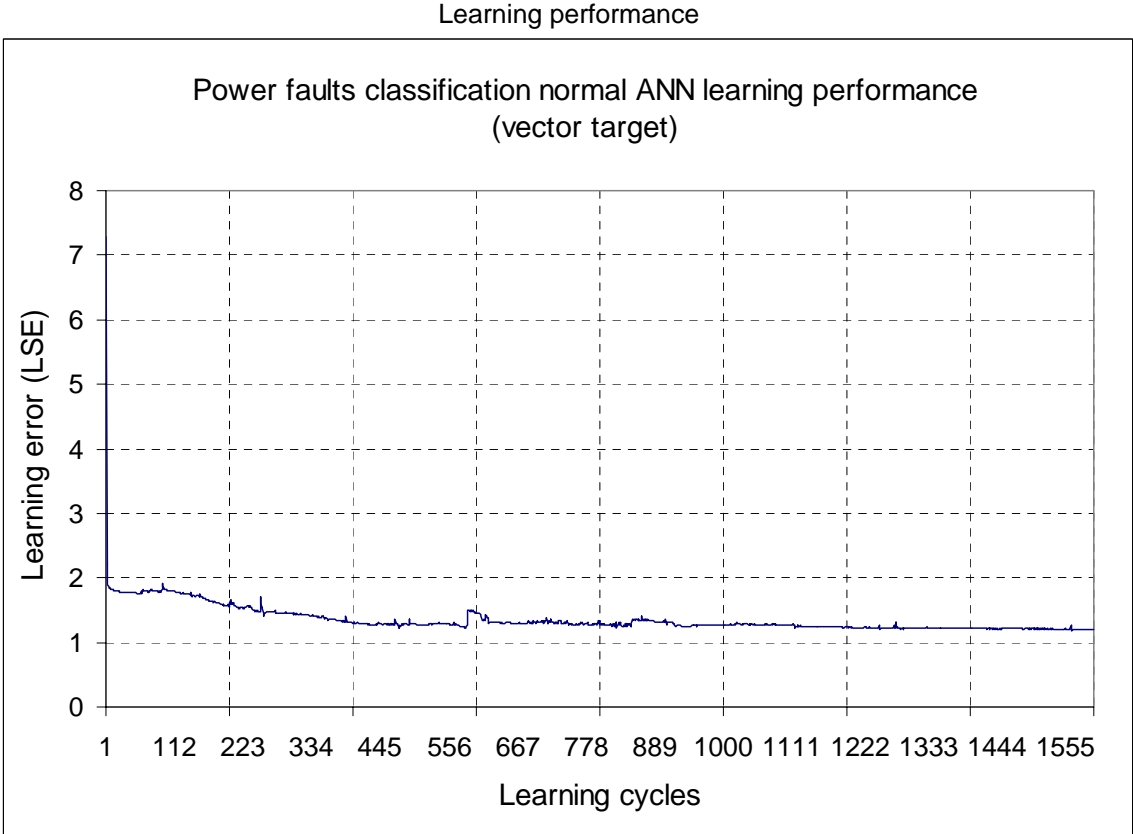
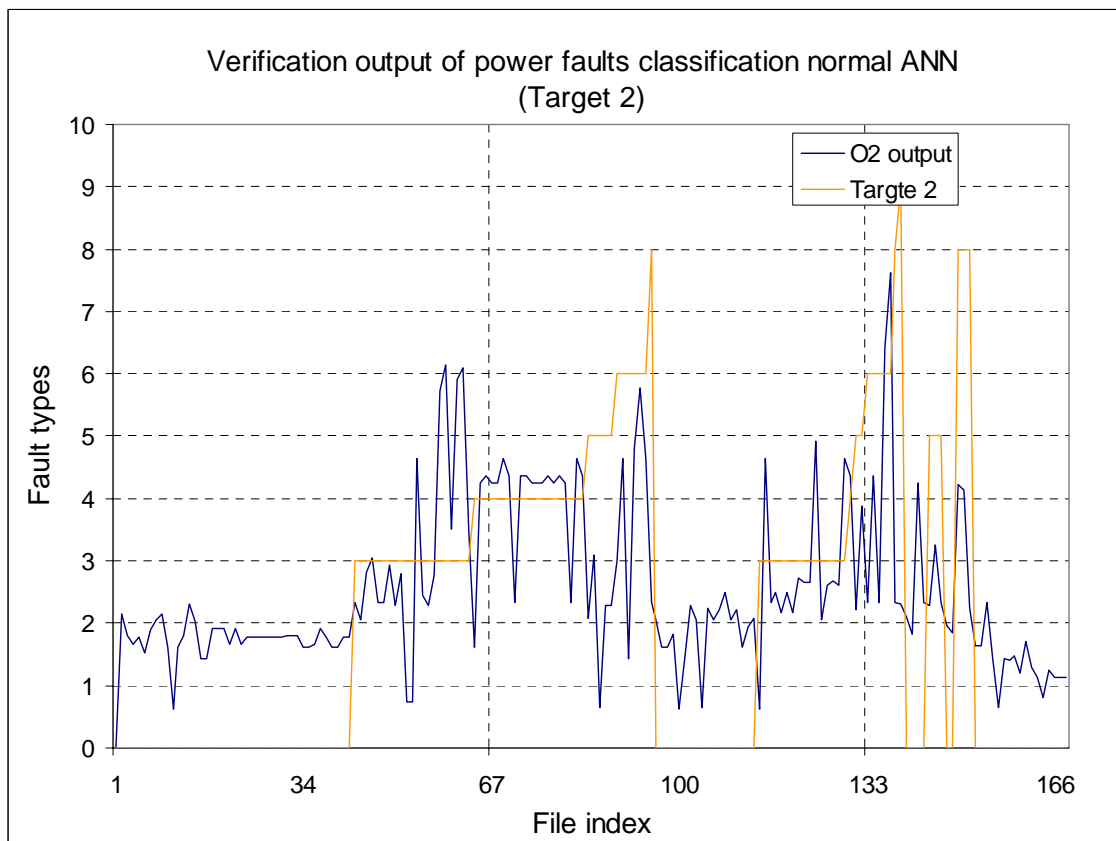
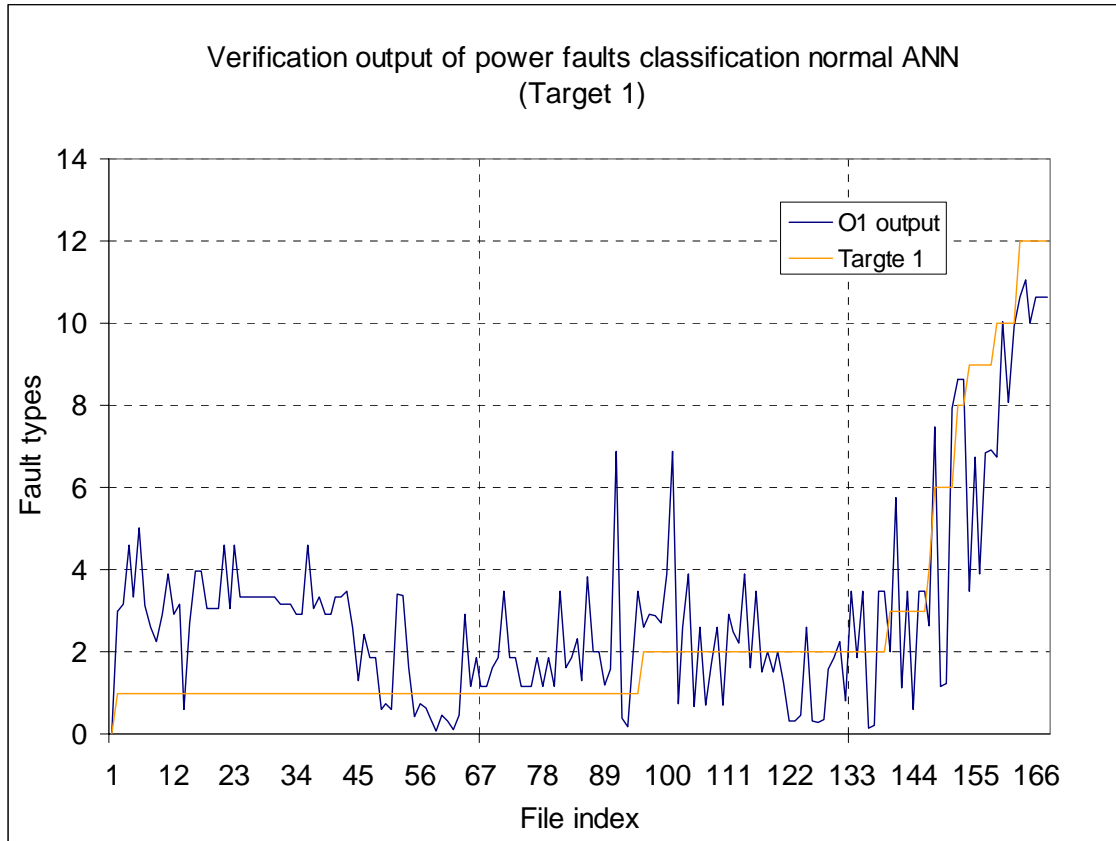


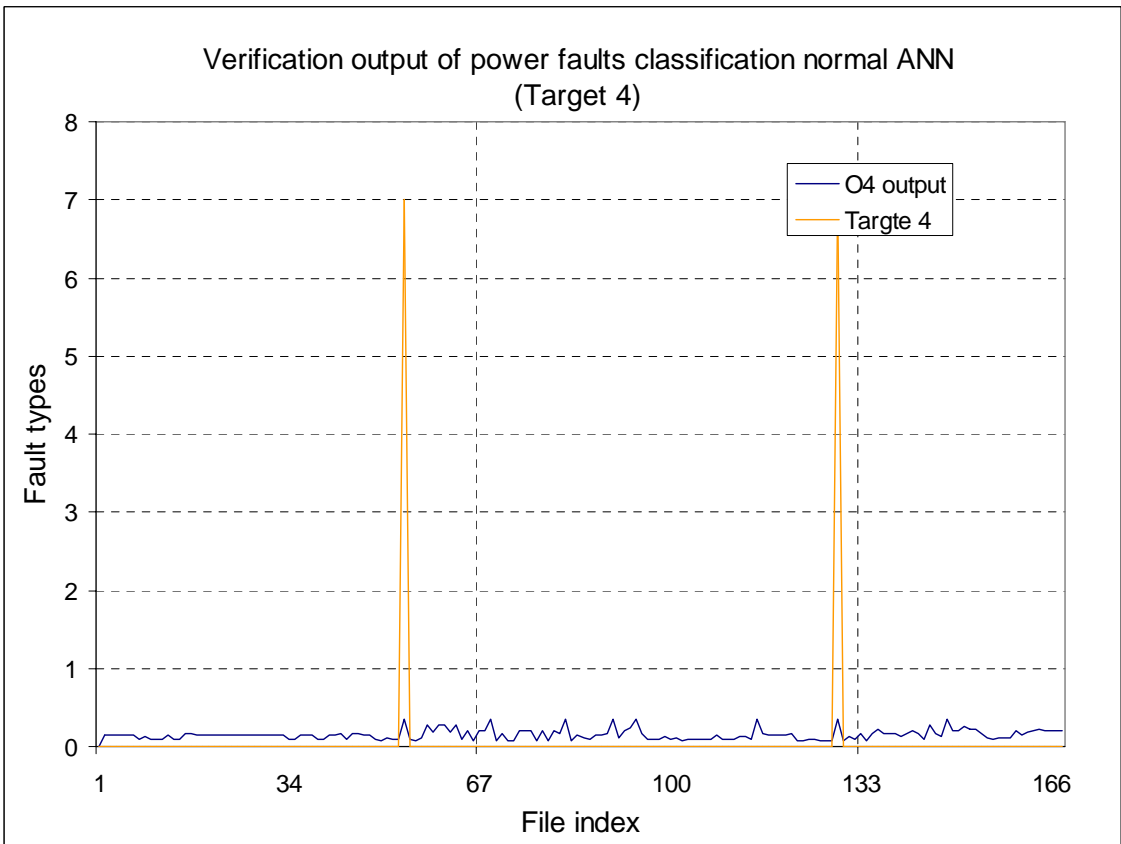
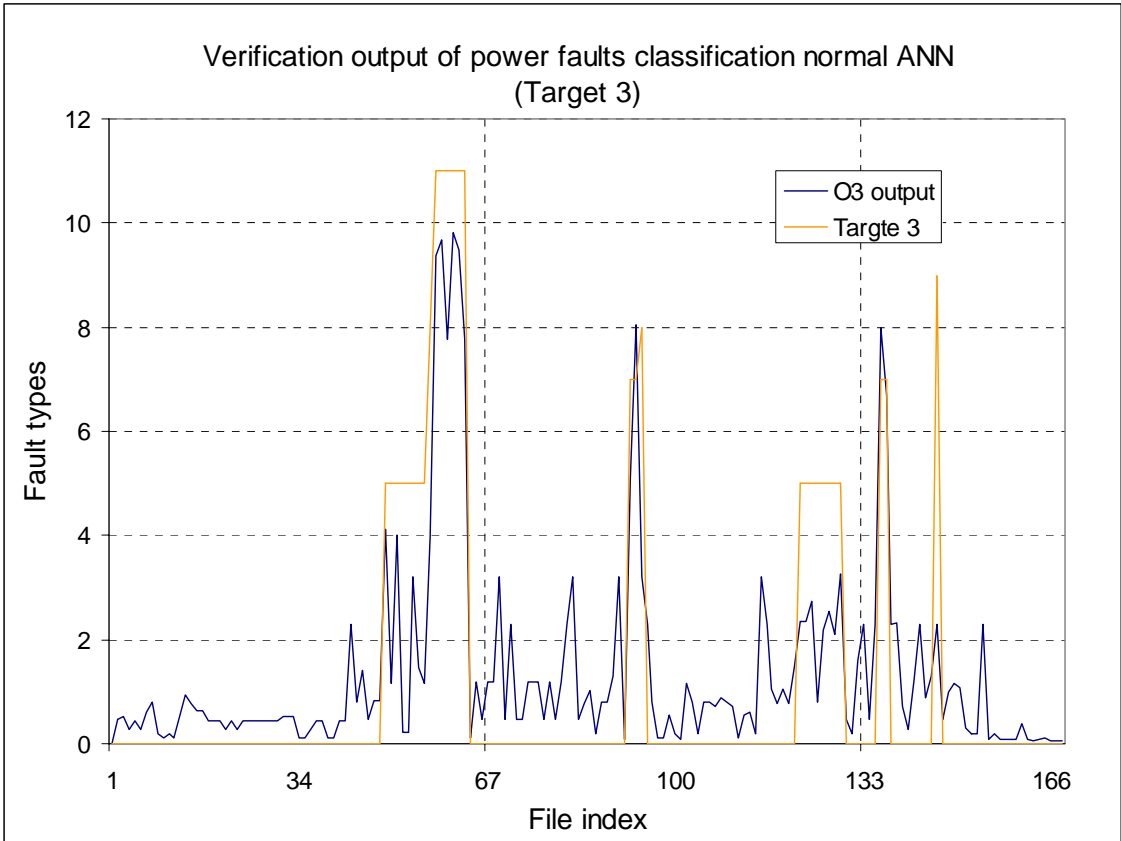
Appendix F – Performance of two normal ANN faults classification systems

1. Single ANN

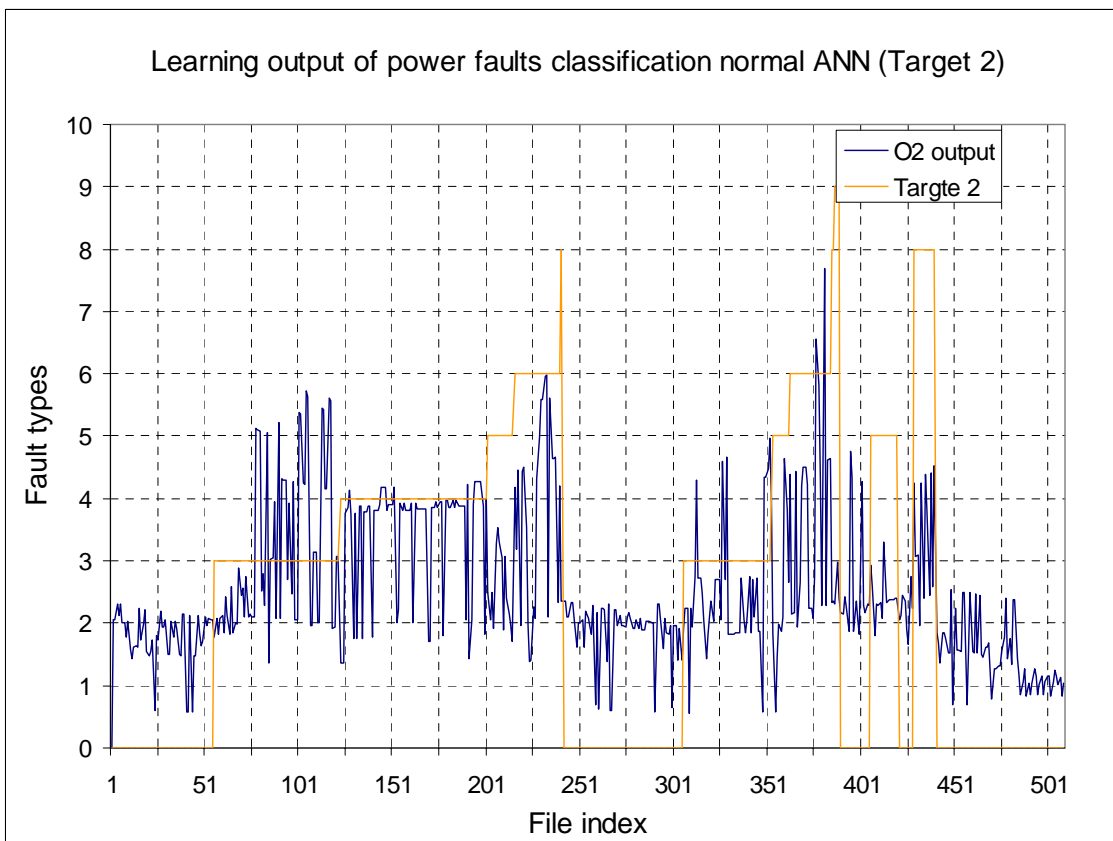
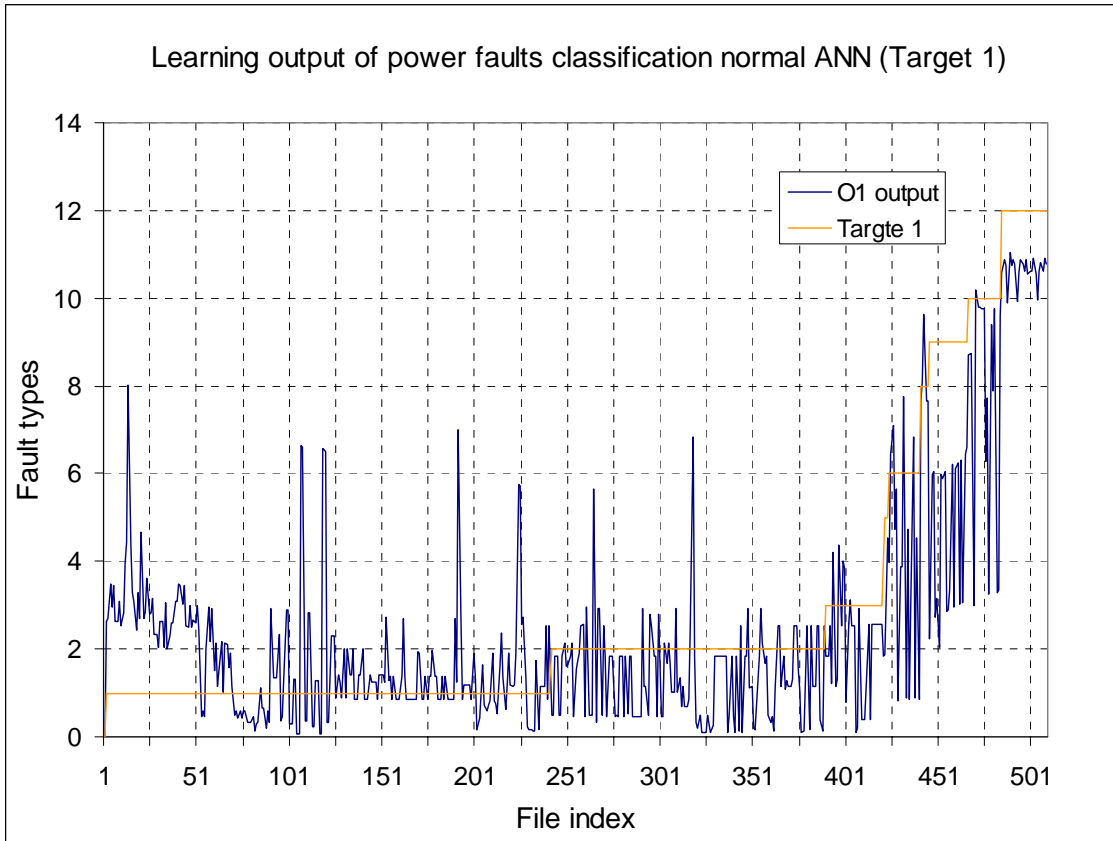


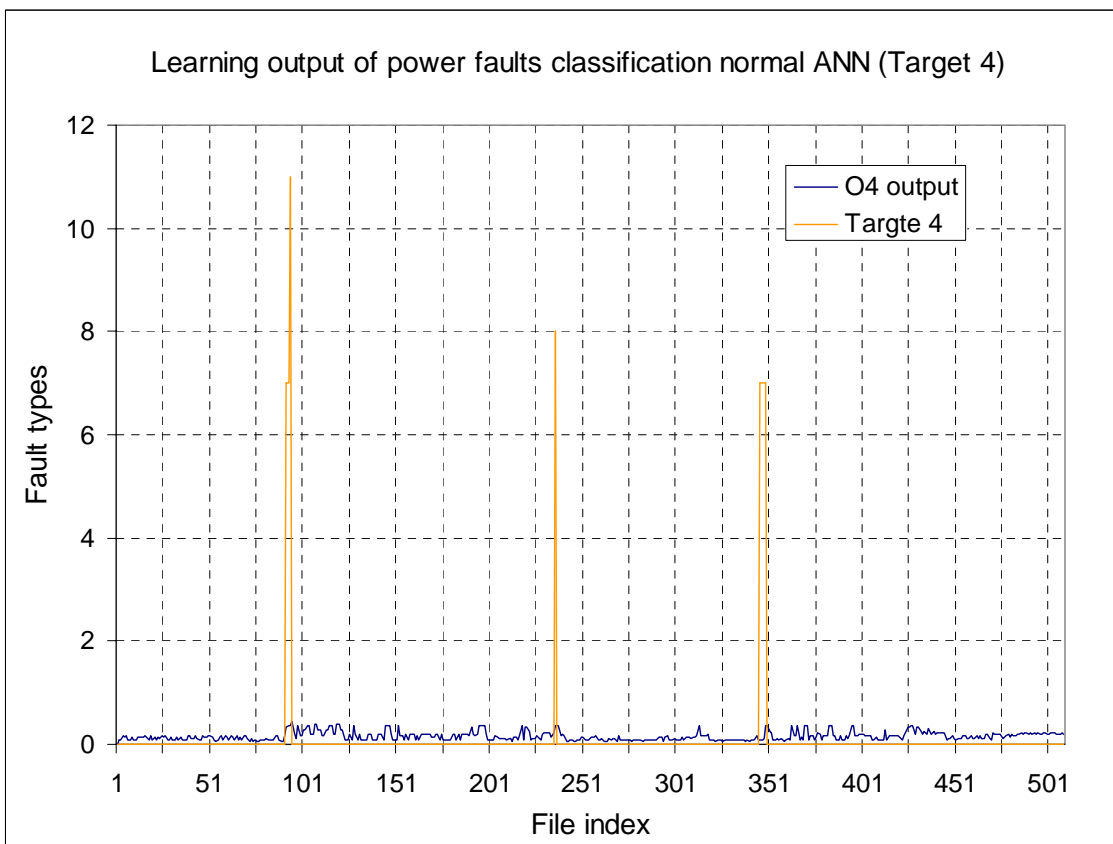
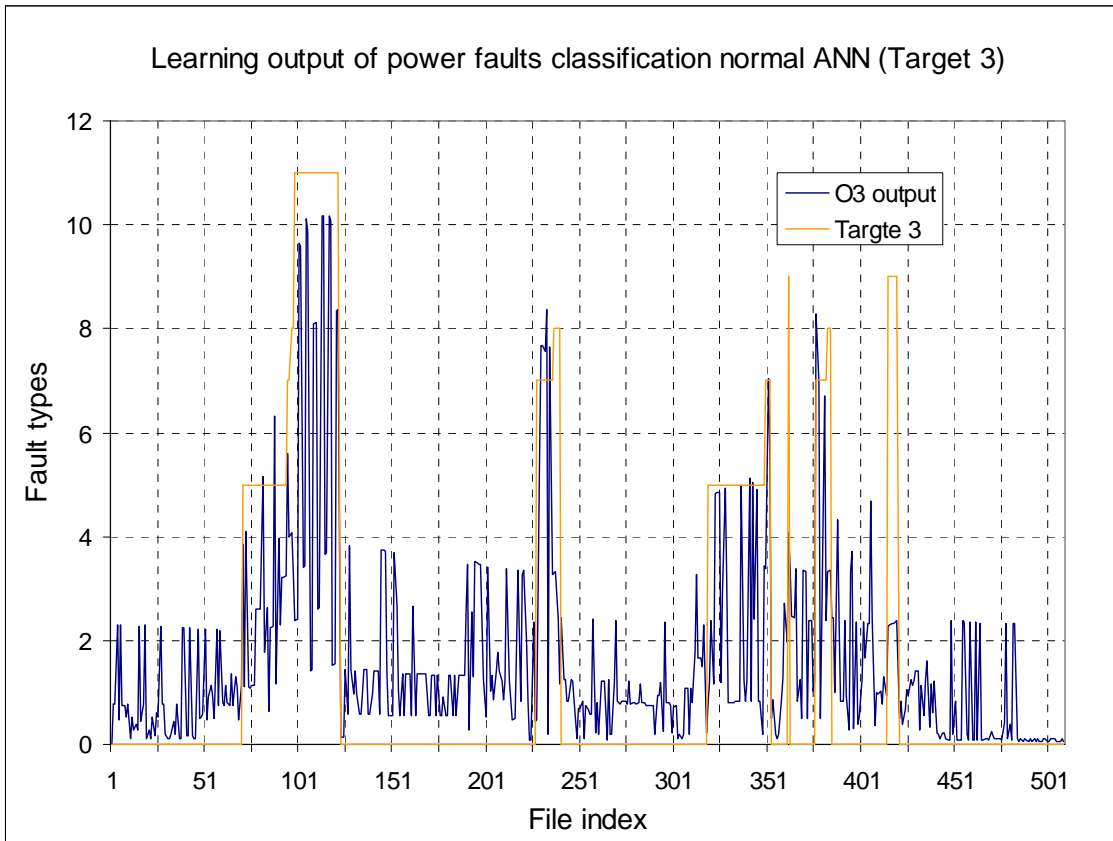
### Verification using 168 cases





# Learning output after final cycle training

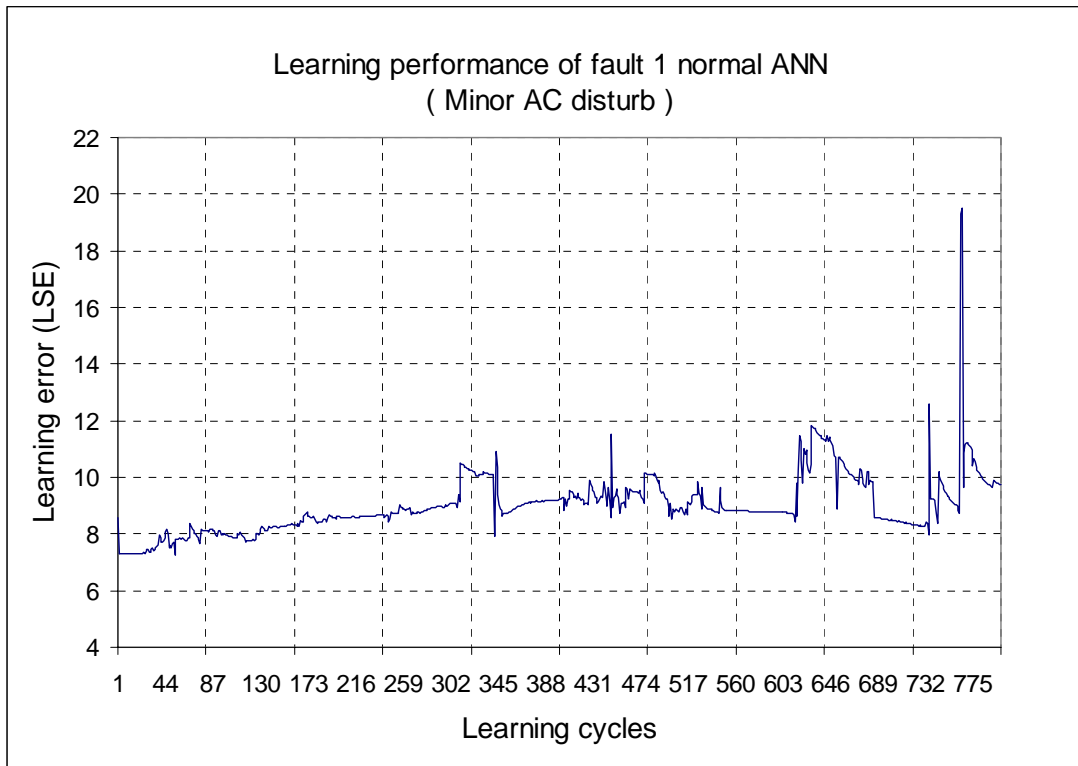




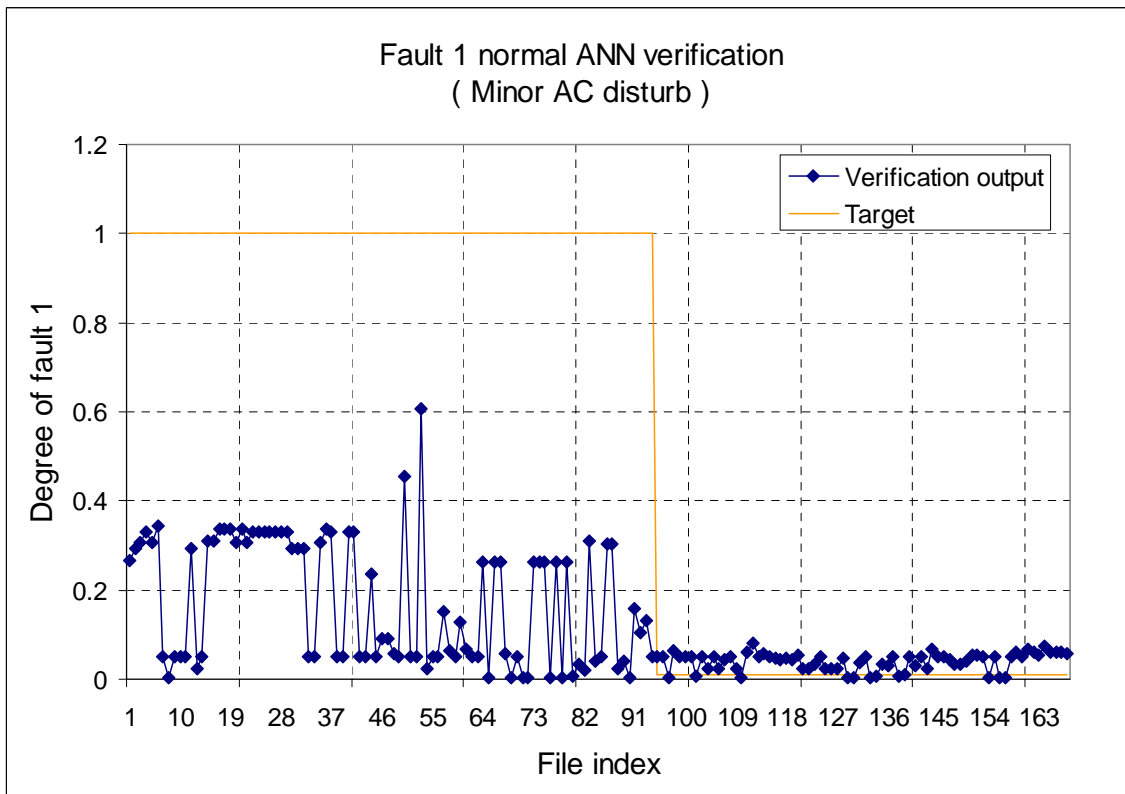
## 2. 12 sub- ANNs

### Fault 1 : Minor AC disturb

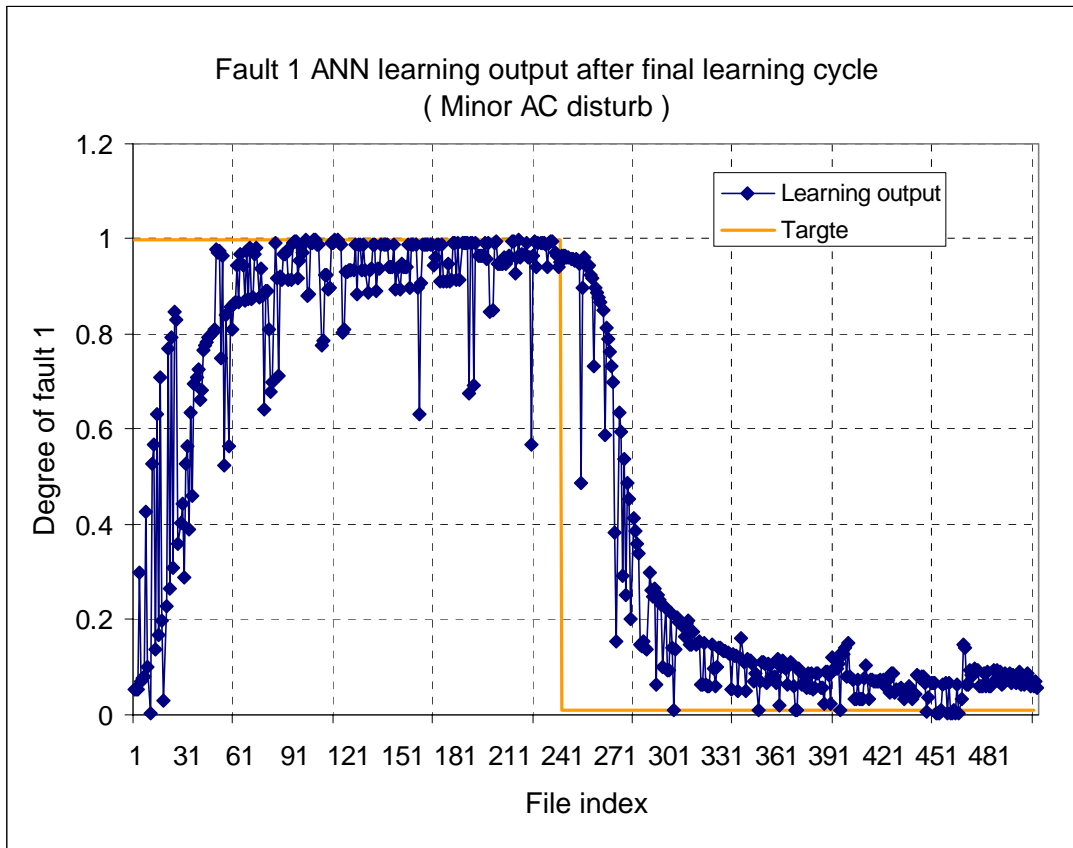
Learning performance



Verification using 168 cases

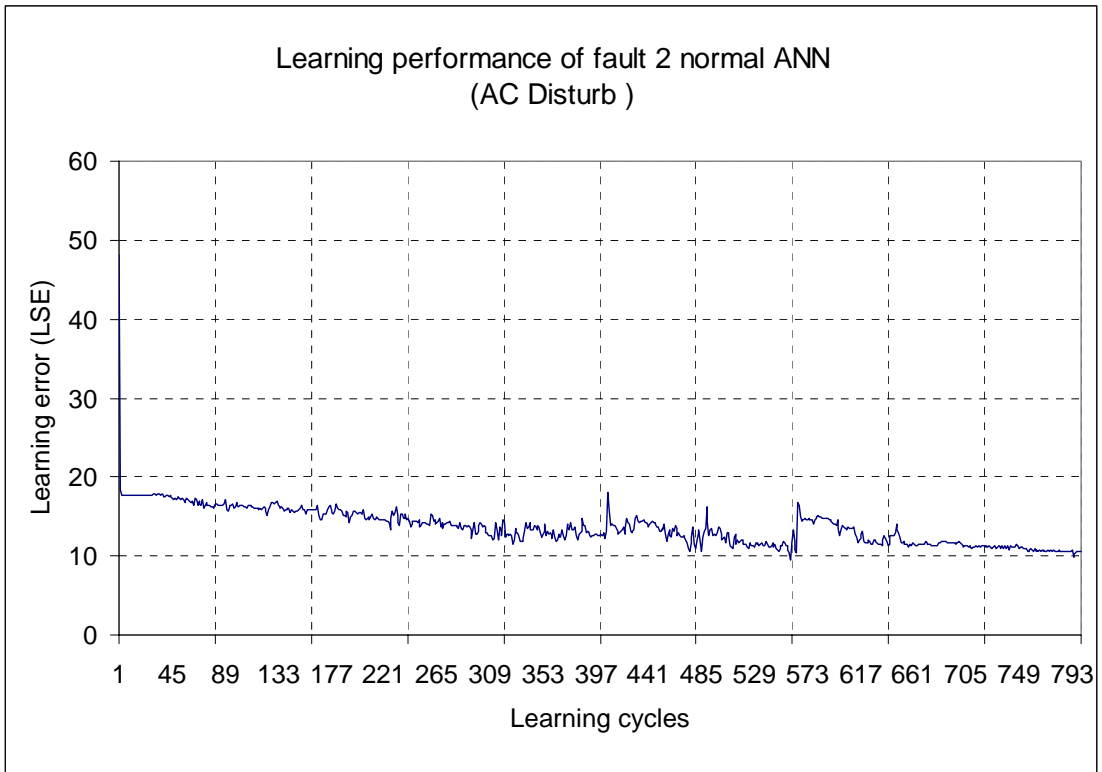


### Learning output after final cycle training

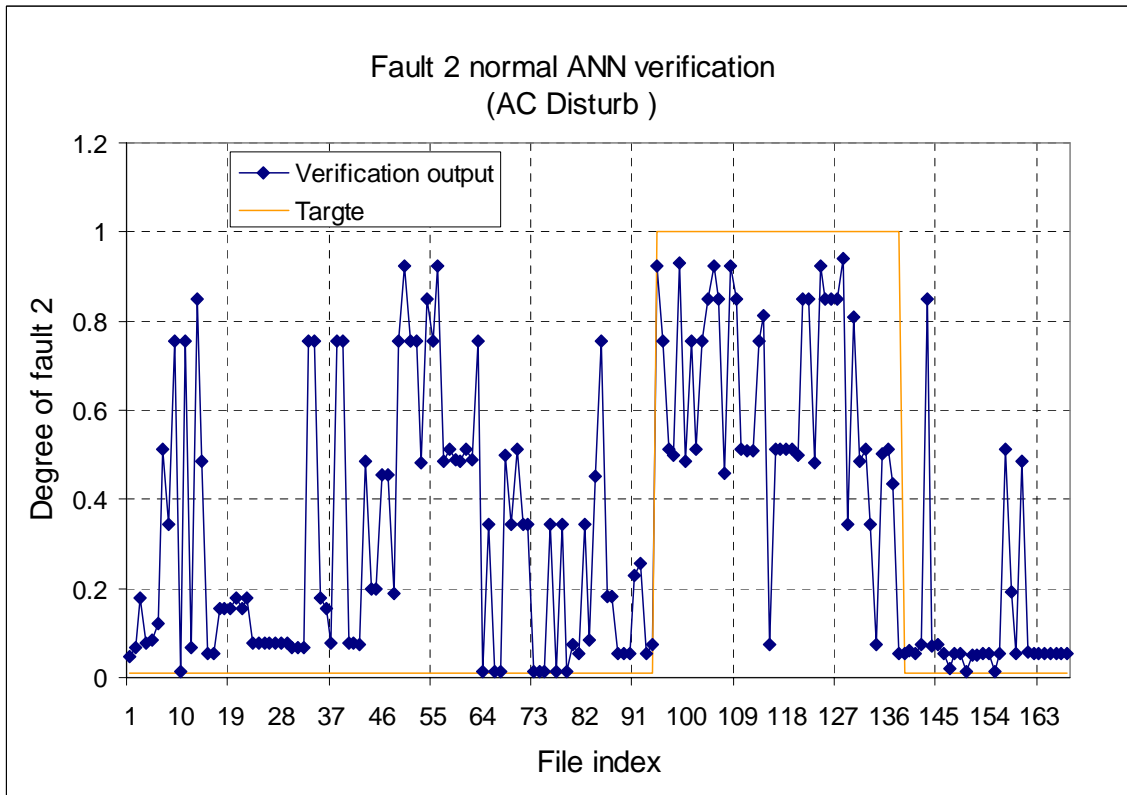


**Fault 2 : AC Disturb**

Learning performance

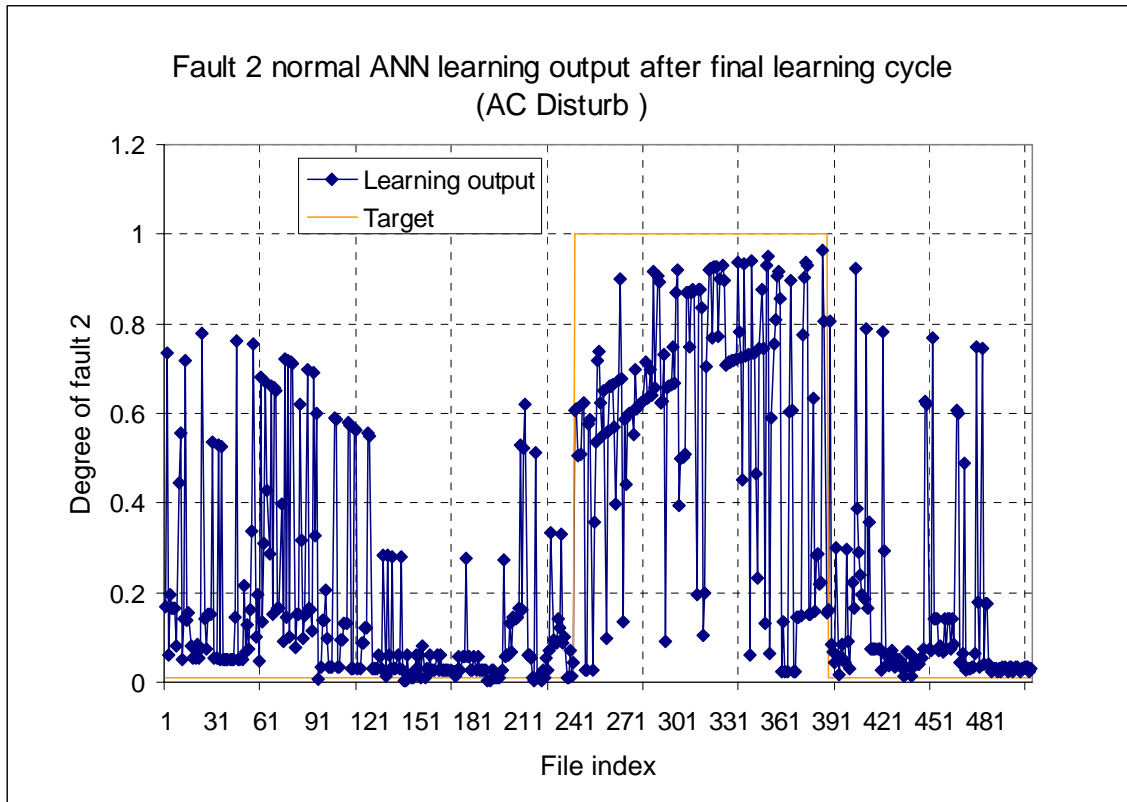


Verification using 168 cases

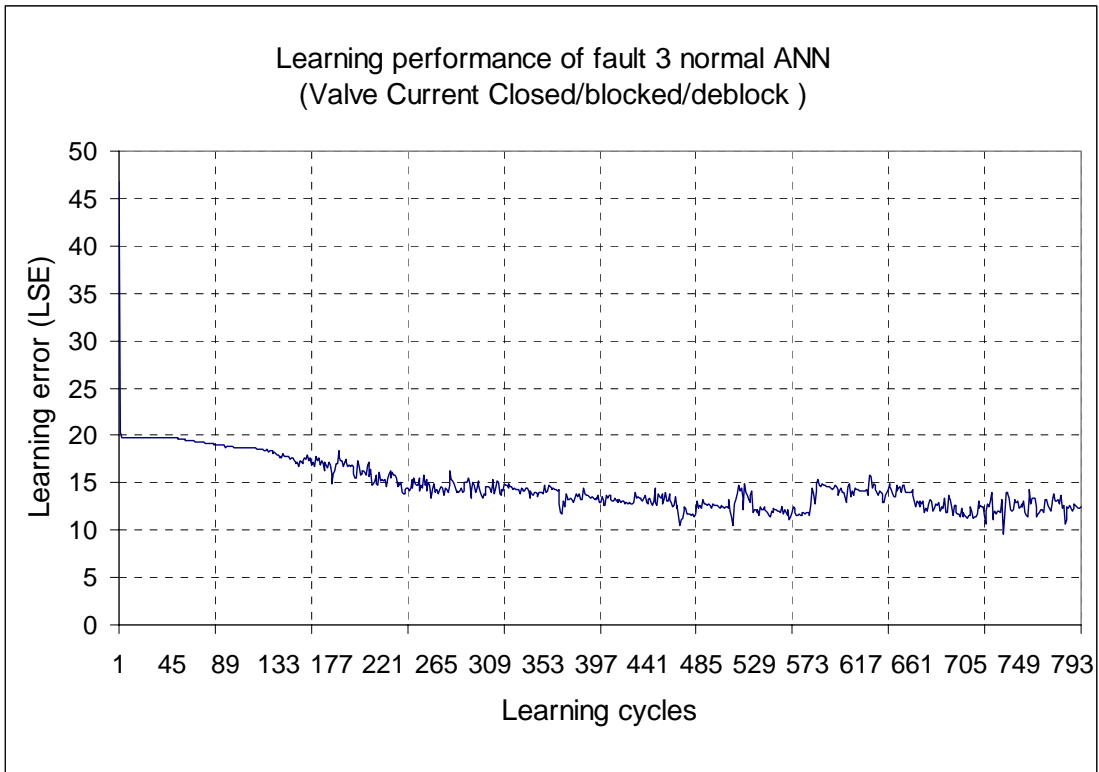




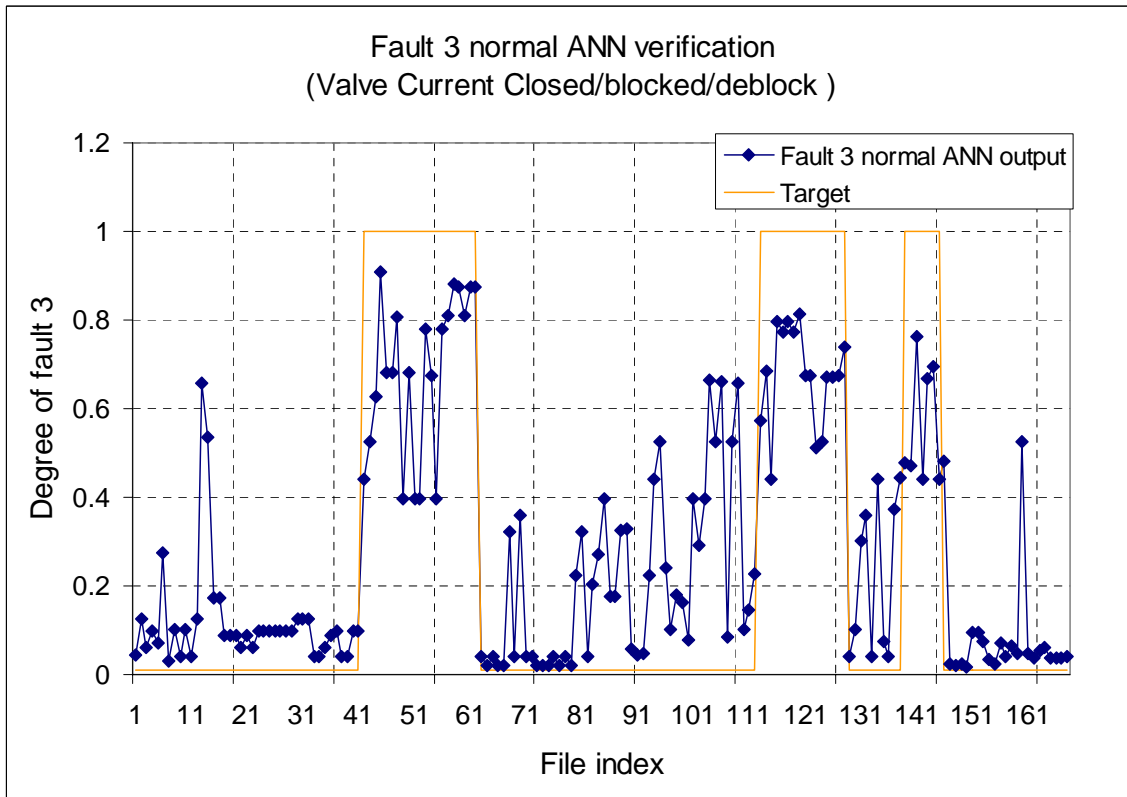
### Learning output after final cycle training



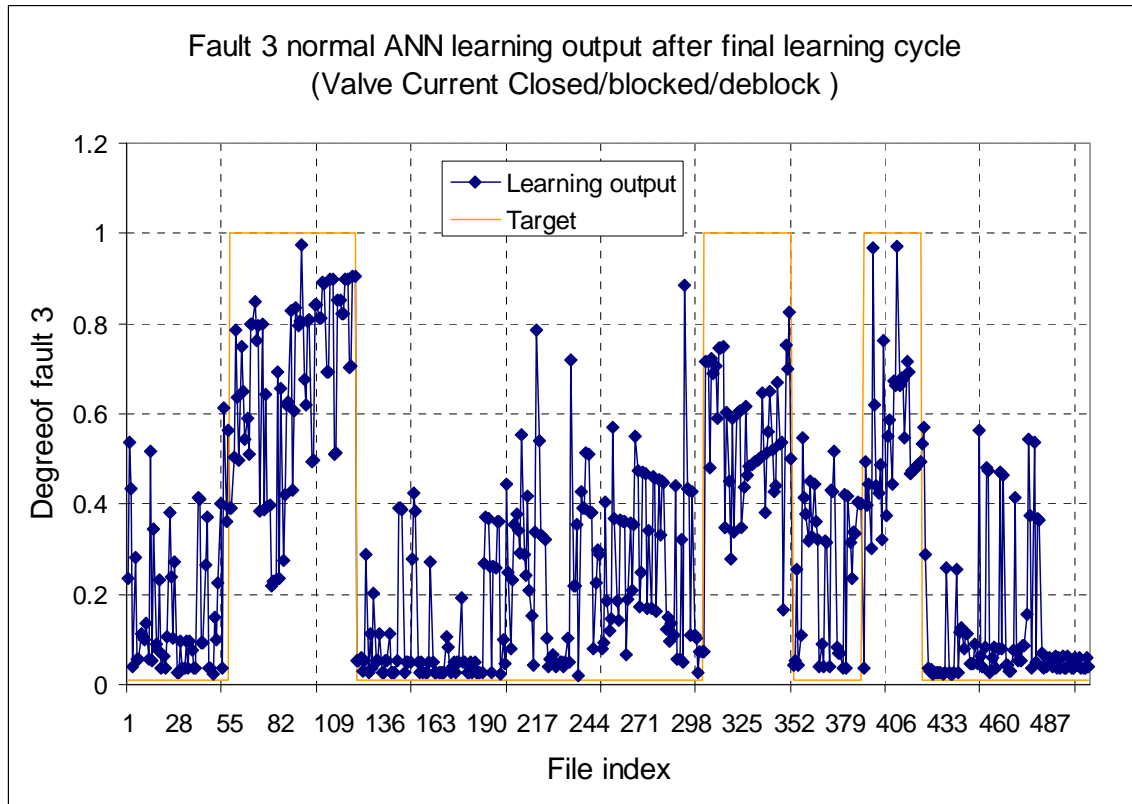
**Fault 3 : Valve Current Closed/blocked/deblock**  
Learning performance



Verification using 168 cases

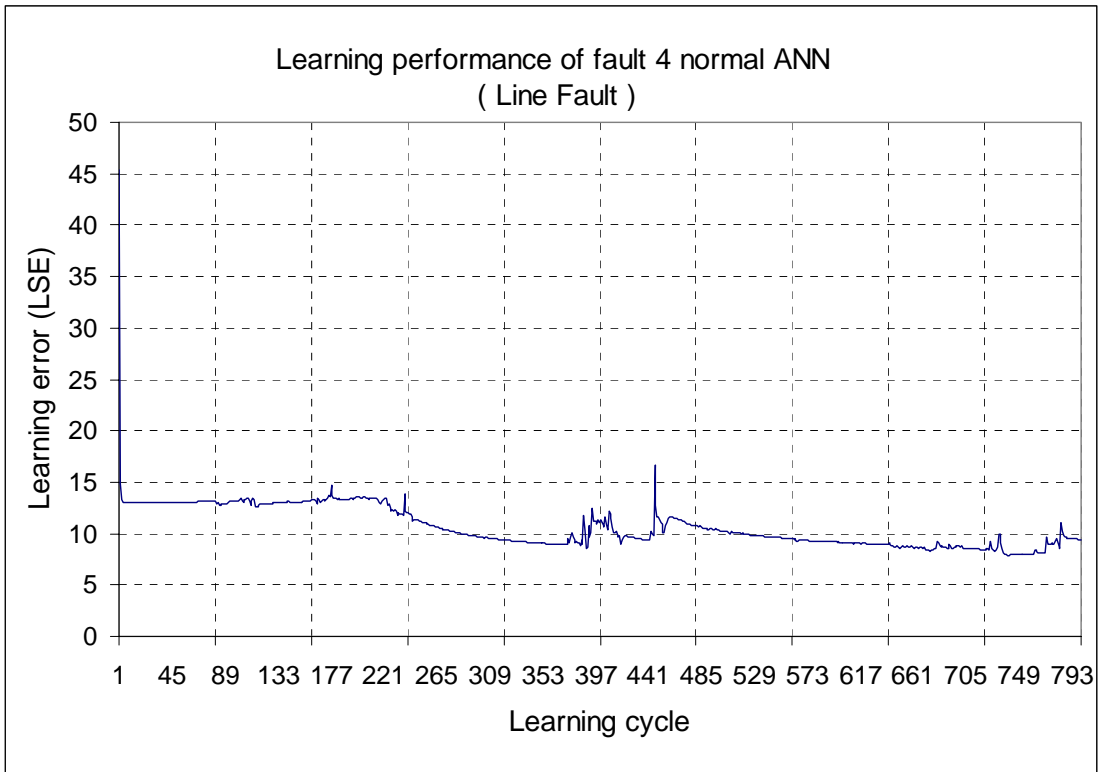


### Learning output after final cycle training

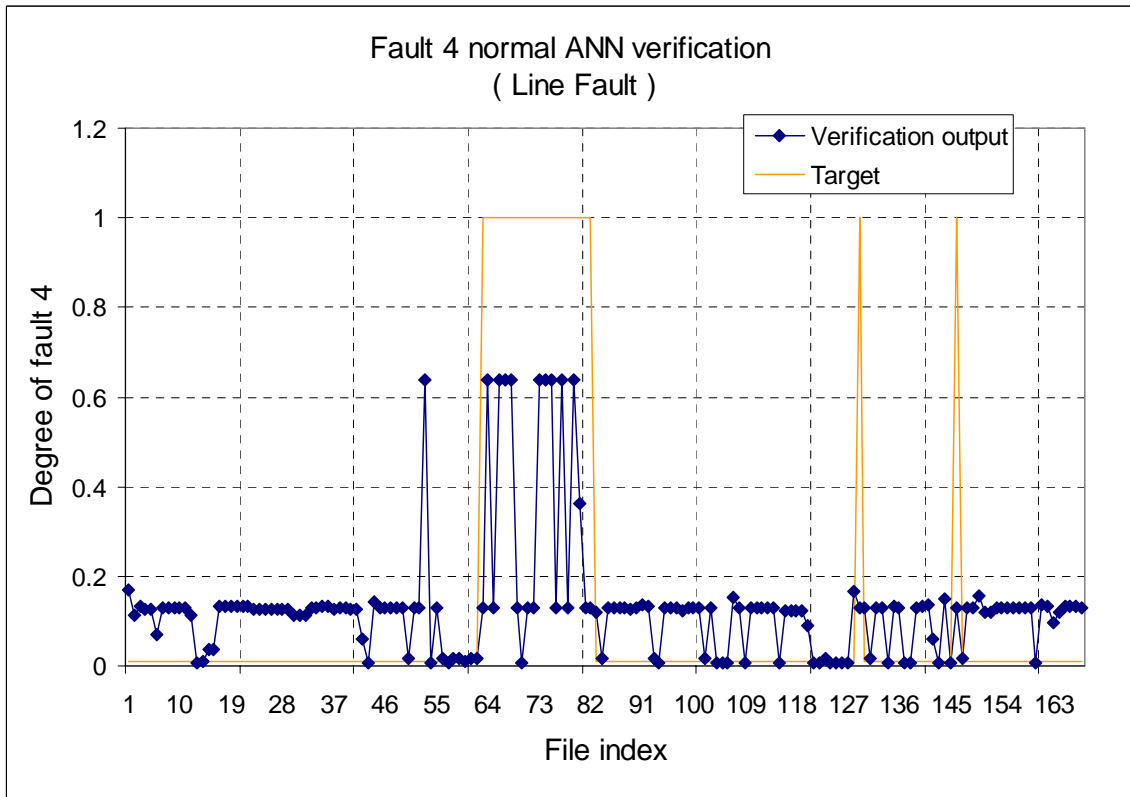


**Fault 4 : Line Fault**

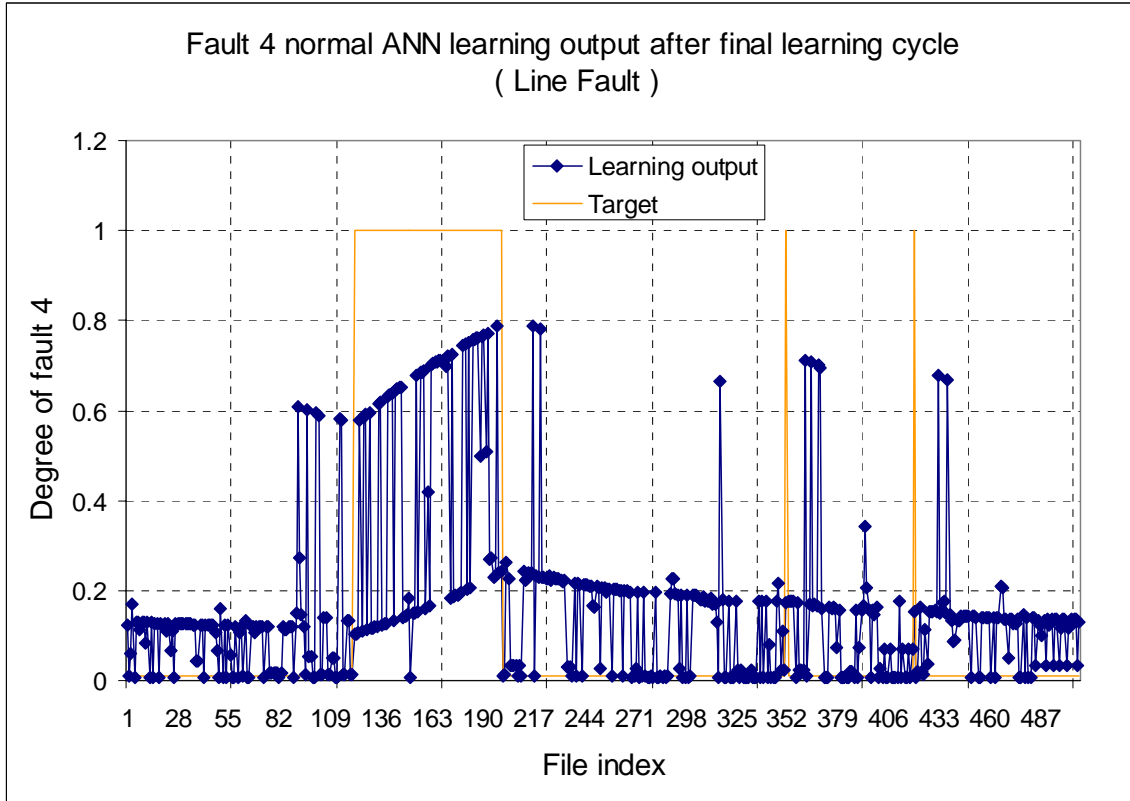
**Learning performance**



**Verification using 168 cases**

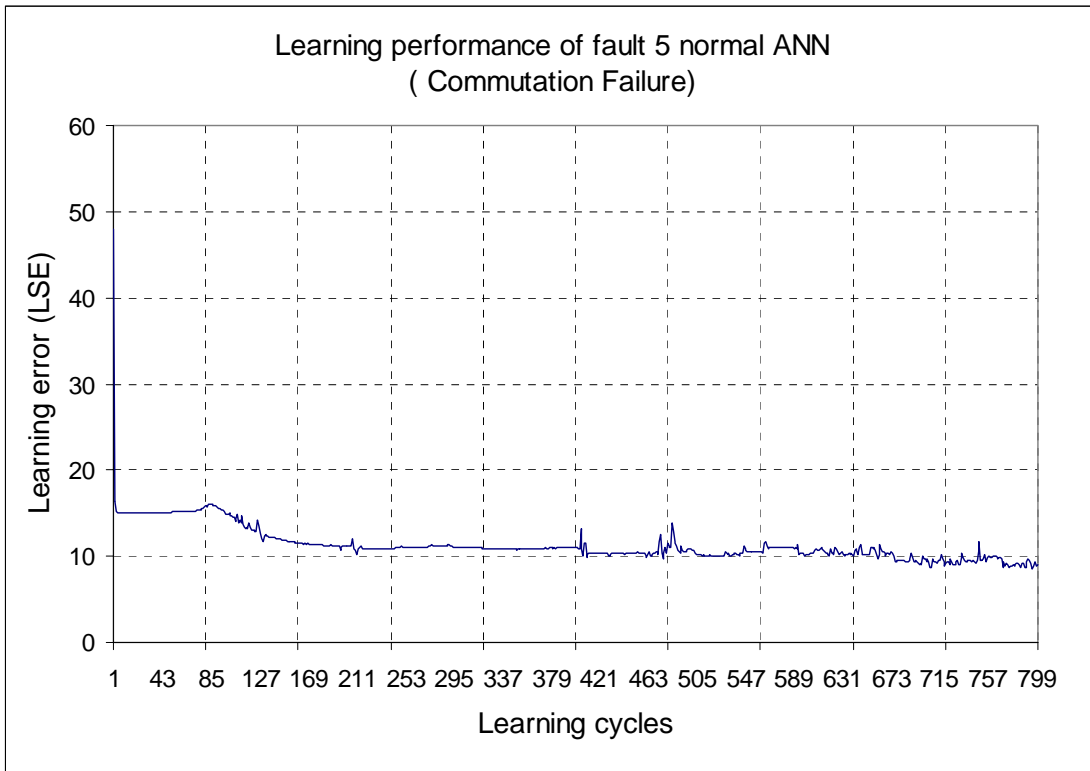


### Learning output after final cycle training

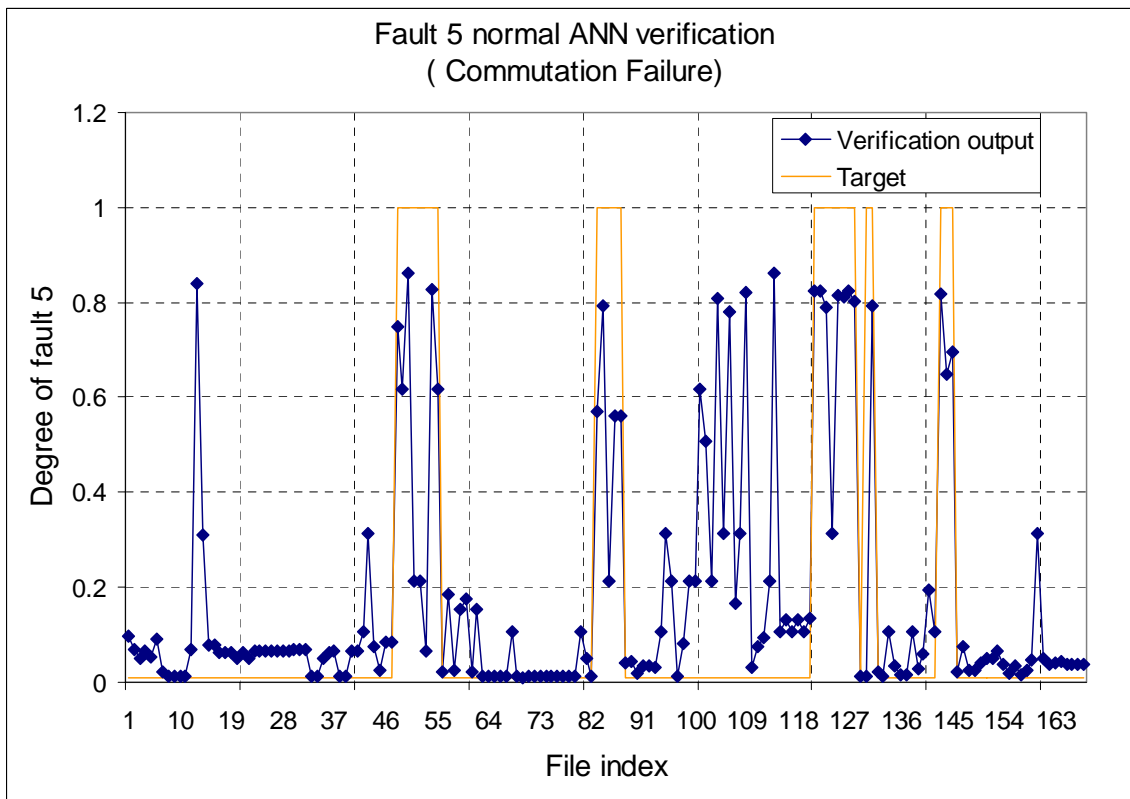


**Fault 5 : Commutation Failure**

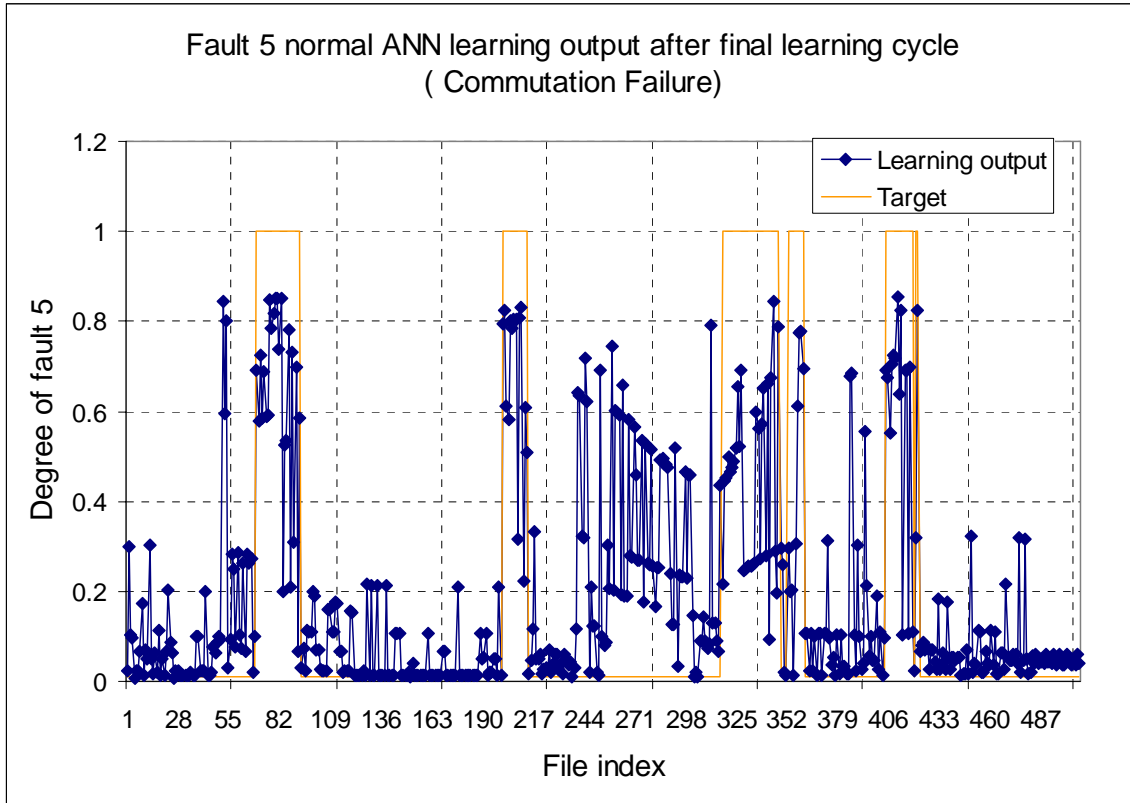
Learning performance



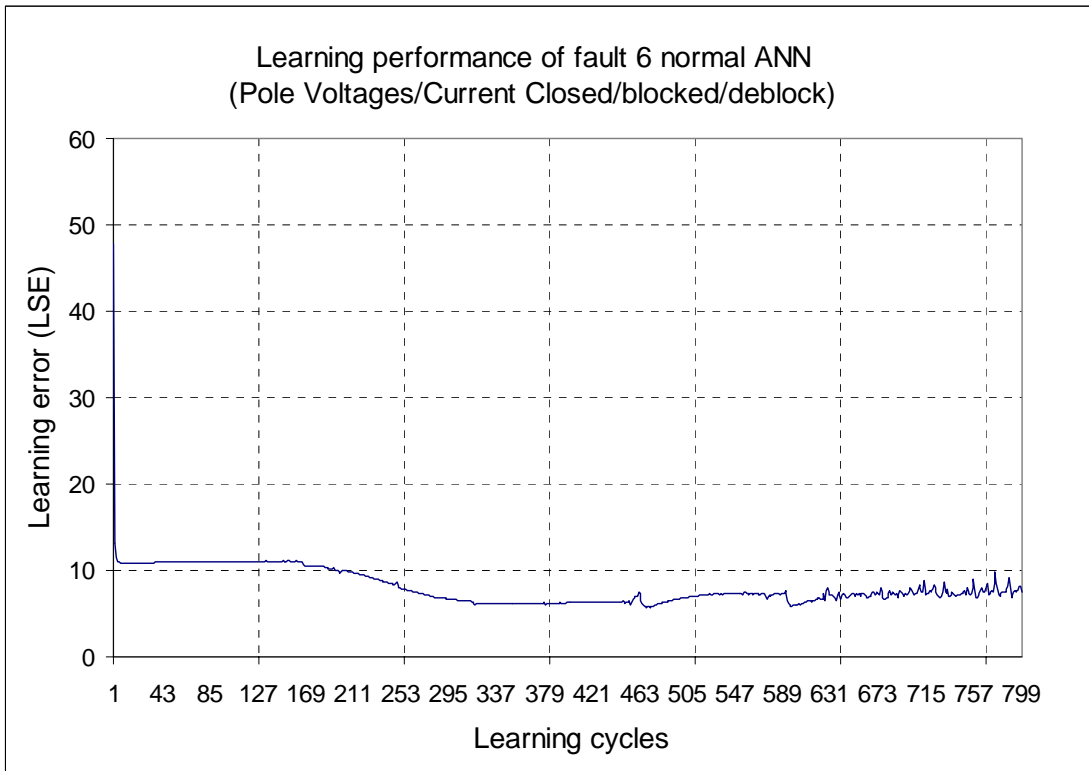
Verification using 168 cases



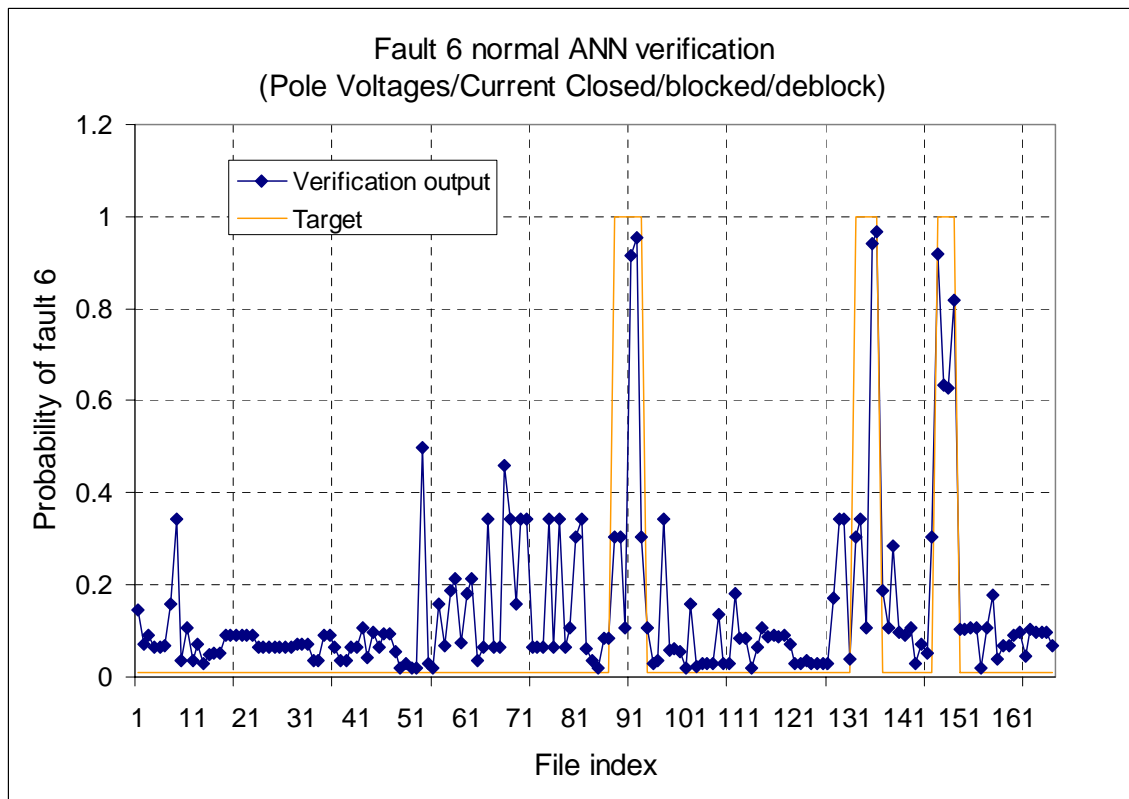
### Learning output after final cycle training



**Fault 6 : Pole Voltages/Current Closed/blocked/deblock**  
Learning performance

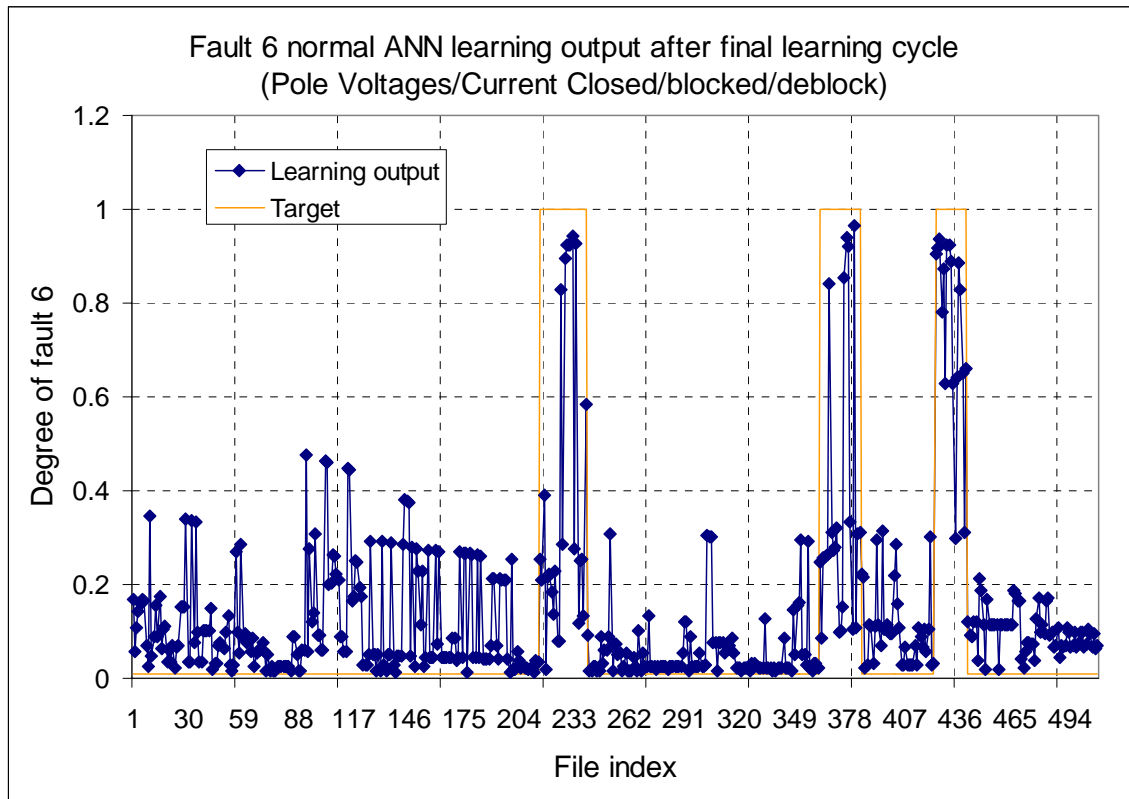


Verification using 168 cases



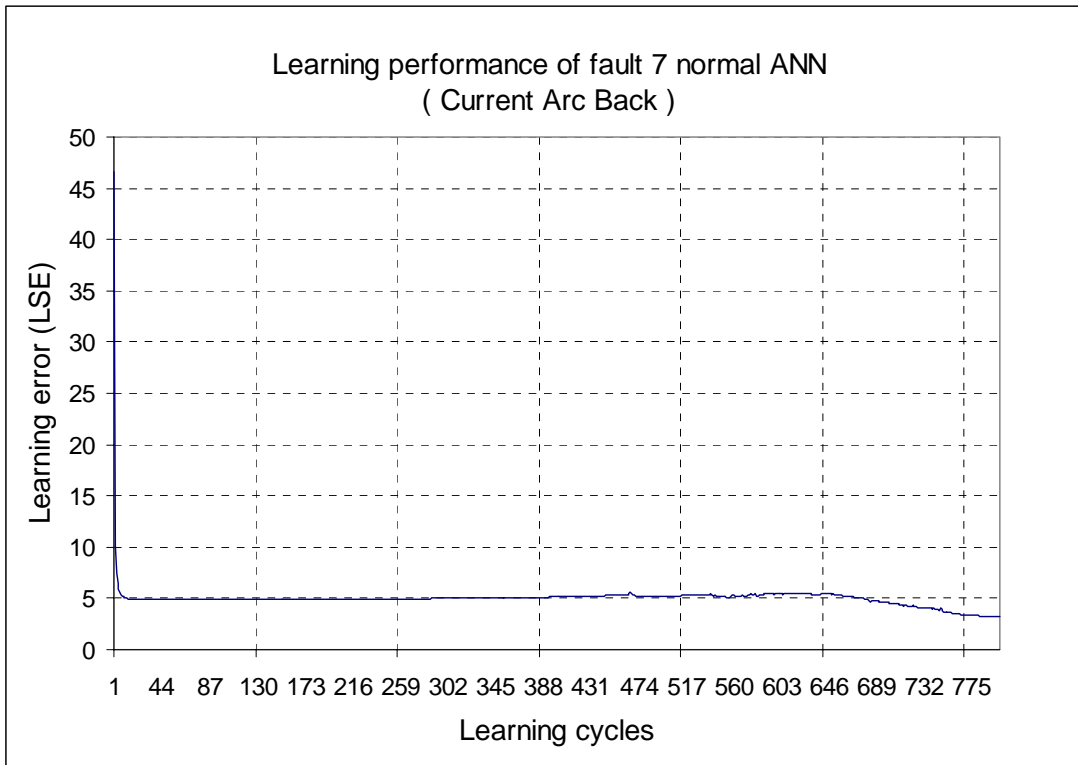


### Learning output after final cycle training

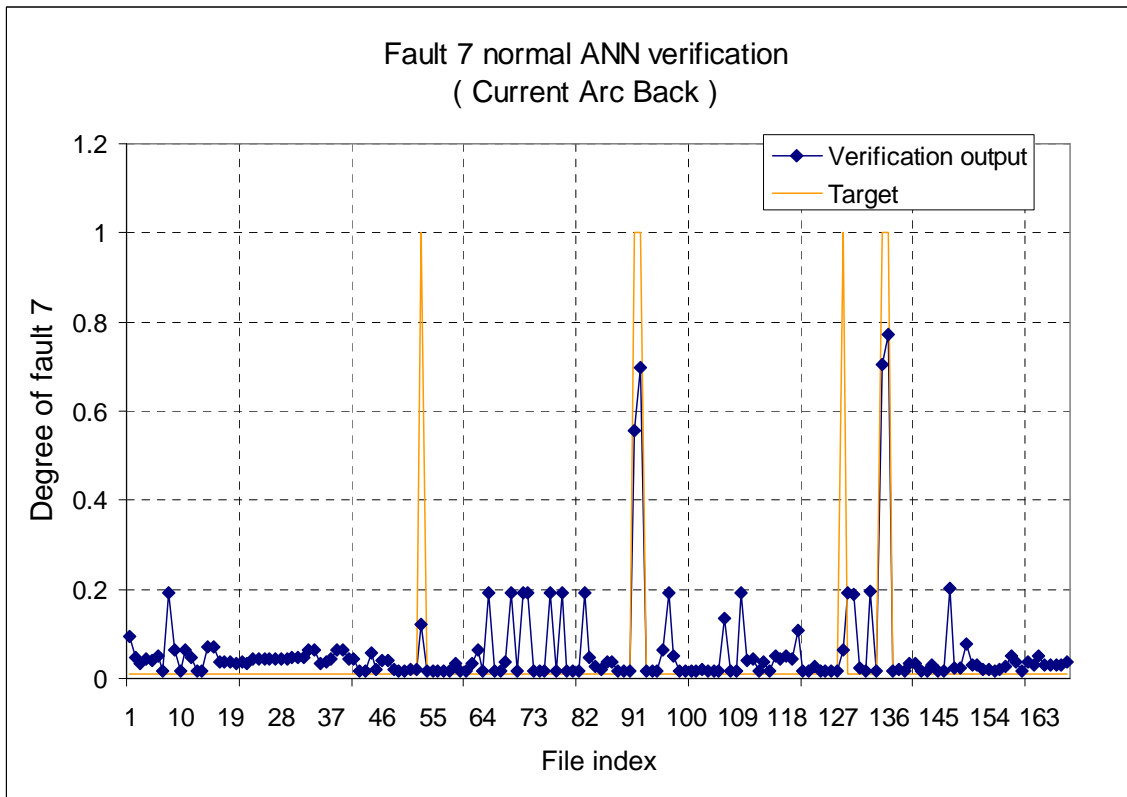


**Fault 7 : Current Arc Back**

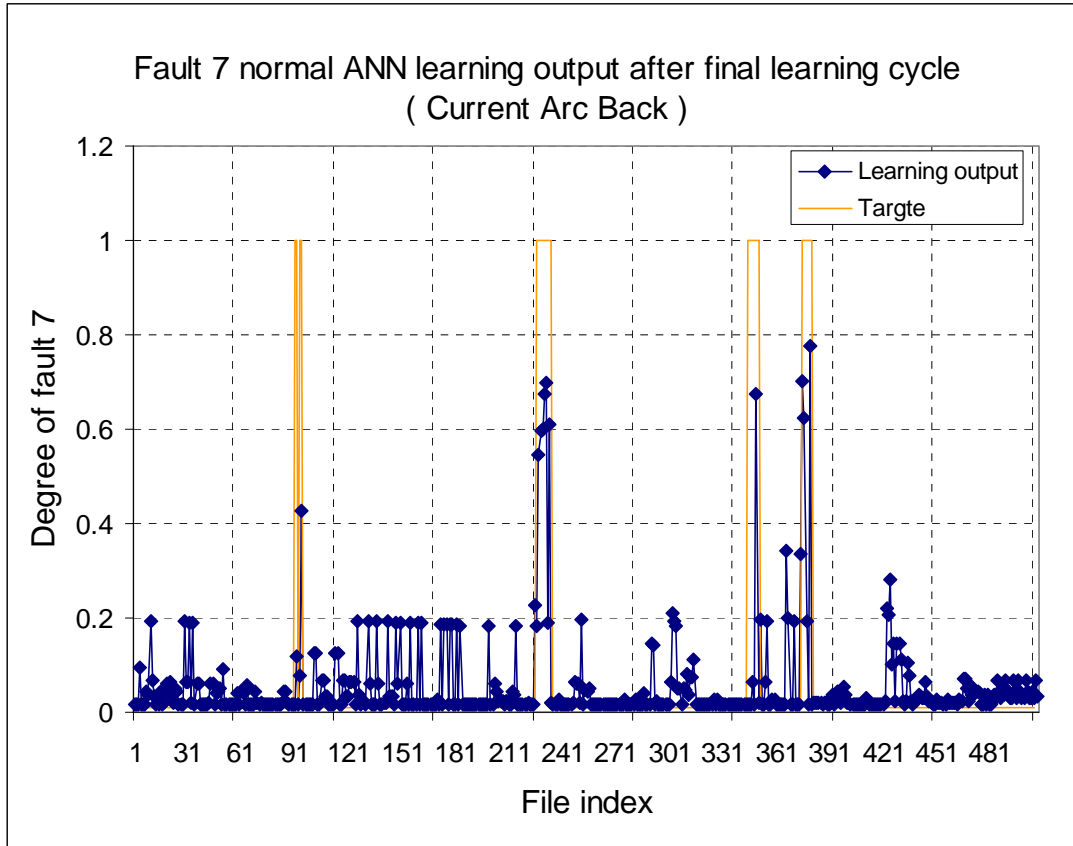
**Learning performance**



**Verification using 168 cases**

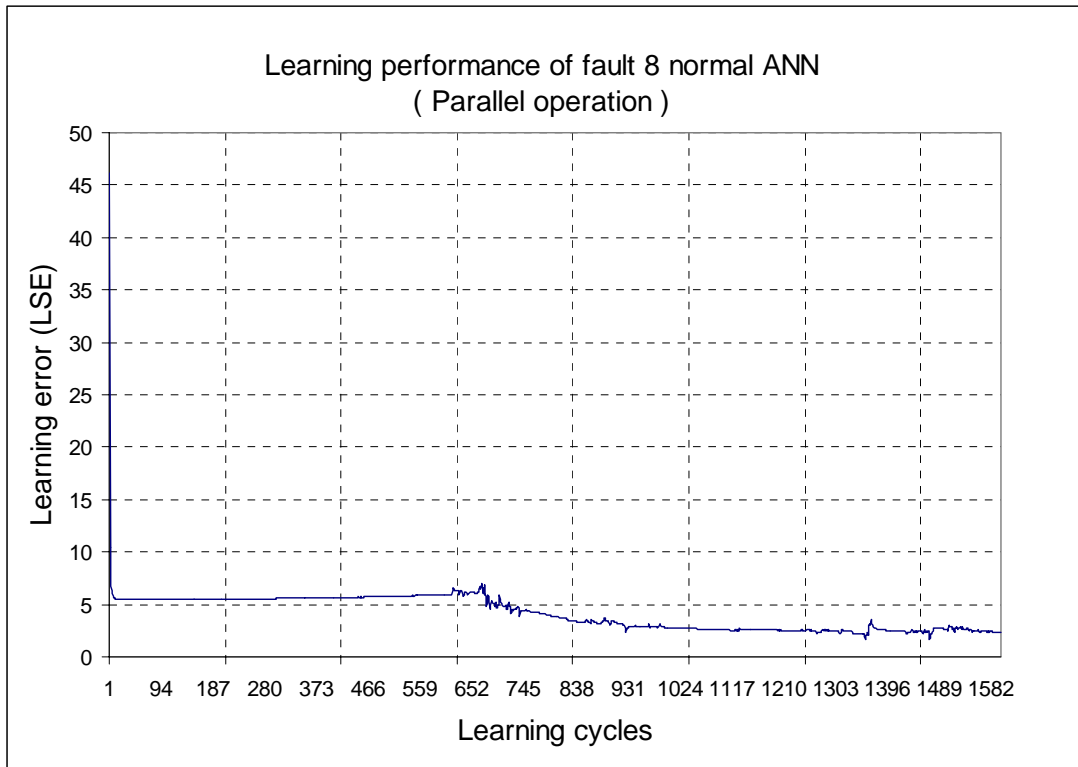


### Learning output after final cycle training

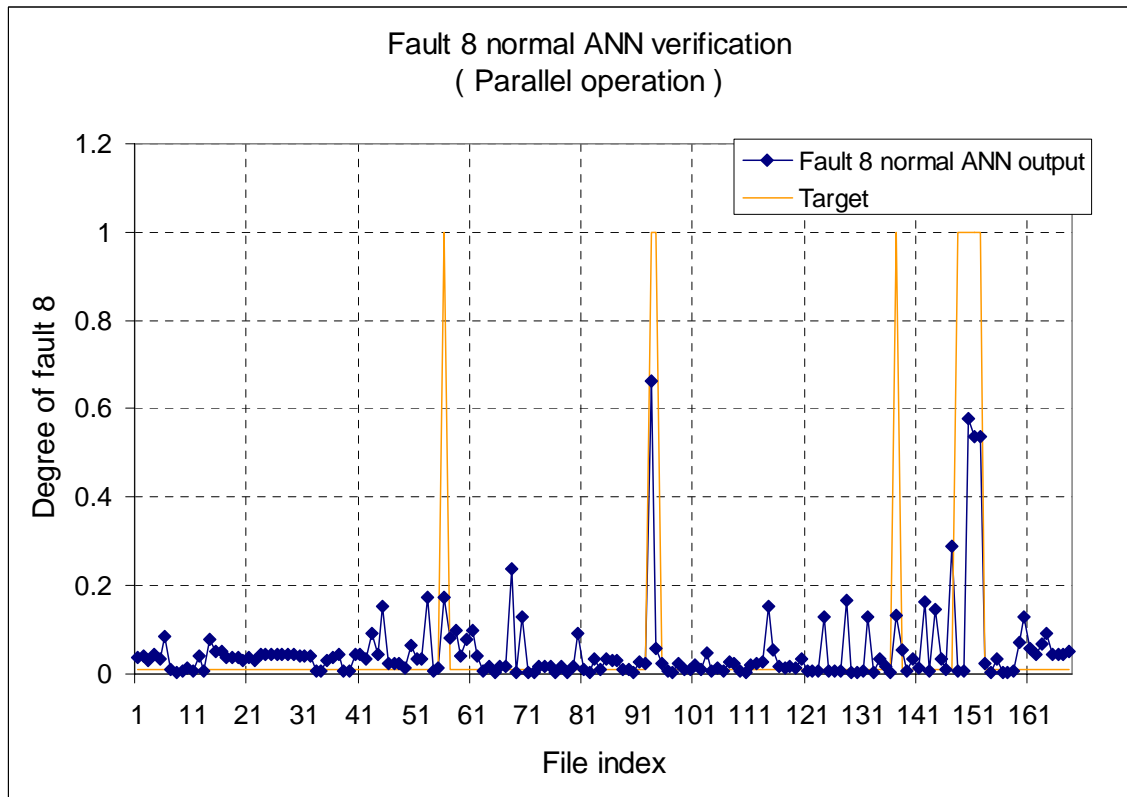


**Fault 8 : Parallel operation**

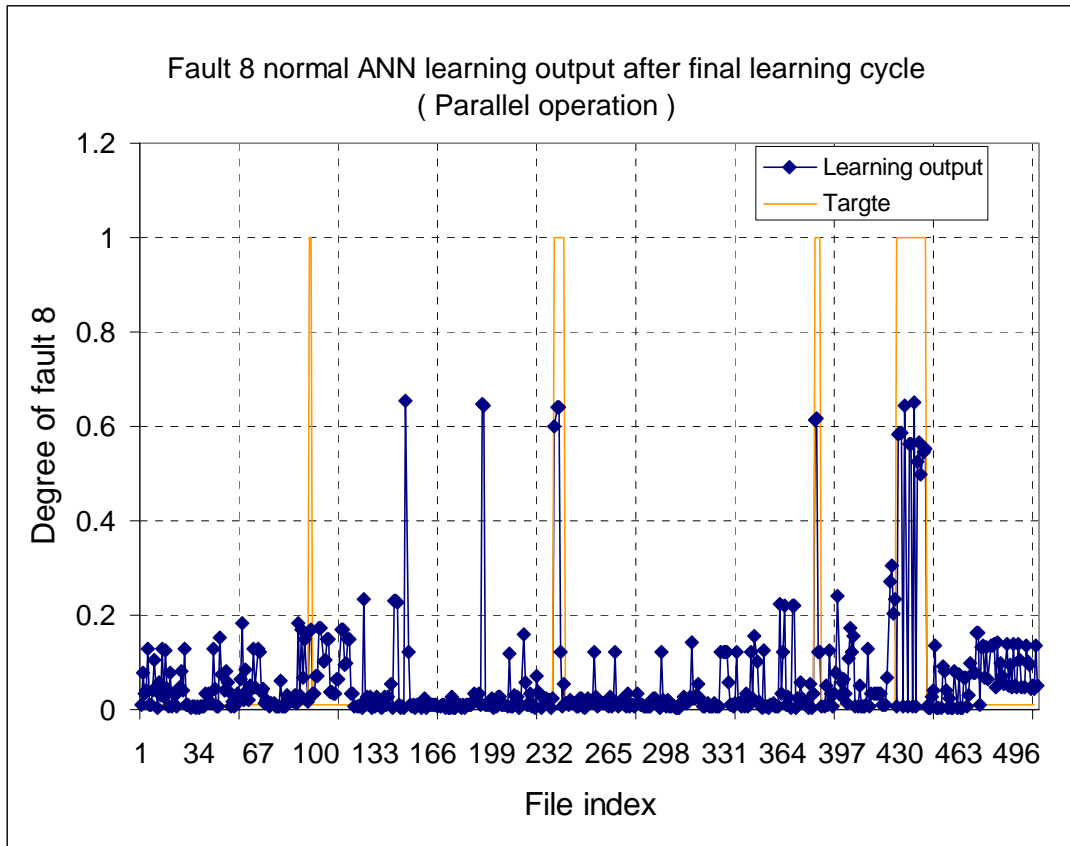
**Learning performance**



**Verification using 168 cases**

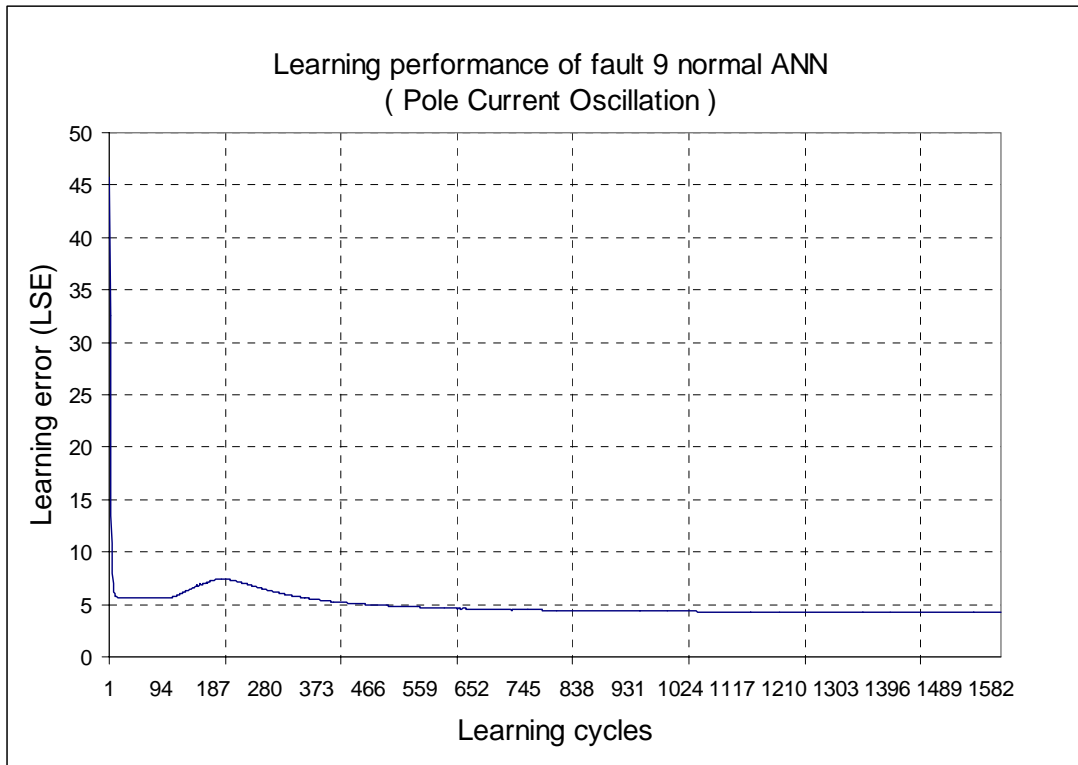


### Learning output after final cycle training

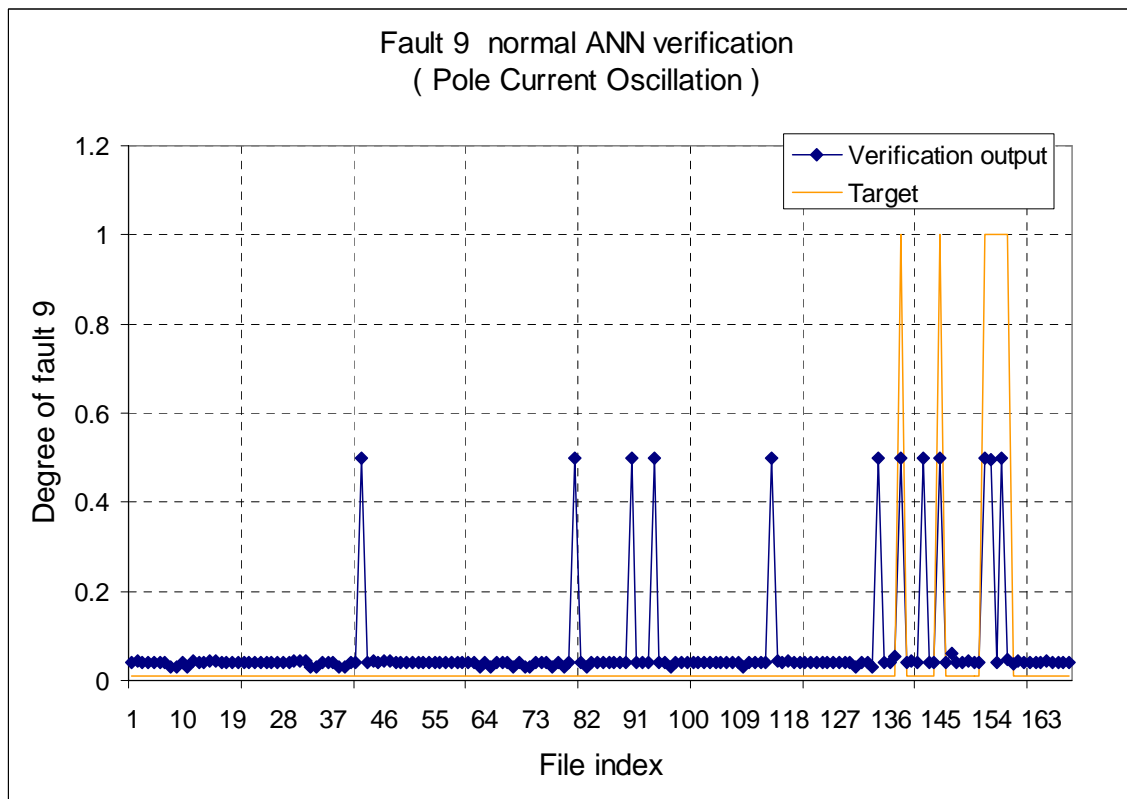


**Fault 9 : Pole Current Oscillation**

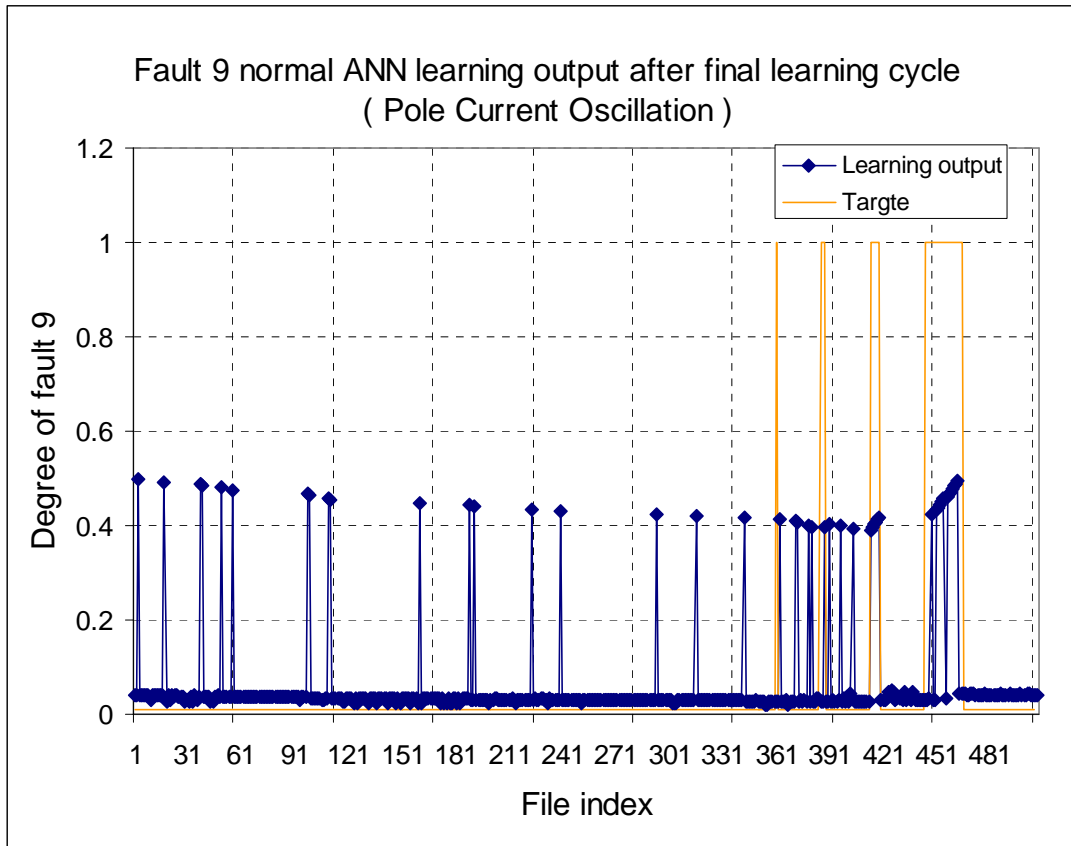
**Learning performance**



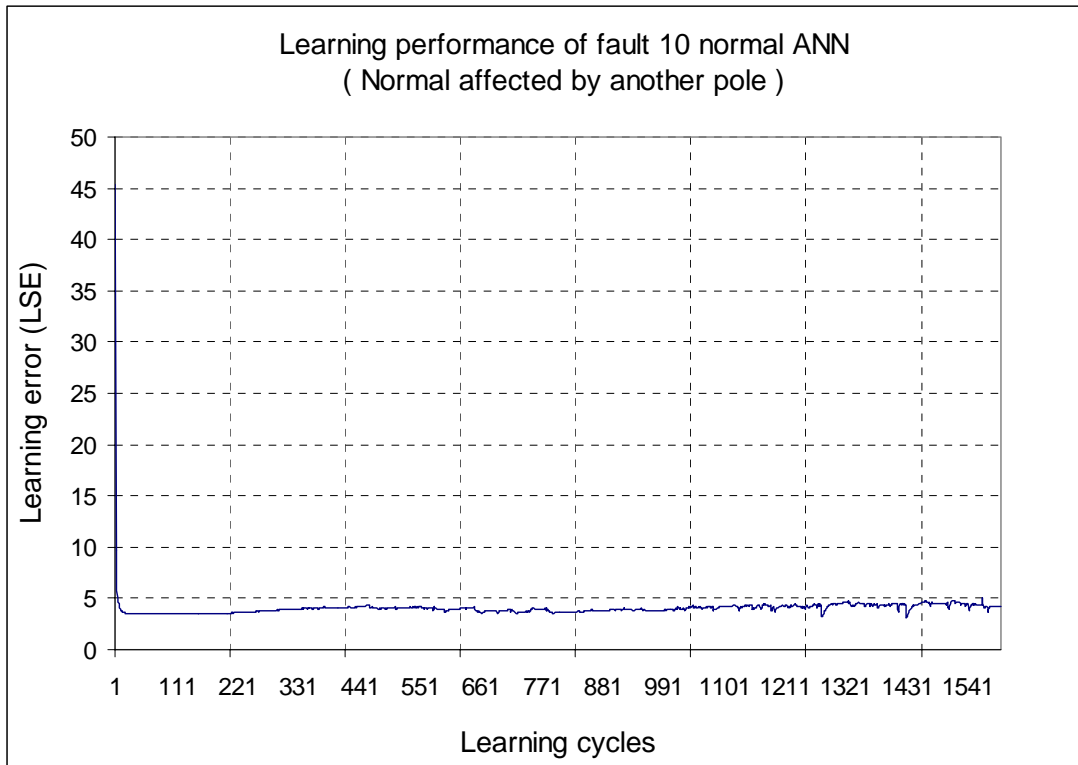
**Verification using 168 cases**



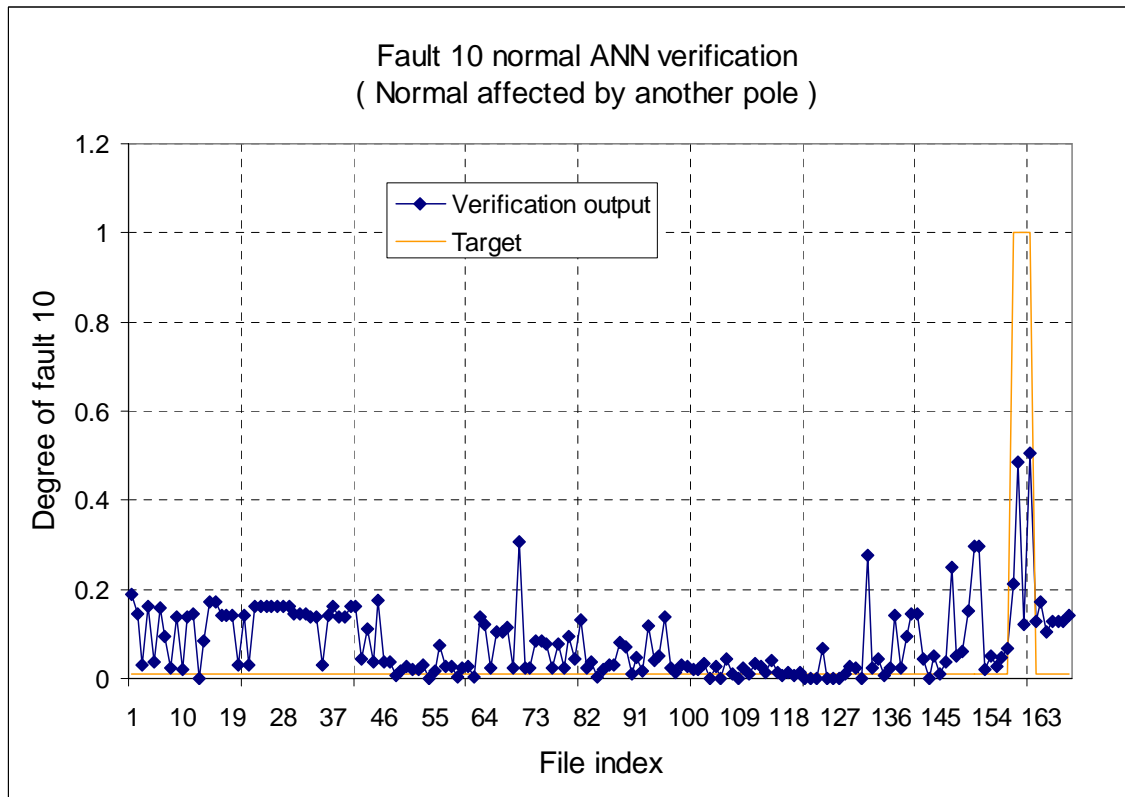
### Learning output after final cycle training



**Fault 10 : Normal affected by another pole**  
**Learning performance**

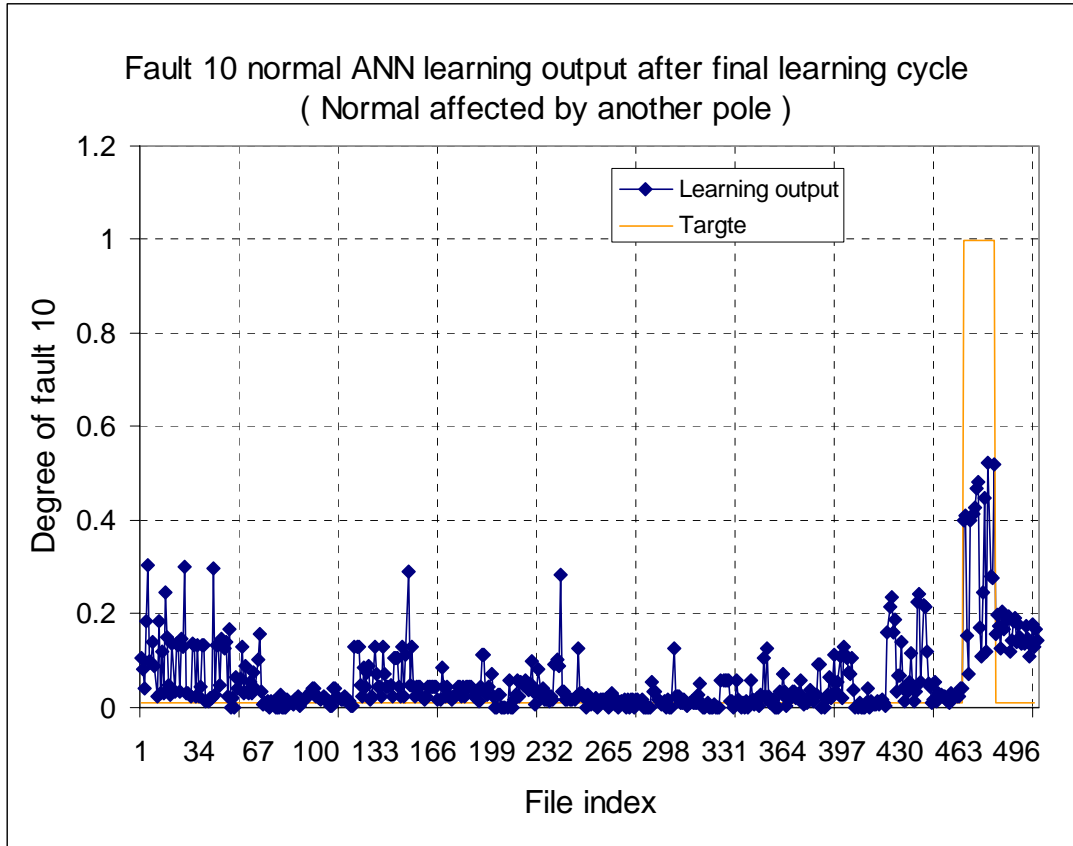


**Verification using 168 cases**



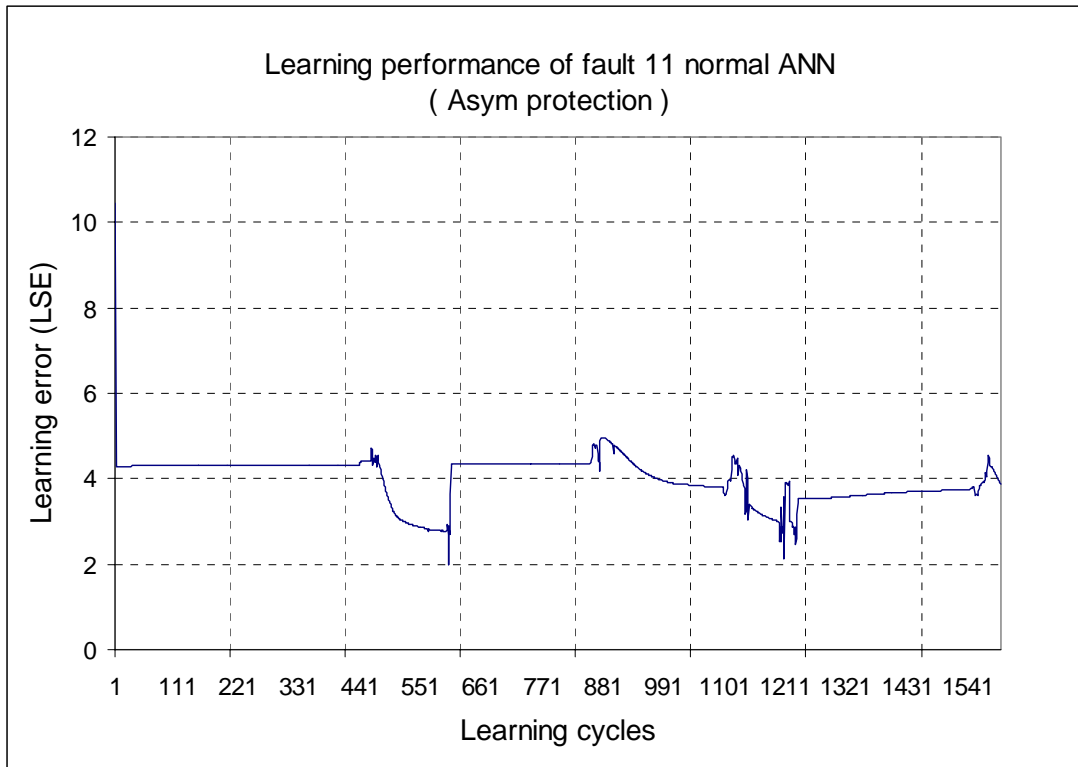


### Learning output after final cycle training

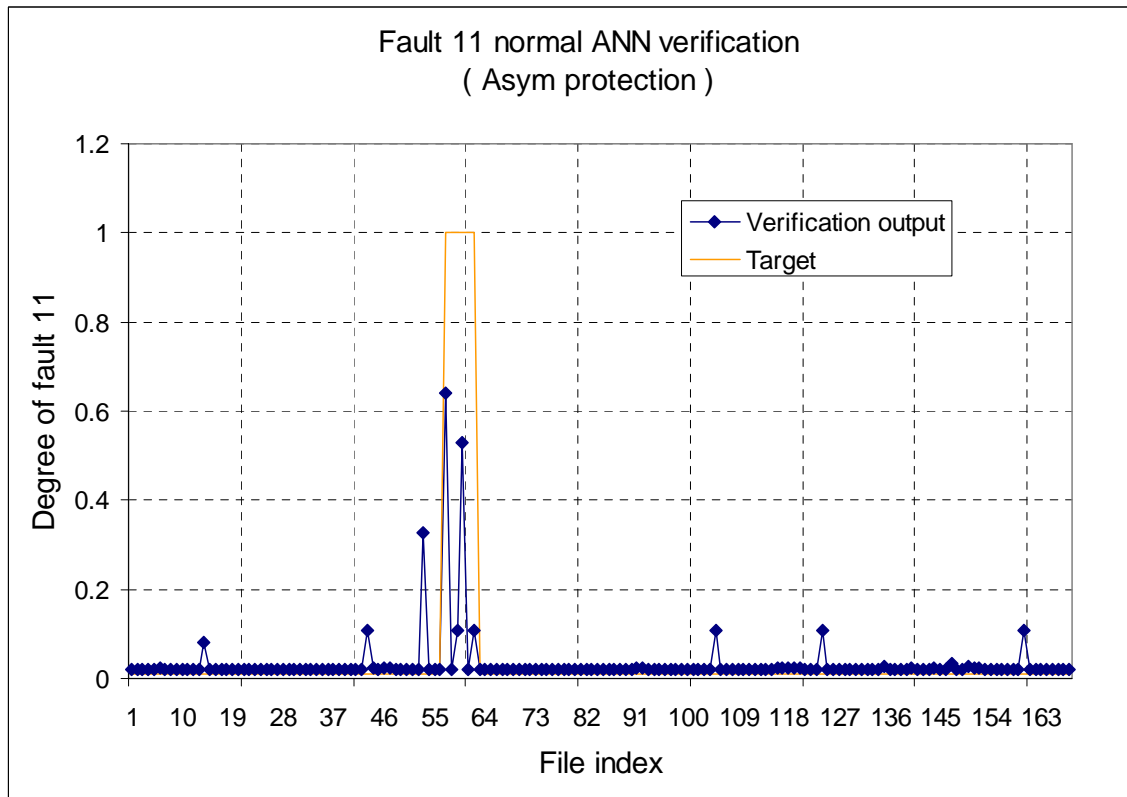


**Fault 11 : Asym protection**

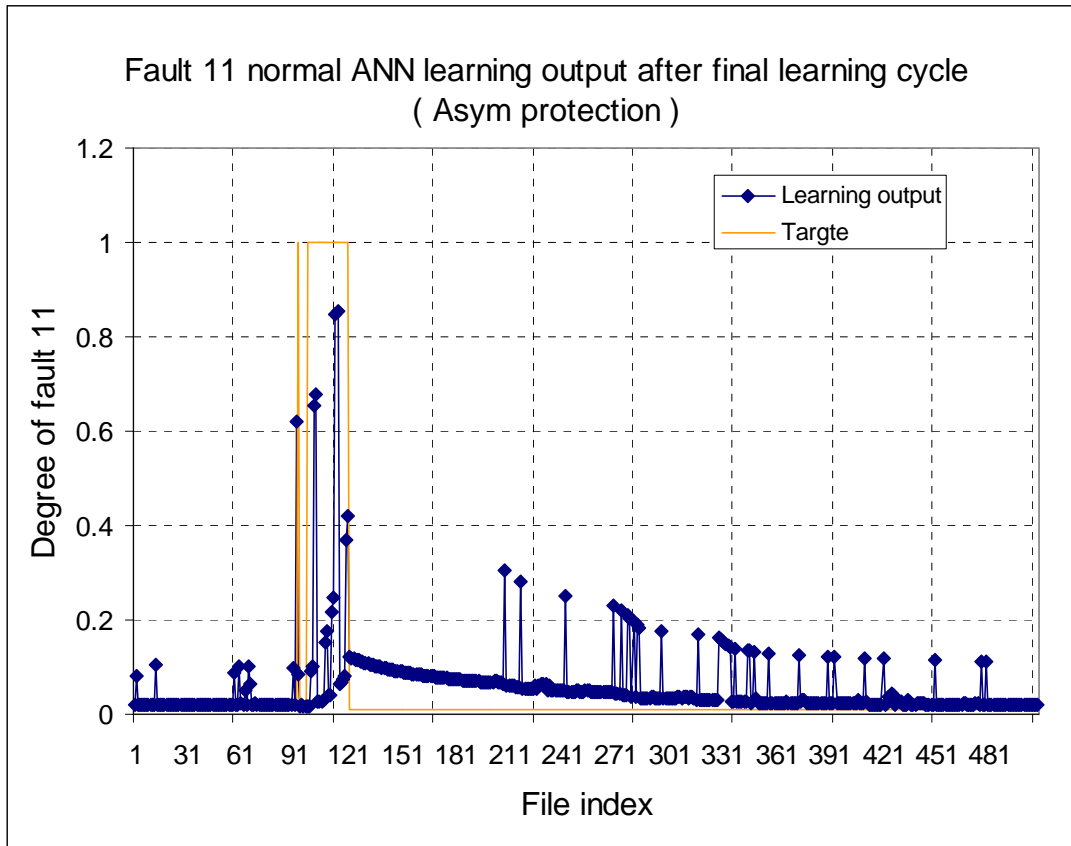
**Learning performance**



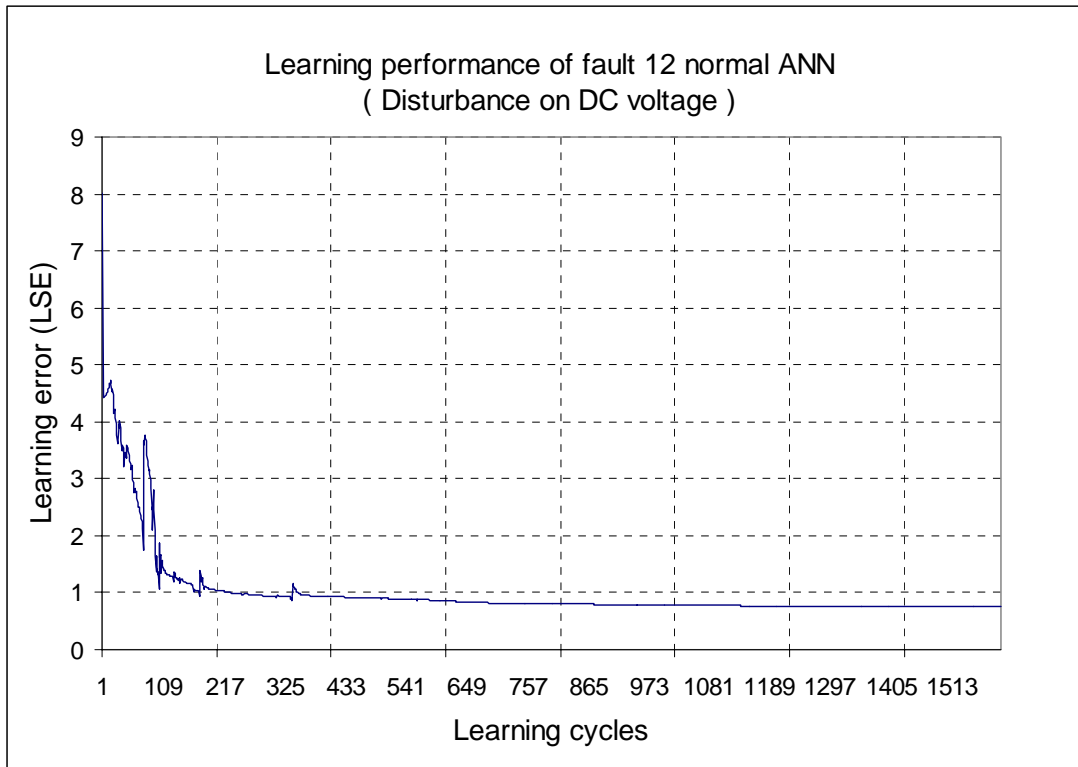
**Verification using 168 cases**



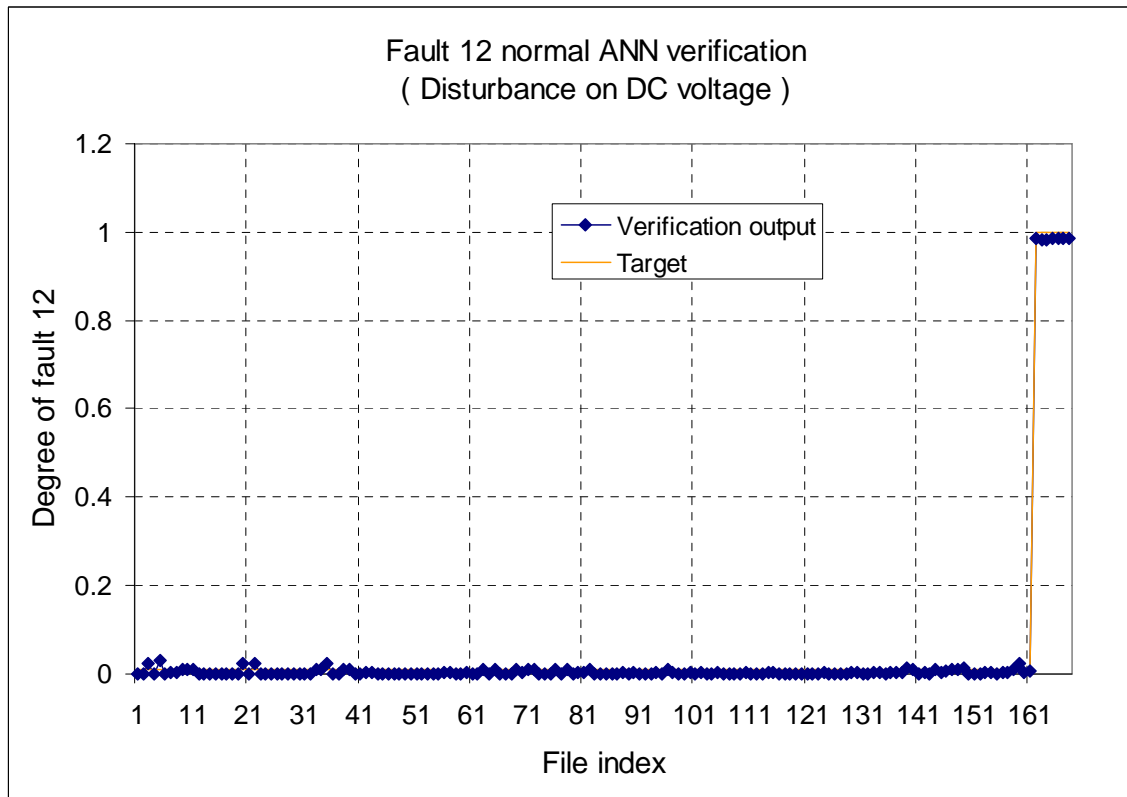
### Learning output after final cycle training



**Fault 12 : Disturbance on DC voltage**  
**Learning performance**



Verification using 168 cases



### Learning output after final cycle training

