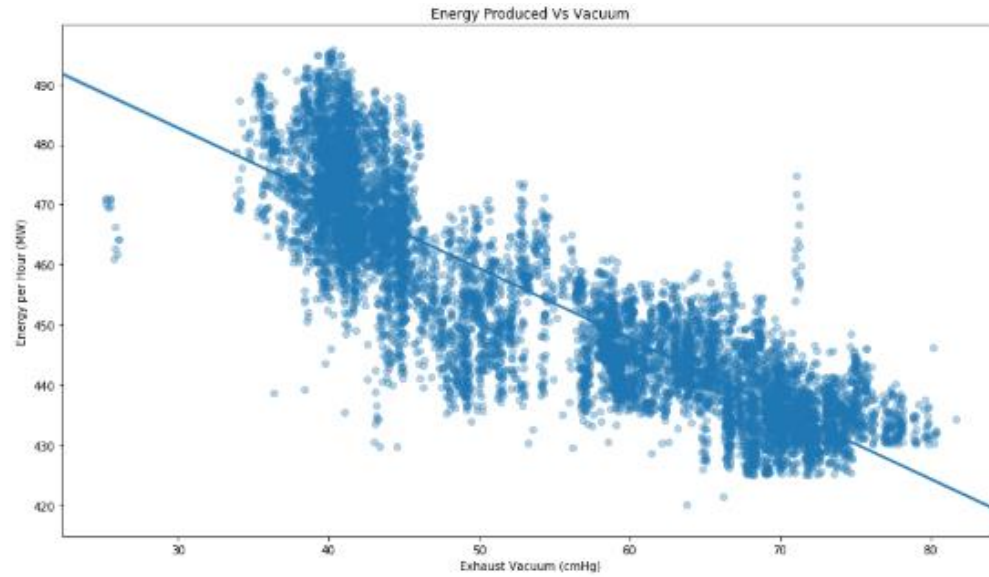
Attribute Distributions

Box Plots

Correlation Heatmap

Energy Produced Vs Attributes

Conclusions

Ambient Temperature is the most observed effective parameter on the output energy

The output energy is linearly proportional to both Exhaust vacuum and Temperature

The output energy is inversely proportional to both Humidity and Ambient Pressure

High fluctuations exist in the measurement of the Exhaust Vacuum variable

Outliers are present in the measurement of Ambient Pressure

References

Pınar Tüfekci, Prediction of full load electrical power output of a base load operated combined cycle power plant using machine learning methods, International Journal of Electrical Power & Energy Systems, Volume 60, September 2014, Pages 126-140, ISSN 0142-0615

Heysem Kaya, Pınar Tüfekci , Sadık Fikret Gürgen: Local and Global Learning Methods for Predicting Power of a Combined Gas & Steam Turbine, Proceedings of the International Conference on Emerging Trends in Computer and Electronics Engineering ICETCEE 2012, pp. 13-18 (Mar. 2012, Dubai)