IMPLEMENTATION OF STOCHASTIC METHODS FOR INDUSTRIAL GAS TURBINE FAULT DIAGNOSIS

C. Romessis **K. Mathioudakis**

Laboratory of Thermal Turbomachines
National Technical University of Athens

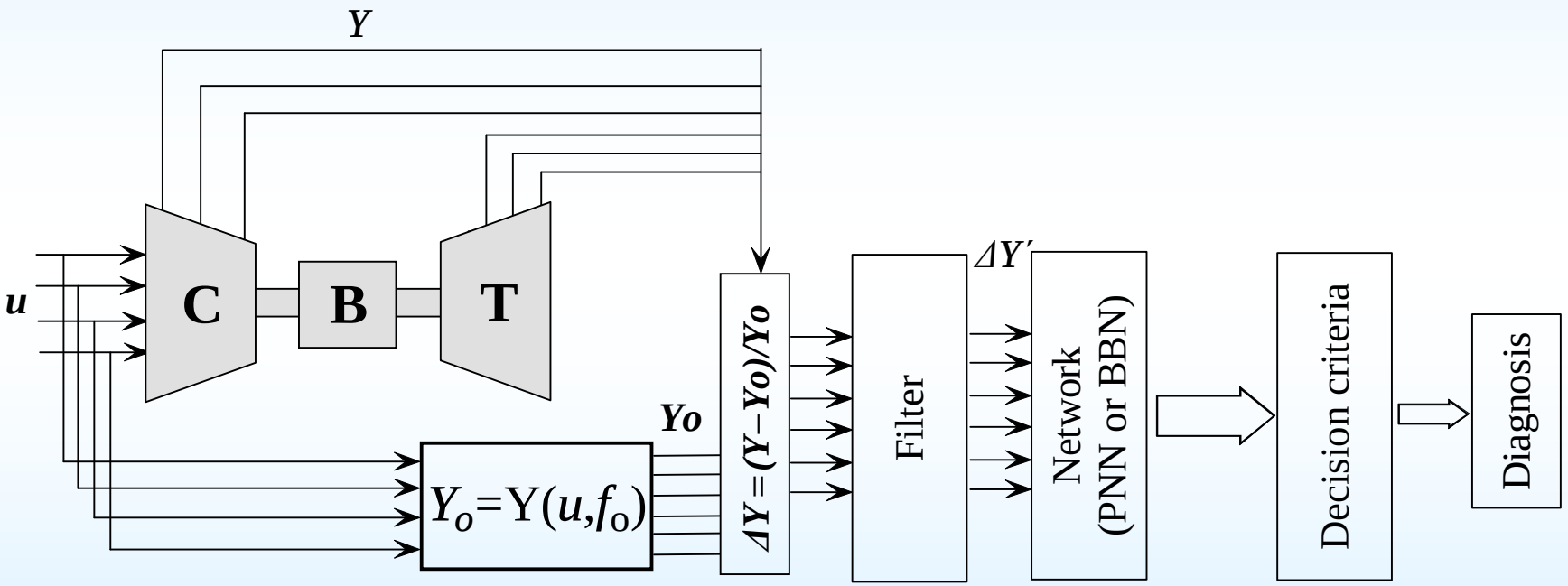
Implementation Of Stochastic Methods For Industrial Gas Turbine Fault Diagnosis

- § Diagnostic Scheme with GPA
- §Stochastic Methods Used
- §Twin Shaft Industrial GT Implementation
- §Signle Shaft Industrial GT Implementation
- §Summary - Conclusions

Implementation Of Stochastic Methods For Industrial Gas Turbine Fault Diagnosis

- **§ Diagnostic Scheme with GPA**
- **§Stochastic Methods Used**
- **§Twin Shaft Industrial GT Implementation**
- **§Single Shaft Industrial GT Implementation**
- **§Summary - Conclusions**

The Diagnostic Process



Implementation Of Stochastic Methods For Industrial Gas Turbine Fault Diagnosis

§ Diagnostic Scheme with GPA

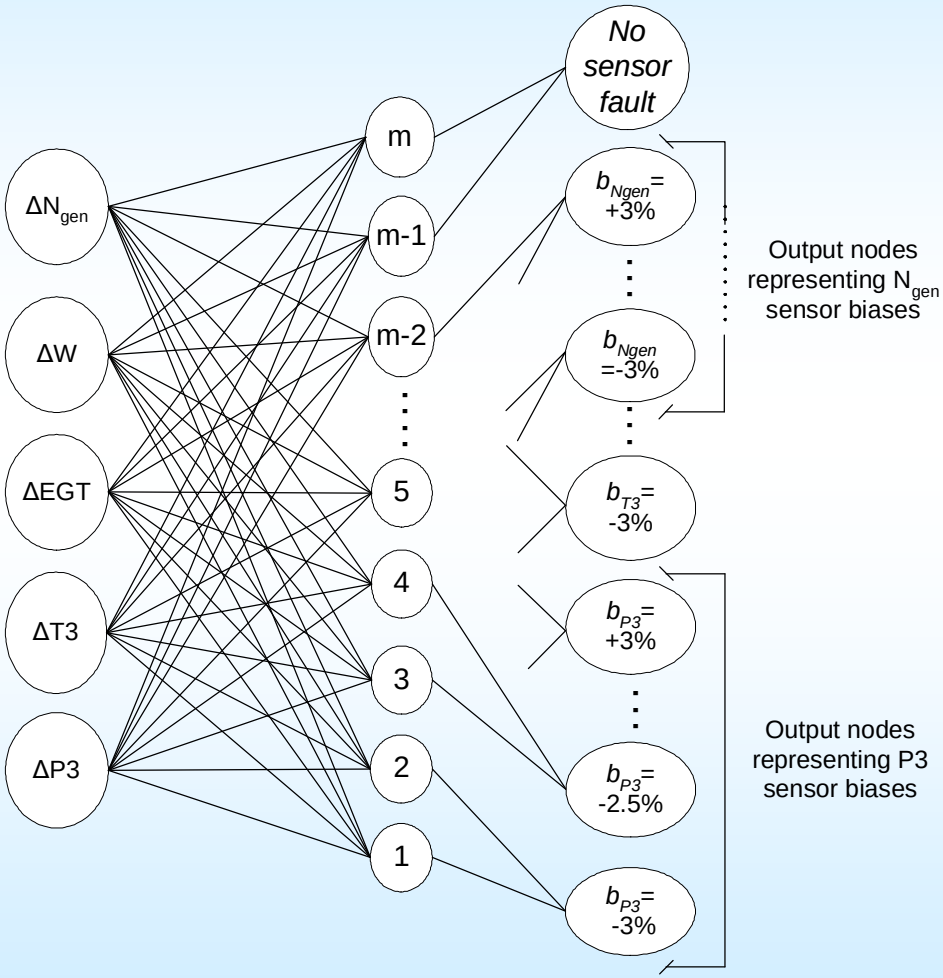
§Stochastic Methods Used

§Twin Shaft Industrial GT Implementation

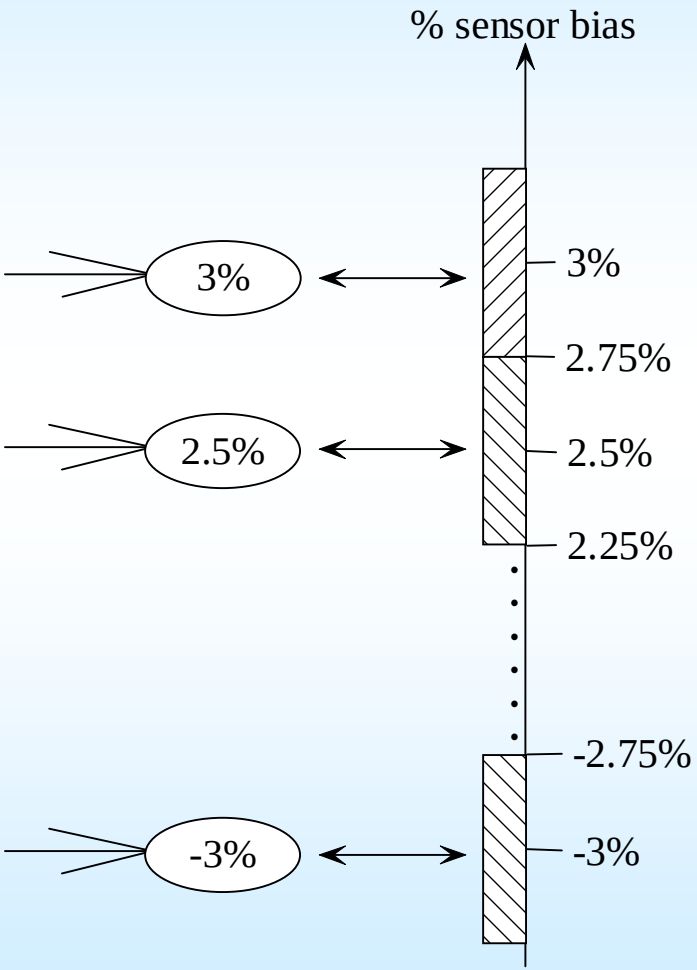
§Single Shaft Industrial GT Implementation

§Summary - Conclusions

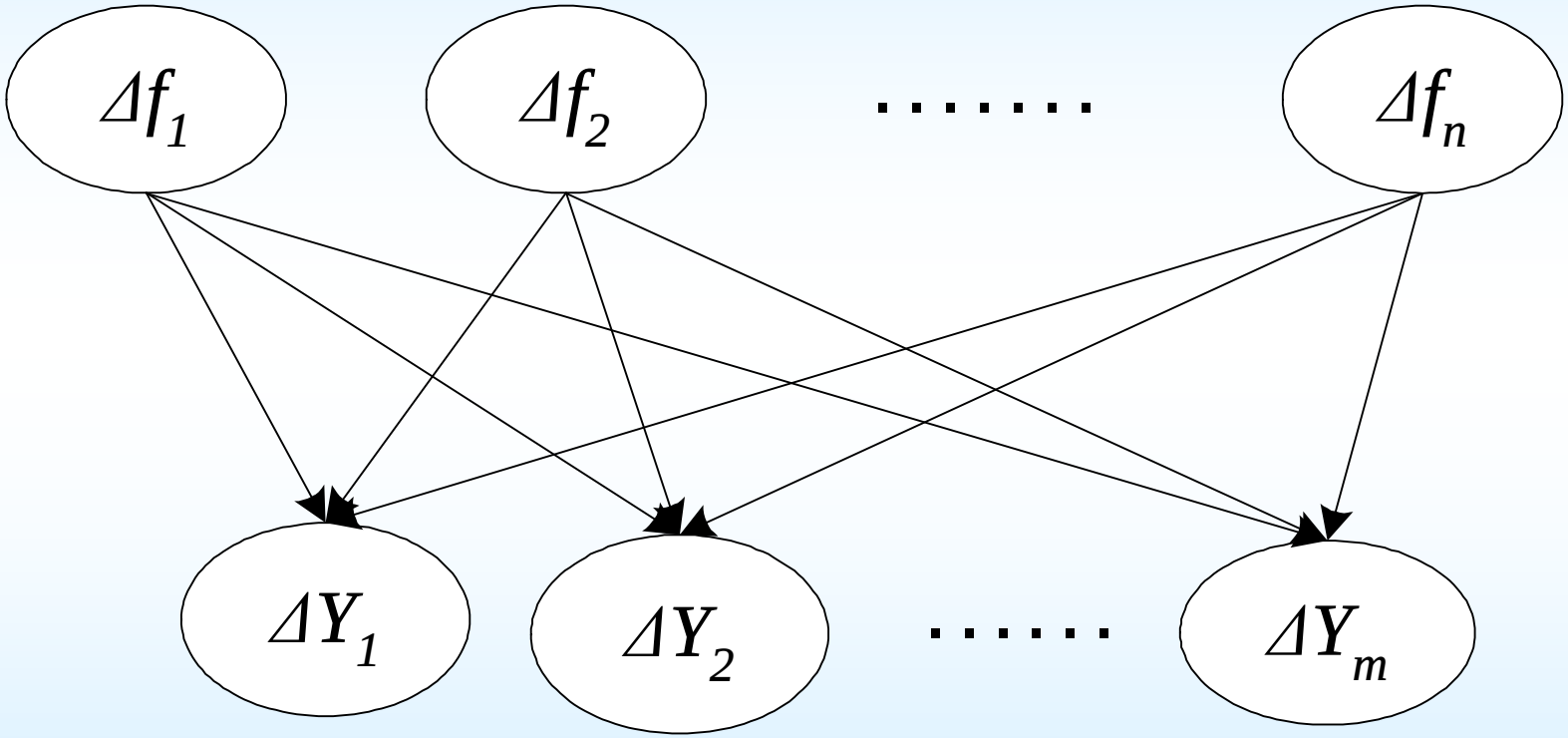
The method of PNN for sensor fault diagnosis



The method of PNN for sensor fault diagnosis

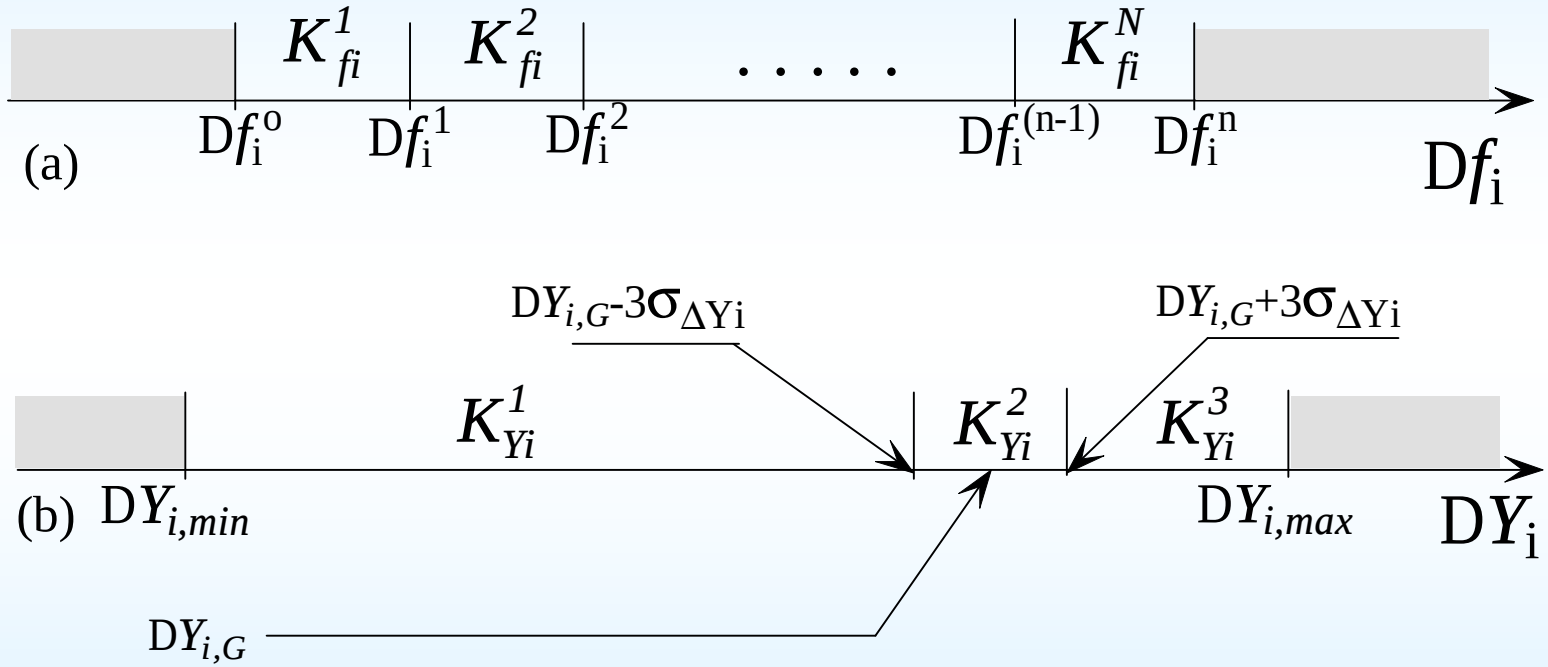


BBN for component faults diagnosis (I)



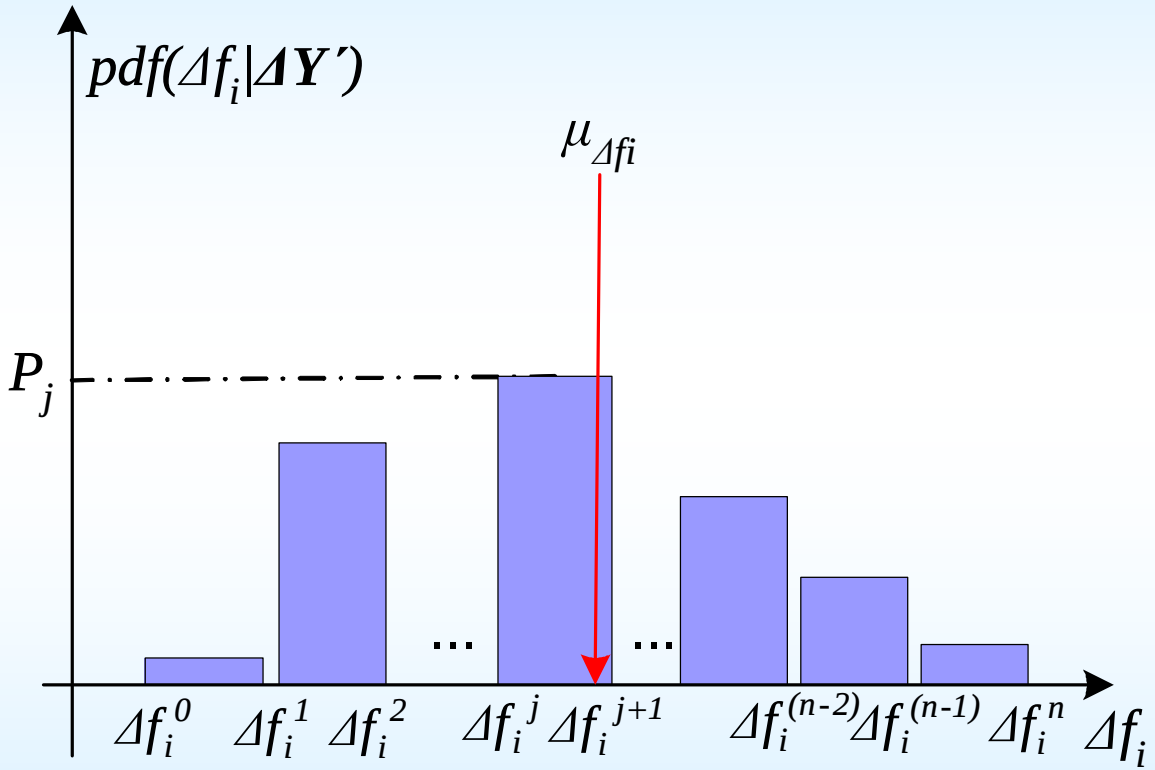
Architecture of BBN for Component Fault Diagnosis

BBN for component faults diagnosis (II)



states of the nodes of the diagnostic BBN. (a. health parameter node, b. measurement node).

BBN for component faults diagnosis (III)



Probability density function of the fi health parameter

Implementation Of Stochastic Methods For Industrial Gas Turbine Fault Diagnosis

§ Diagnostic Scheme with GPA

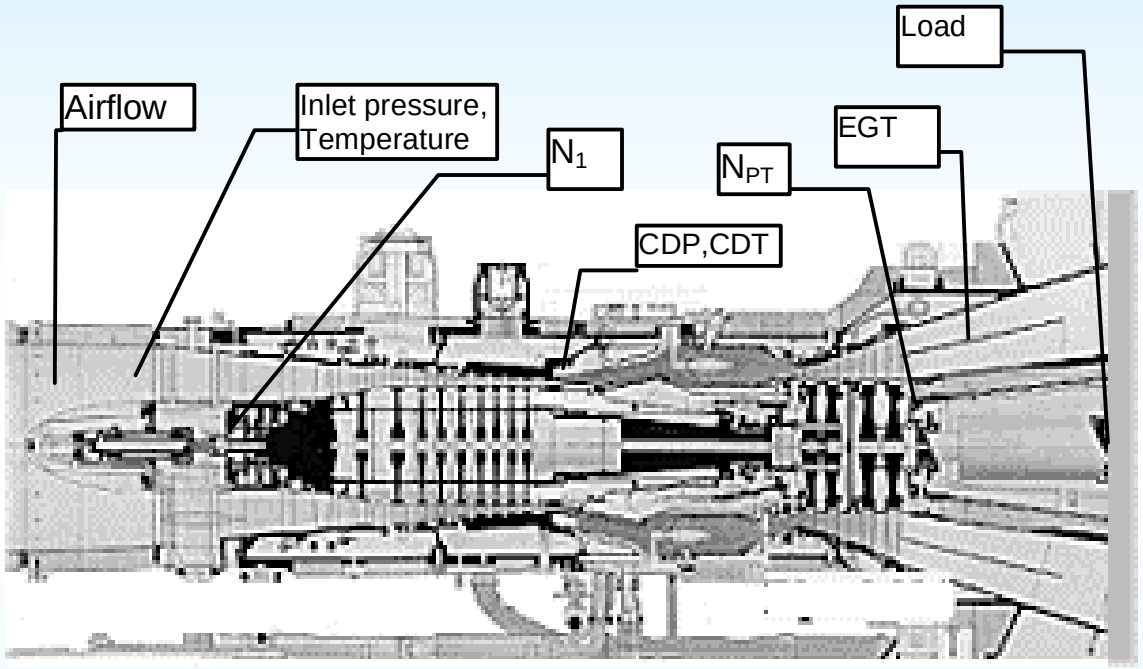
§Stochastic Methods Used

§Twin Shaft Industrial GT Implementation

§Single Shaft Industrial GT Implementation

§Summary - Conclusions

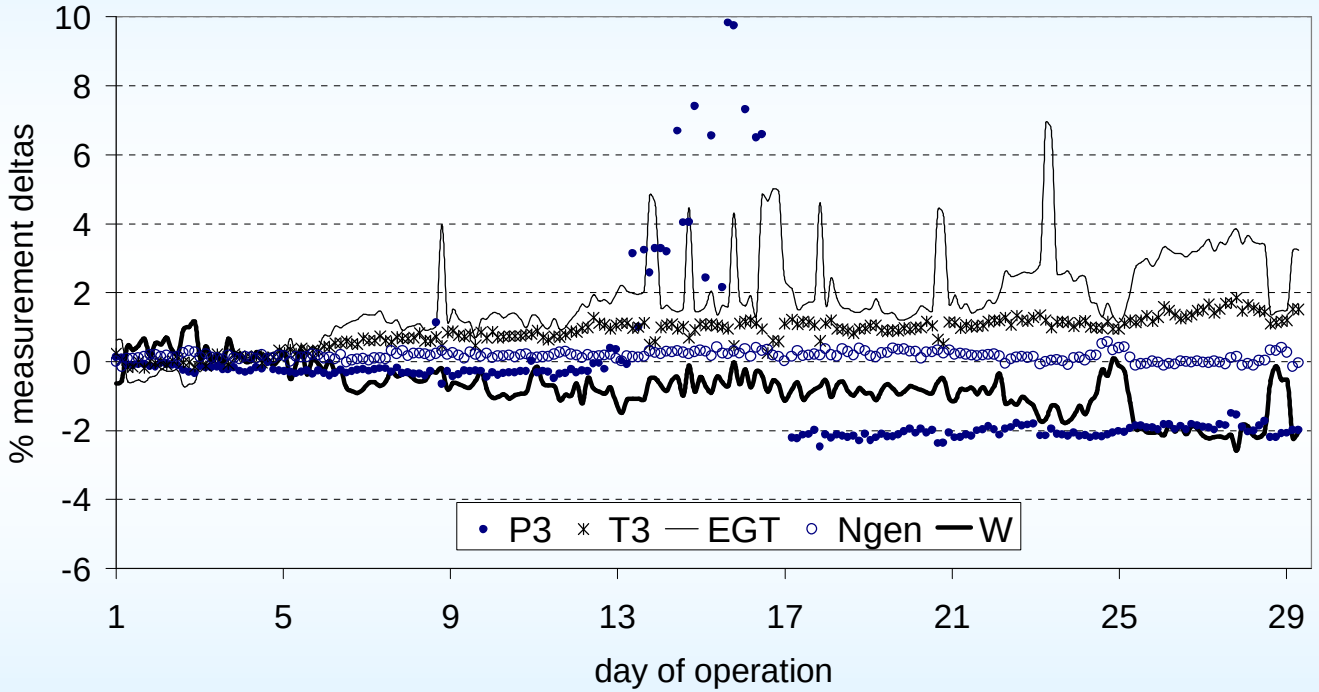
Fault Diagnosis On A Twin Shaft Industrial Gas Turbine



Gas turbine Layout and quantities measured for monitoring

Sensor Fault Diagnosis using PNN

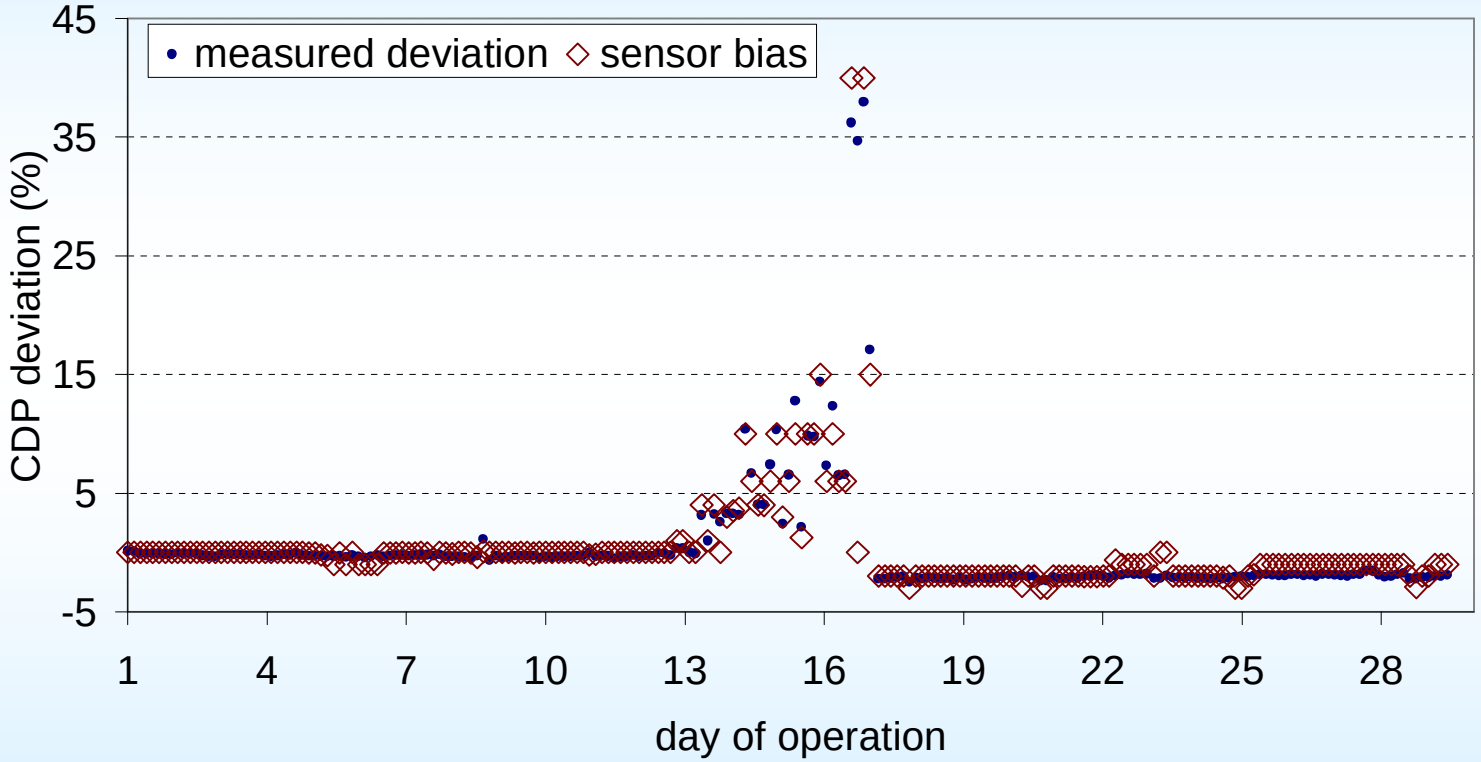
Twin Shaft Industrial Gas Turbine



Evolution of Deltas

Sensor Fault Diagnosis using PNN

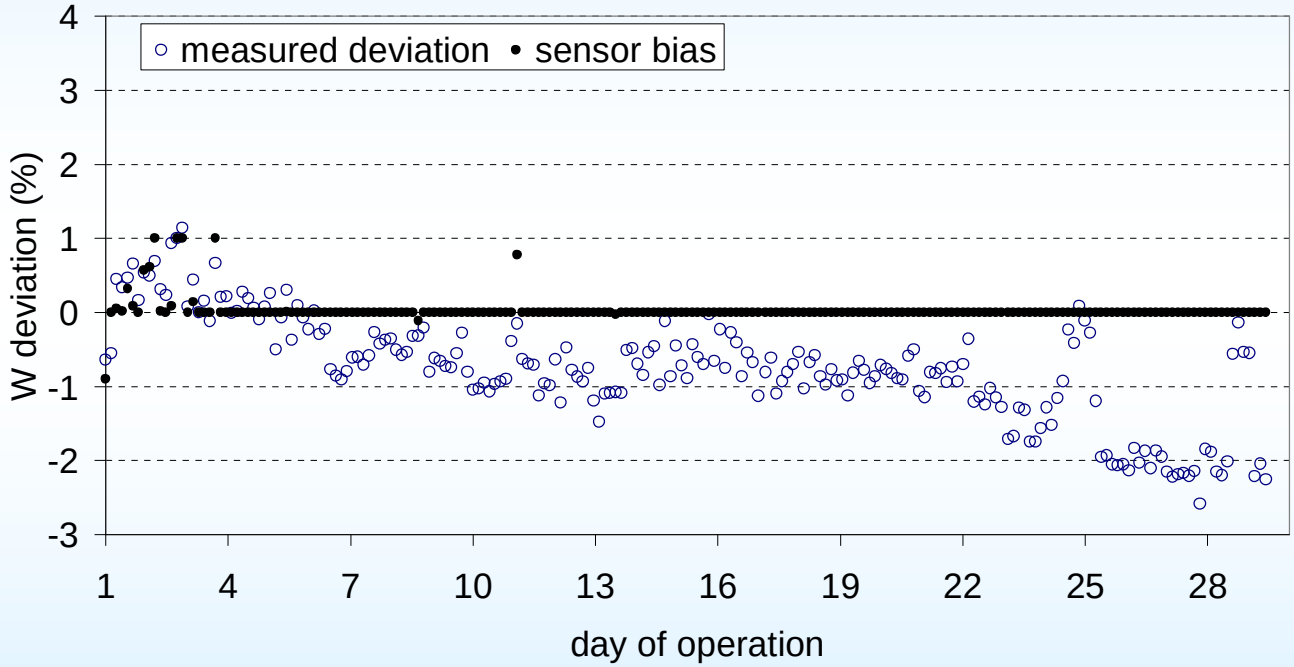
Twin Shaft Industrial Gas Turbine



Estimated biases of P3 sensor and deviations of its measured values

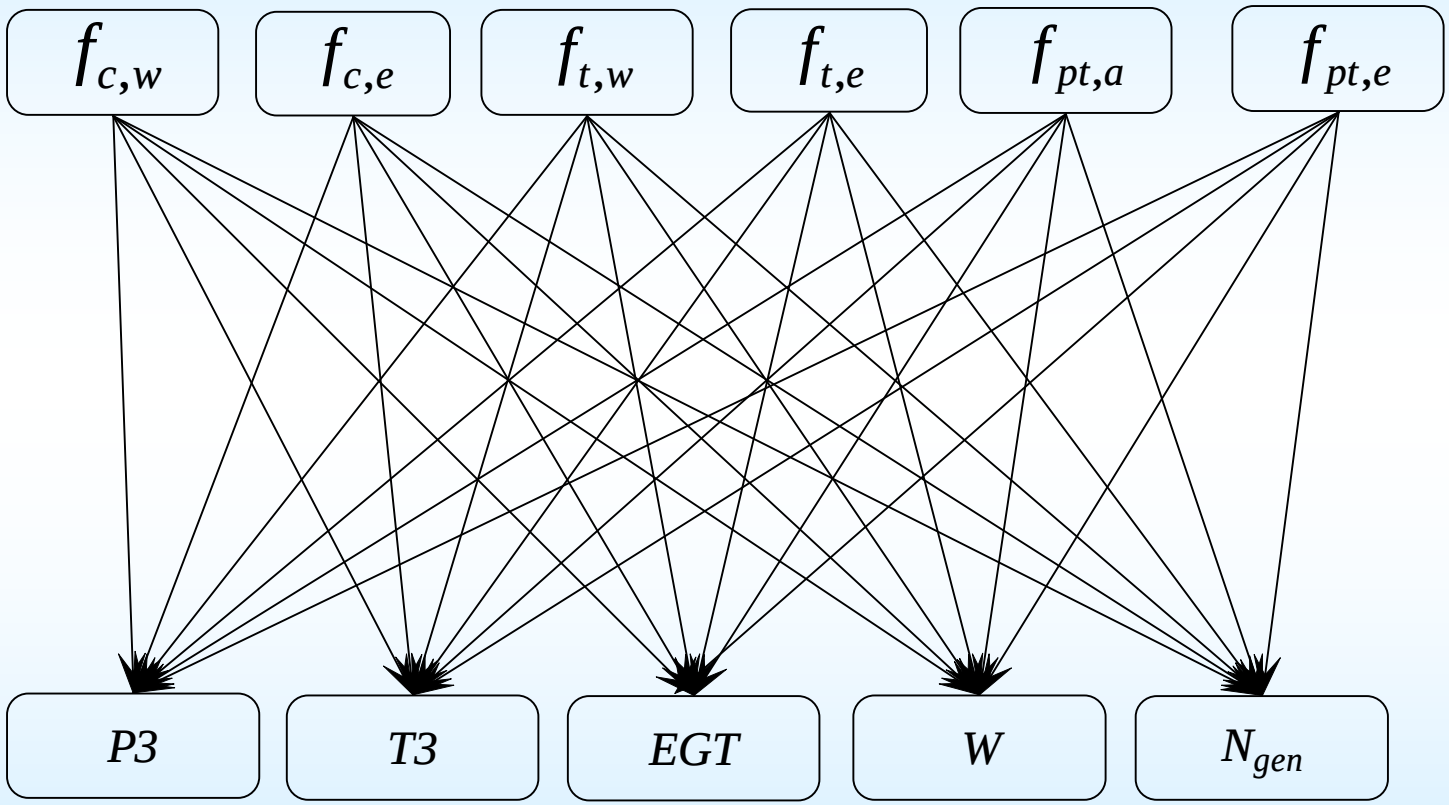
Sensor Fault Diagnosis using PNN

Twin Shaft Industrial Gas Turbine



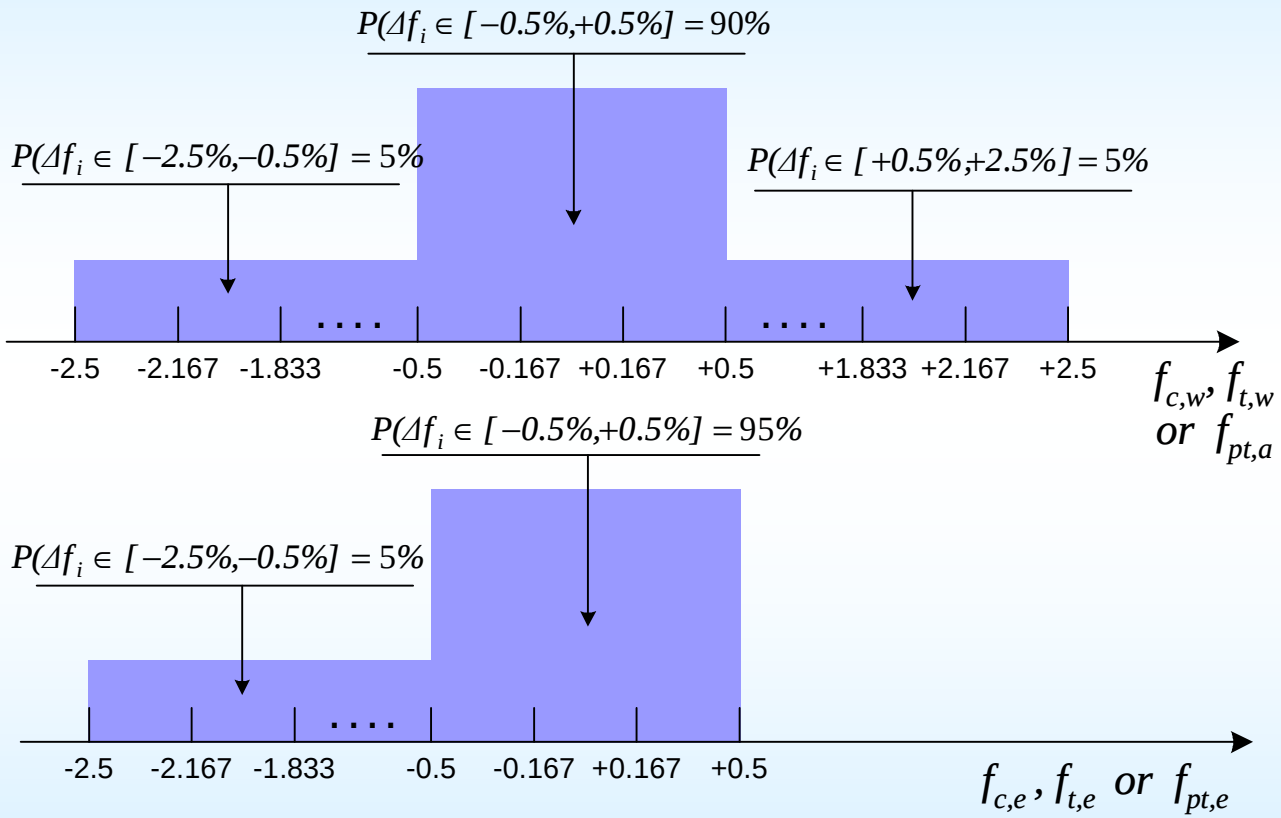
Estimated biases of W and deviations of measured values

BBN for component fault diagnosis



Architecture of the BBN for component fault diagnosis on the twin shaft gas tur

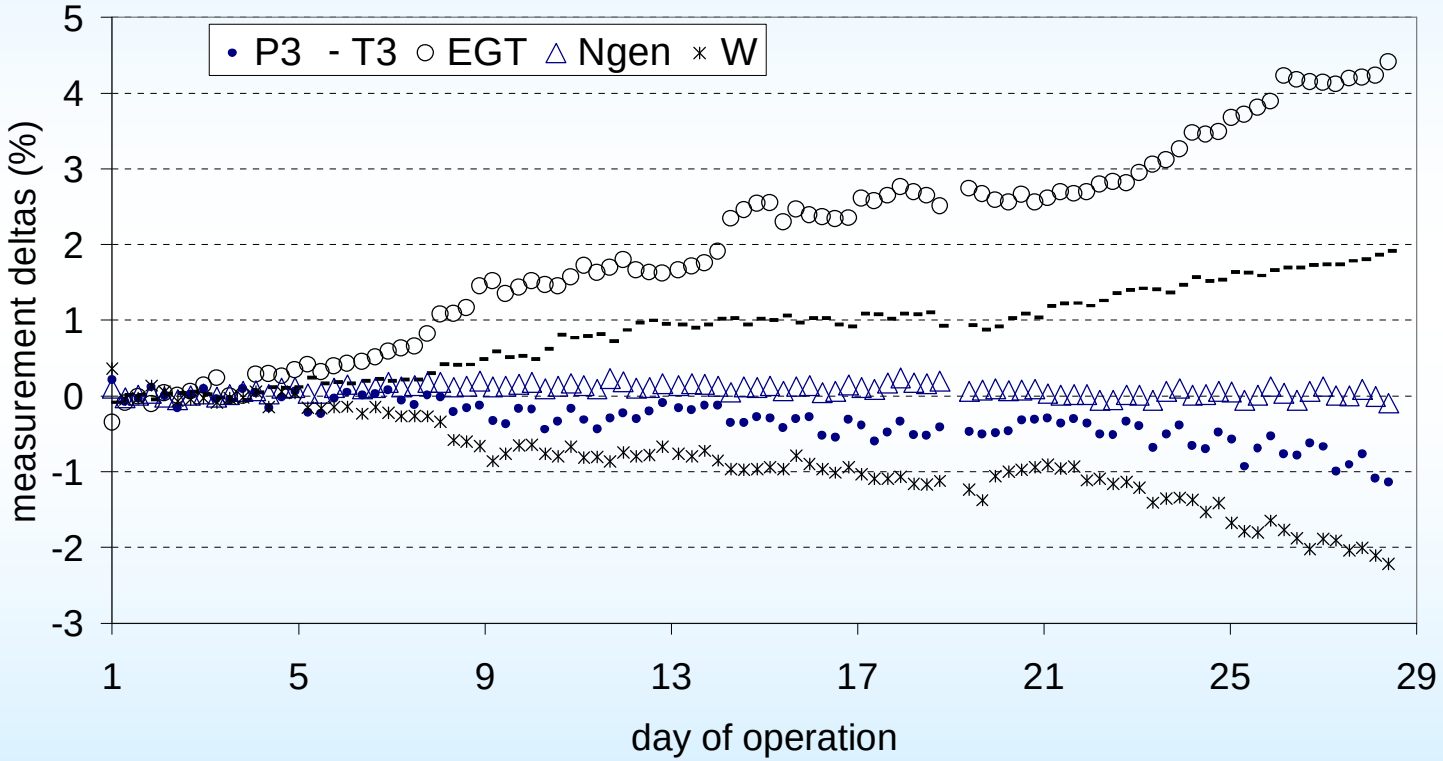
BBN for component fault diagnosis



States (a) and the a-priori probability density functions (b) of the health parameter nodes

Component Fault Diagnosis using BBN

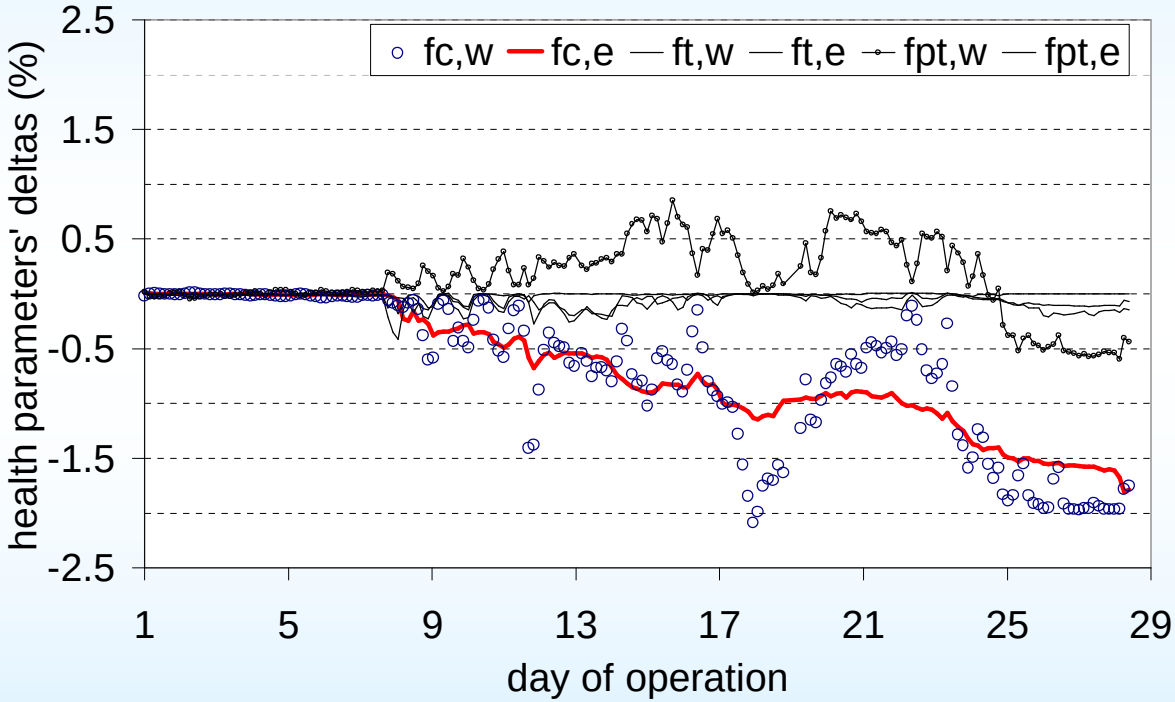
Twin Shaft Industrial Gas Turbine



Deviations of measurements

Component Fault Diagnosis using BBN

Twin Shaft Industrial Gas Turbine



Diagnosis of a compressor fouling case

Implementation Of Stochastic Methods For Industrial Gas Turbine Fault Diagnosis

§ Diagnostic Scheme with GPA

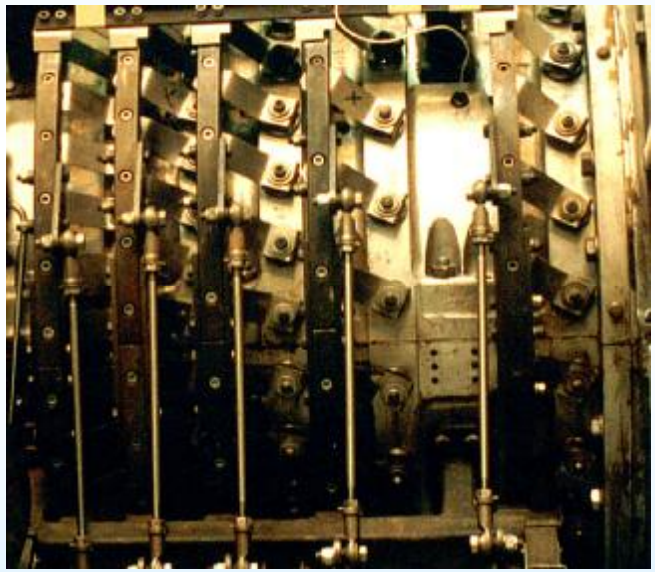
§Stochastic Methods Used

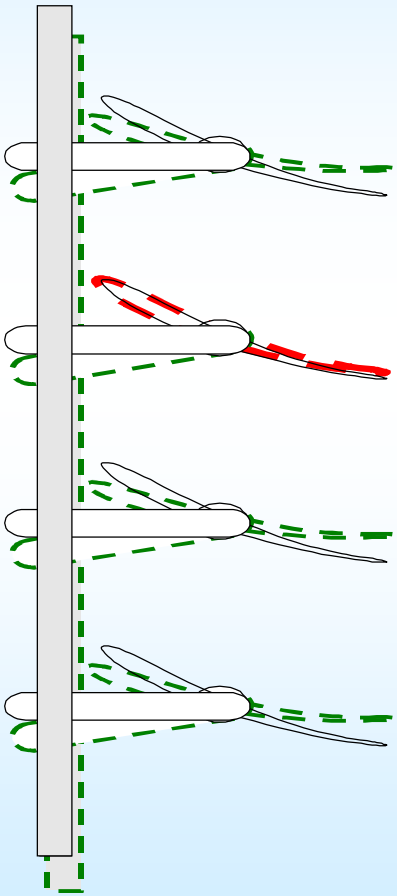
§Twin Shaft Industrial GT Implementation

§Single Shaft Industrial GT Implementation

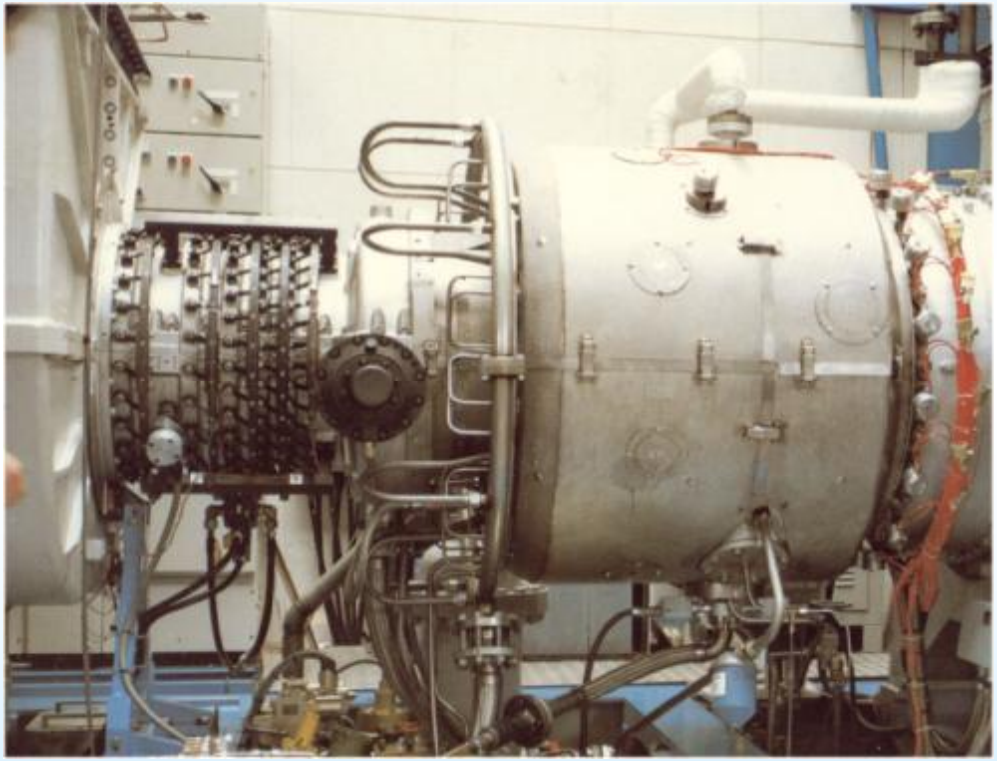
§Summary - Conclusions

Fault Diagnosis On A Single Shaft Industrial Gas Turbine (I)

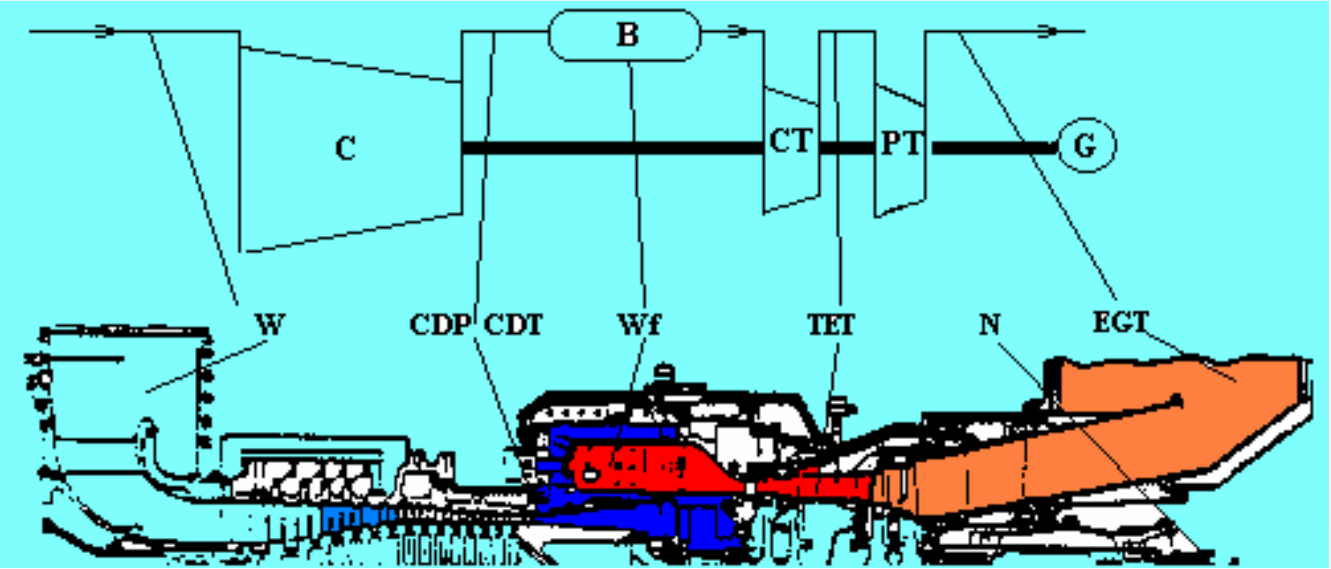




Fault Diagnosis On A Single Shaft Industrial Gas Turbine (II)



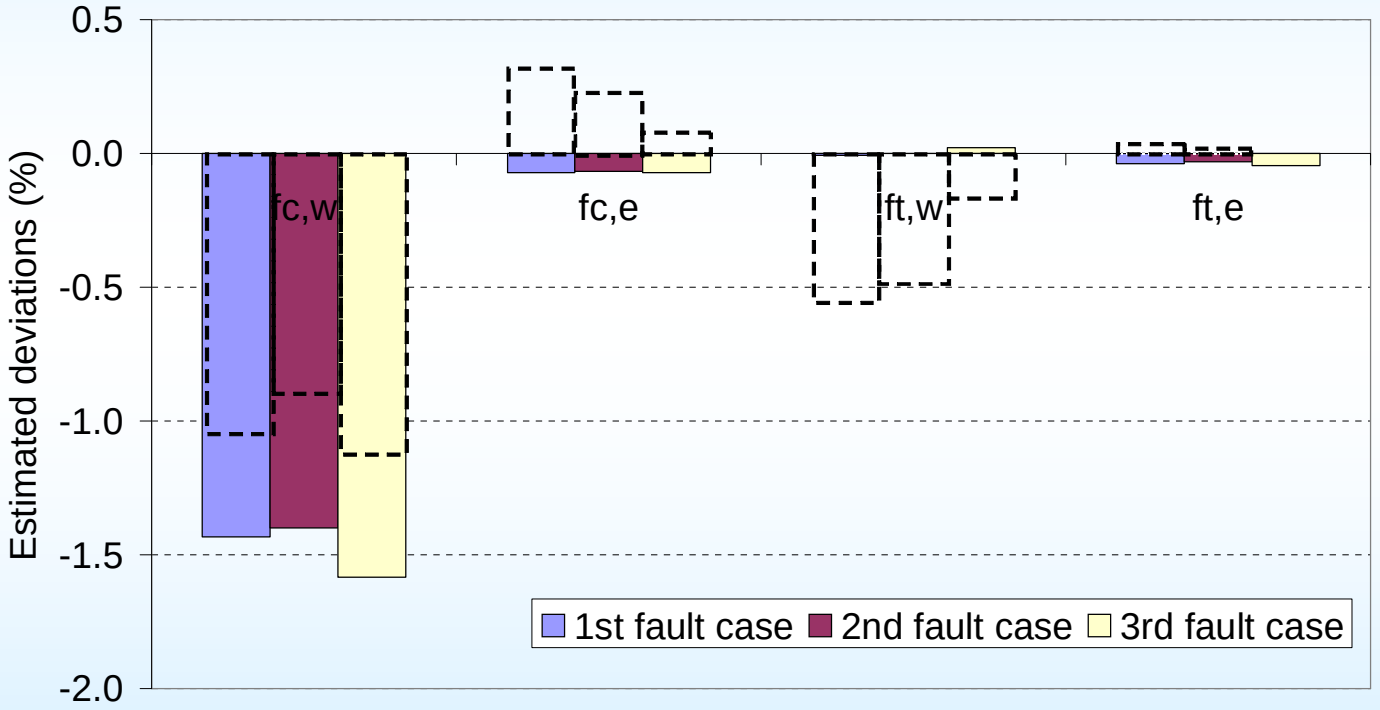
Fault Diagnosis On A Single Shaft Industrial Gas Turbine (III)



Engine Layout And Measured Quantities

Component Fault Diagnosis using BBN

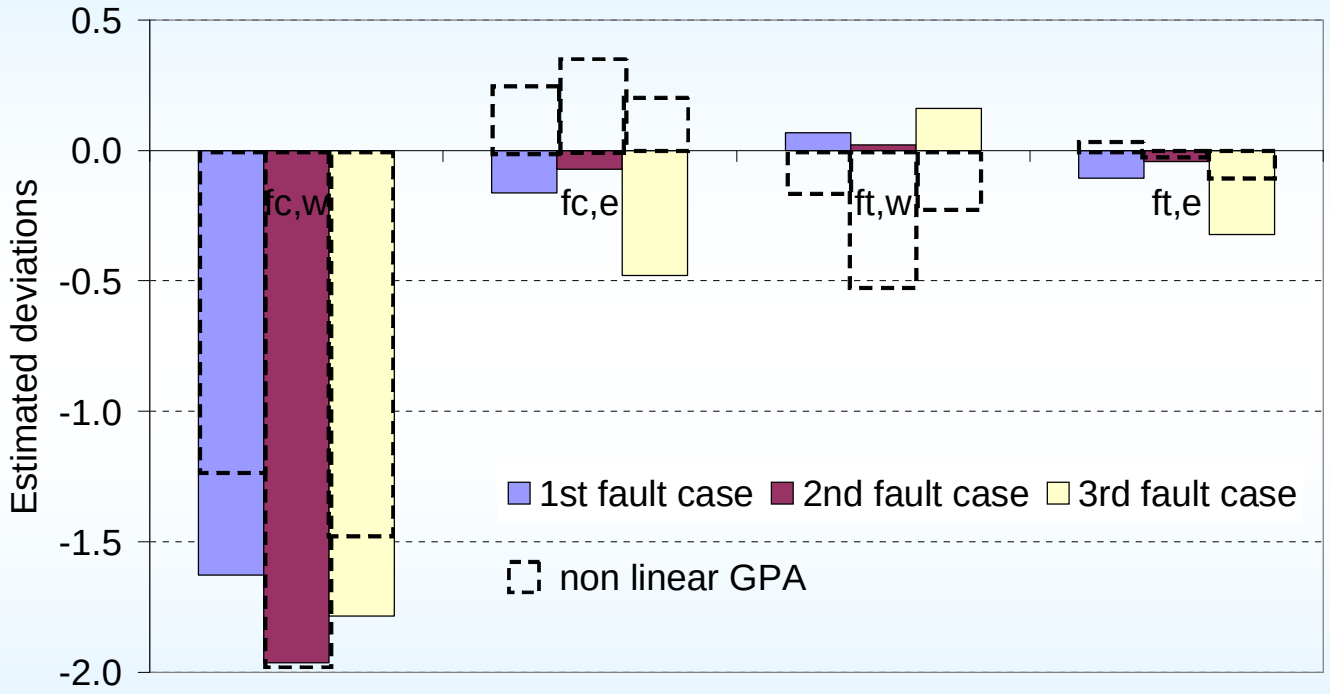
Single Shaft Industrial Gas Turbine



Estimated health parameter deviations for 1st stage mistuned VGV

Component Fault Diagnosis using BBN

Single Shaft Industrial Gas Turbine



Estimated health parameter deviations for three 1st stage mistuned VGV

Implementation Of Stochastic Methods For Industrial Gas Turbine Fault Diagnosis

§ Diagnostic Scheme with GPA

§Stochastic Methods Used

§Twin Shaft Industrial GT Implementation

§Single Shaft Industrial GT Implementation

§Summary - Conclusions

Summary - Conclusions

§ Possibilities offered by implementation of stochastic methods for fault diagnosis in industrial GTs have been demonstrated

§Sensor fault were successfully identified

§Component faults and gradual deterioration were also identified

§Methods of the type presented here can constitute a usefull constituent of gas path diagnostic schemes