

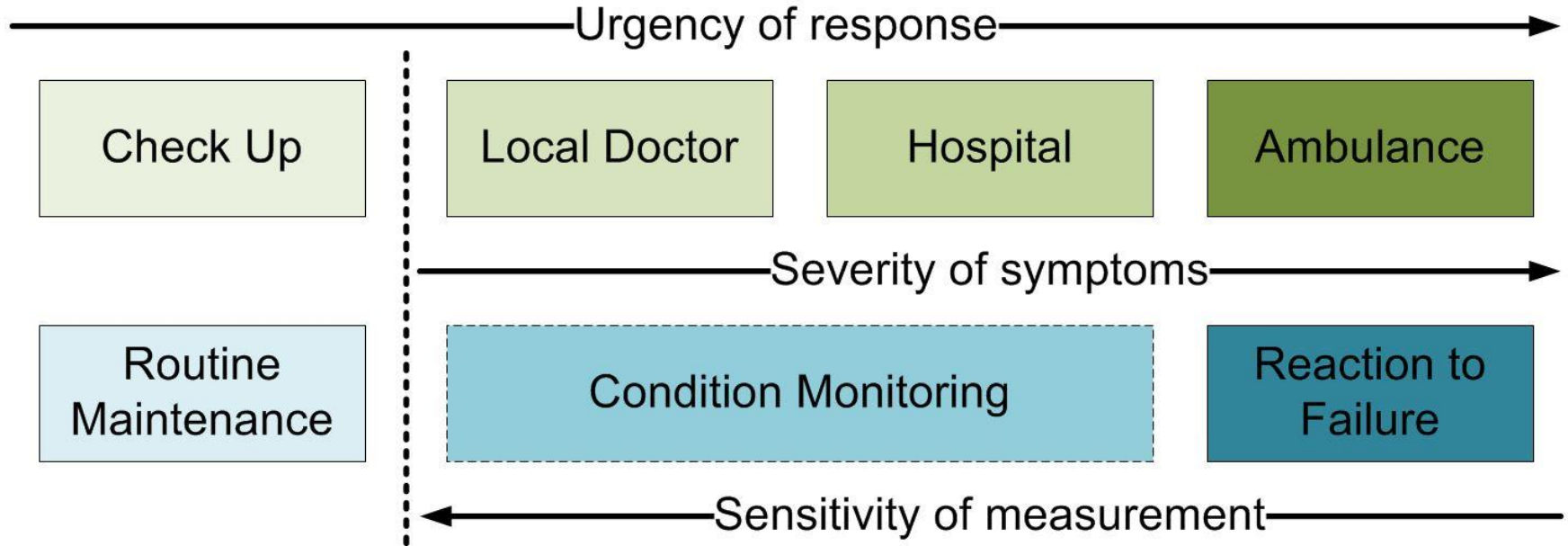


From Data to Diagnosis

Point condition monitoring through machine learning
Richard Parkinson

Balfour Beatty

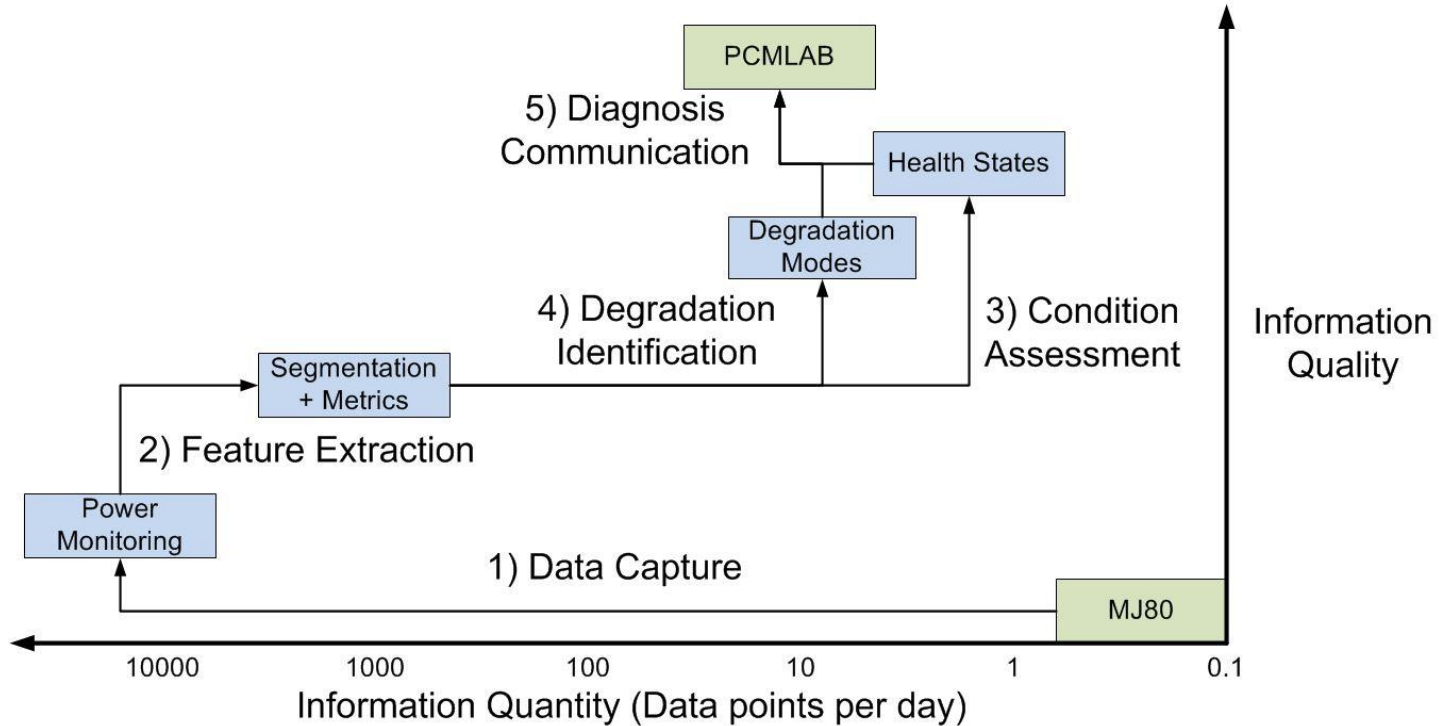
Healthcare vs. Maintenance



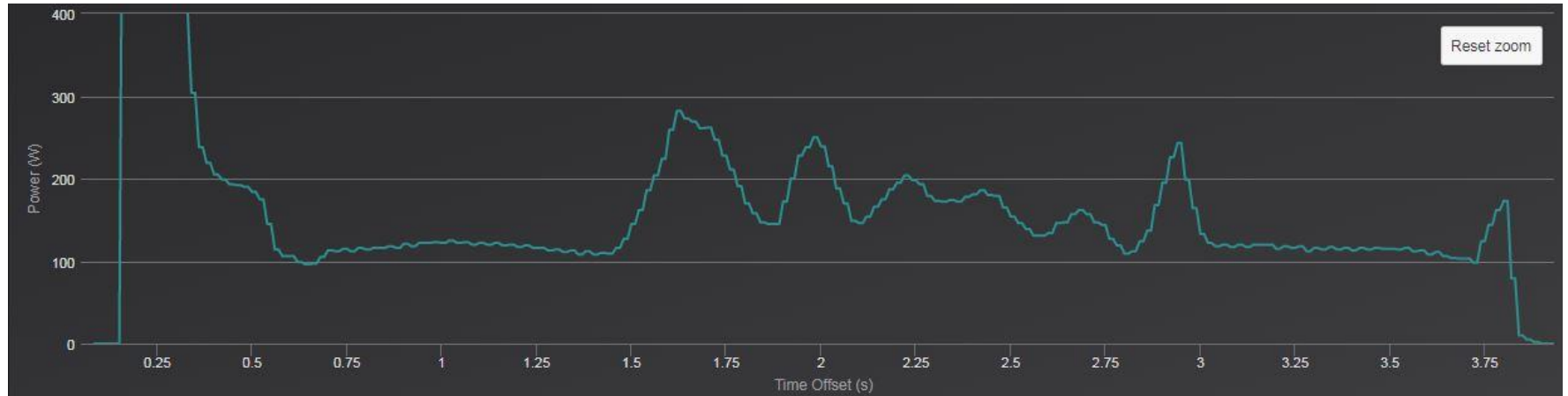
What are points?



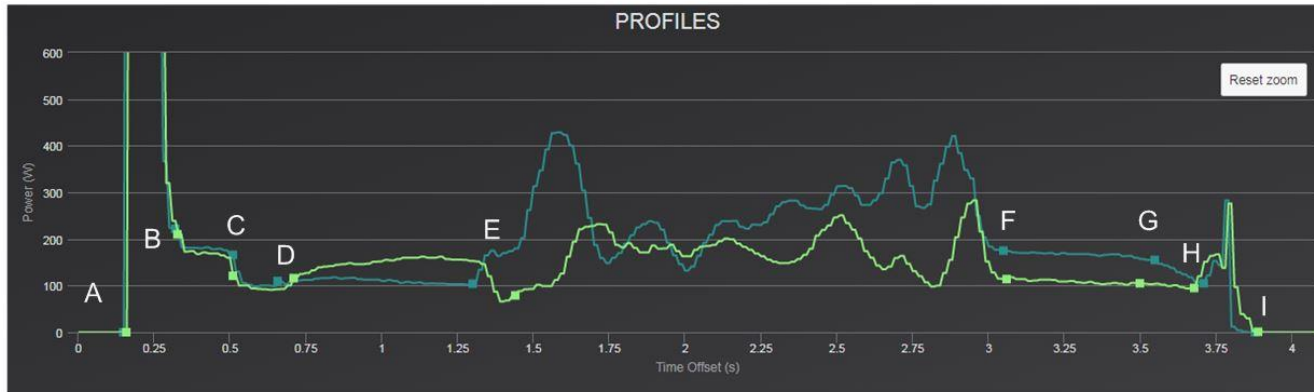
Data to Diagnosis Framework



1) Data Capture – Power Profile

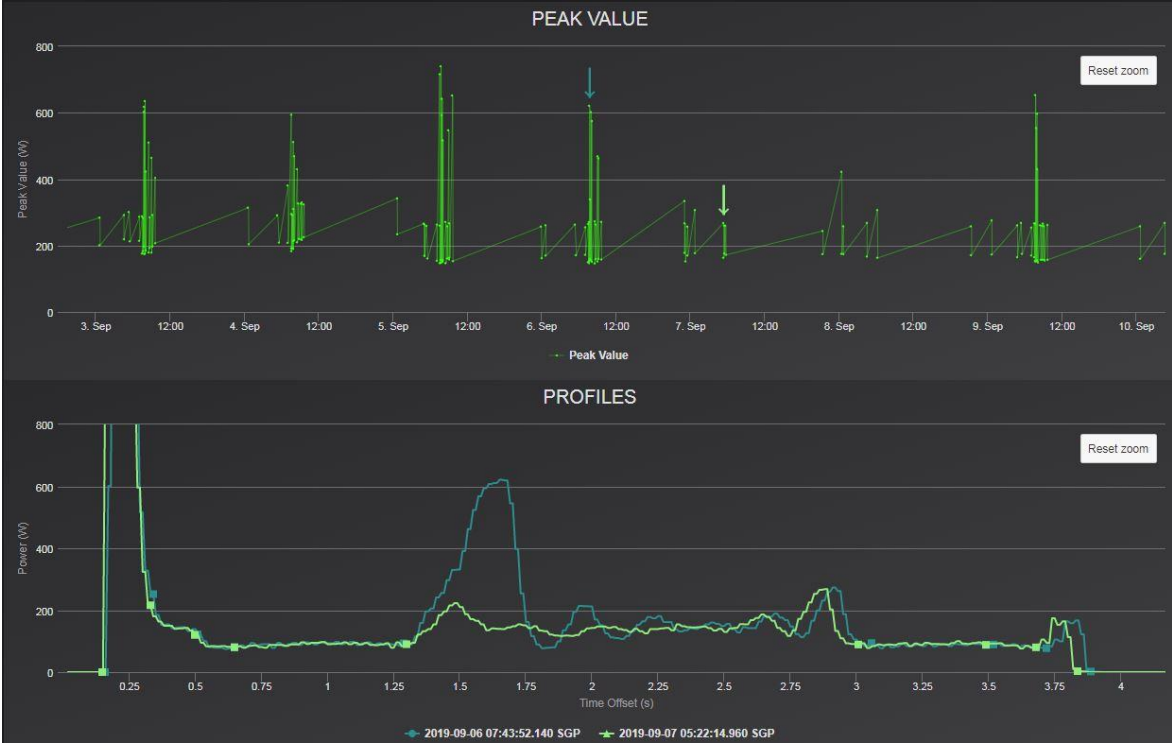


2) Feature Extraction – Segmentation

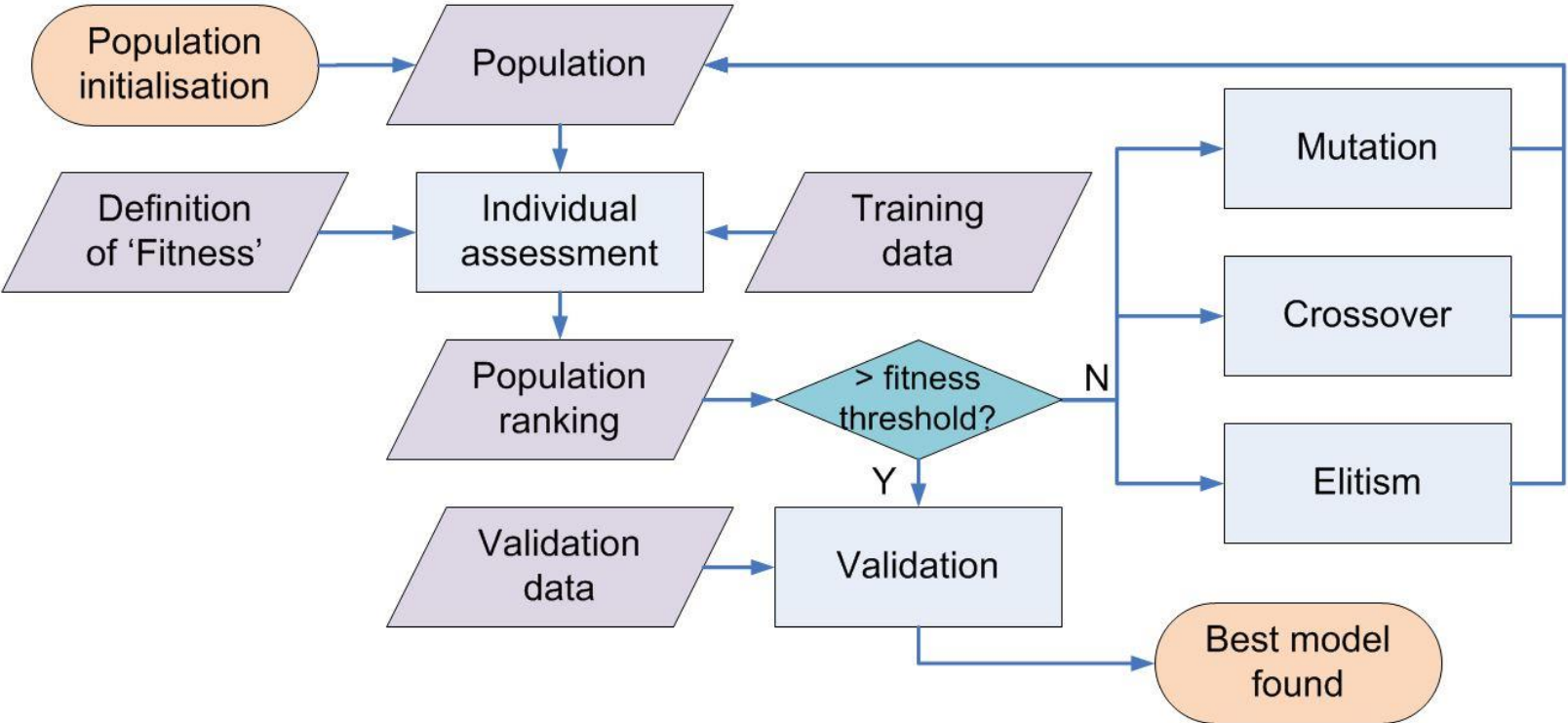


- A Start
- B Release
- C Brake Off
- D Unlock Start
- E Traverse Start
- F Traverse End
- G Lock End
- H Brake On
- I End

2) Feature Extraction - Statistics



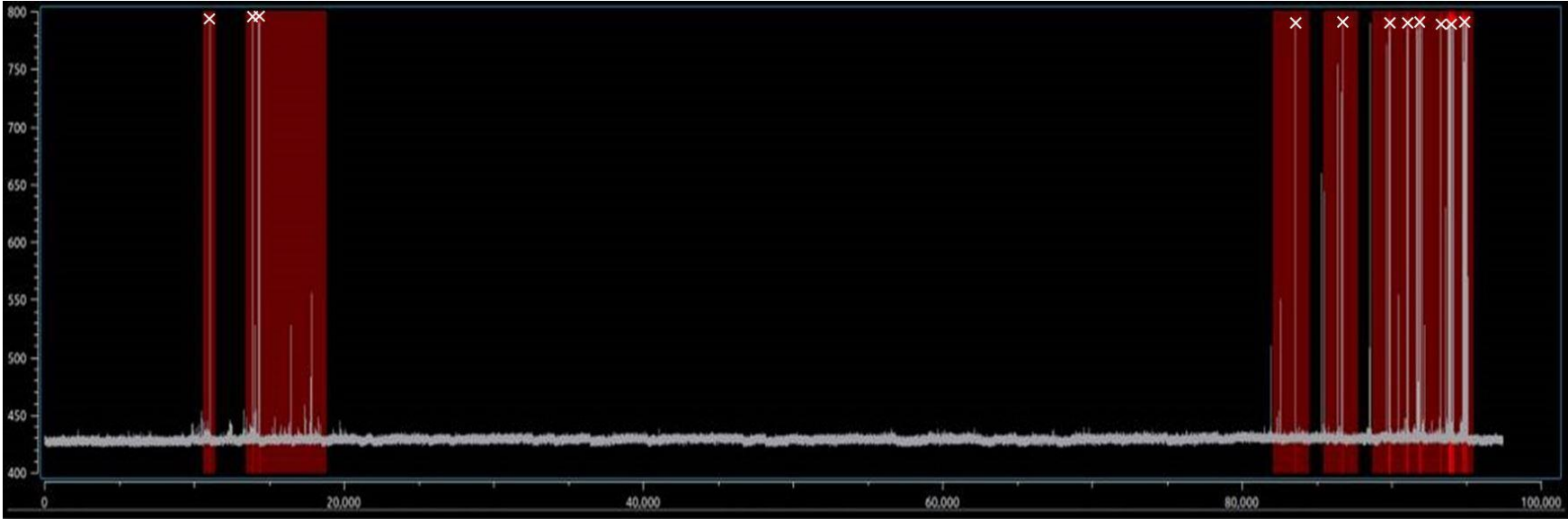
2) Feature Extraction – Genetic Algorithm



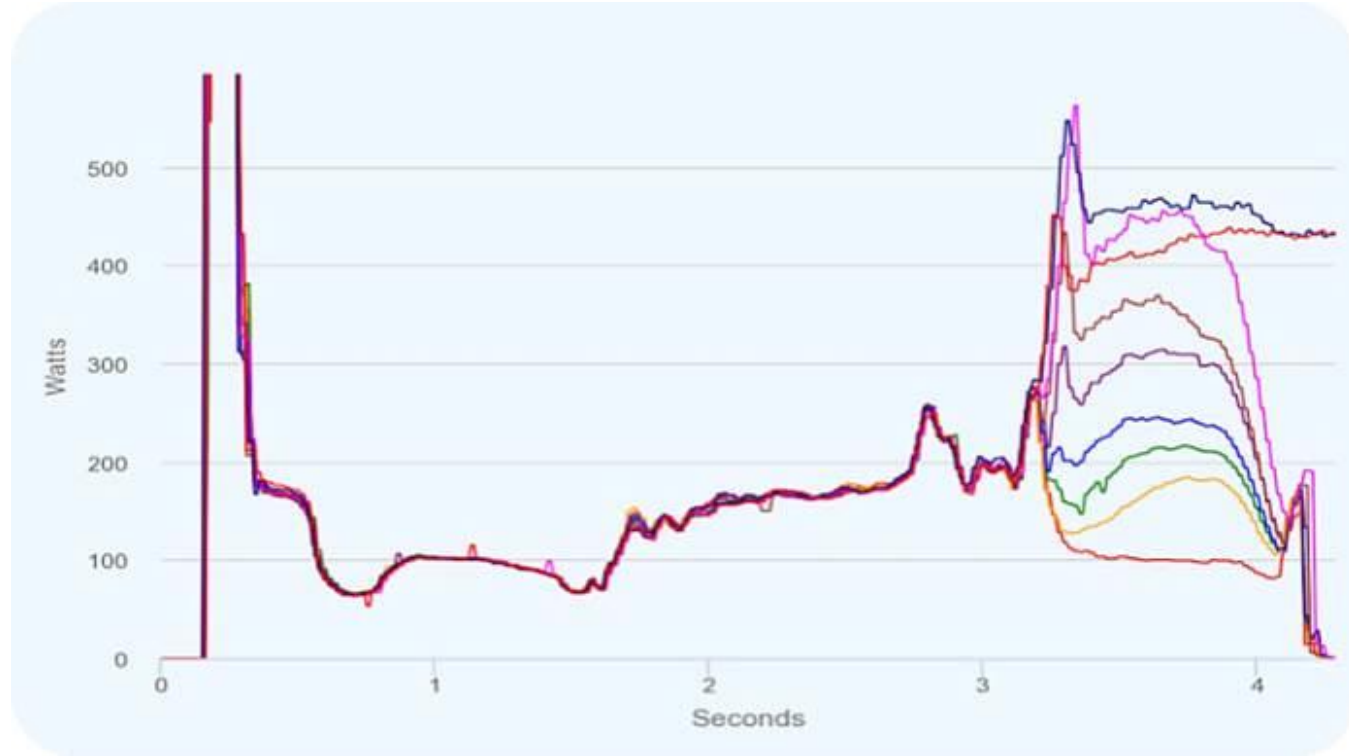
3) Condition Assessment – Defining health

No	Training KPR	Result	Impact
1	% failures captured by red health	>70%	Failure prediction rate
2	Red and neutral health risk ratio	>25	Significance of red
3	% red states with a failure	>30%	Significance of red
4	Red states per asset per year	<1	Avoid over-alerting
5	% time spent in red health	<15%	Avoid over-alerting

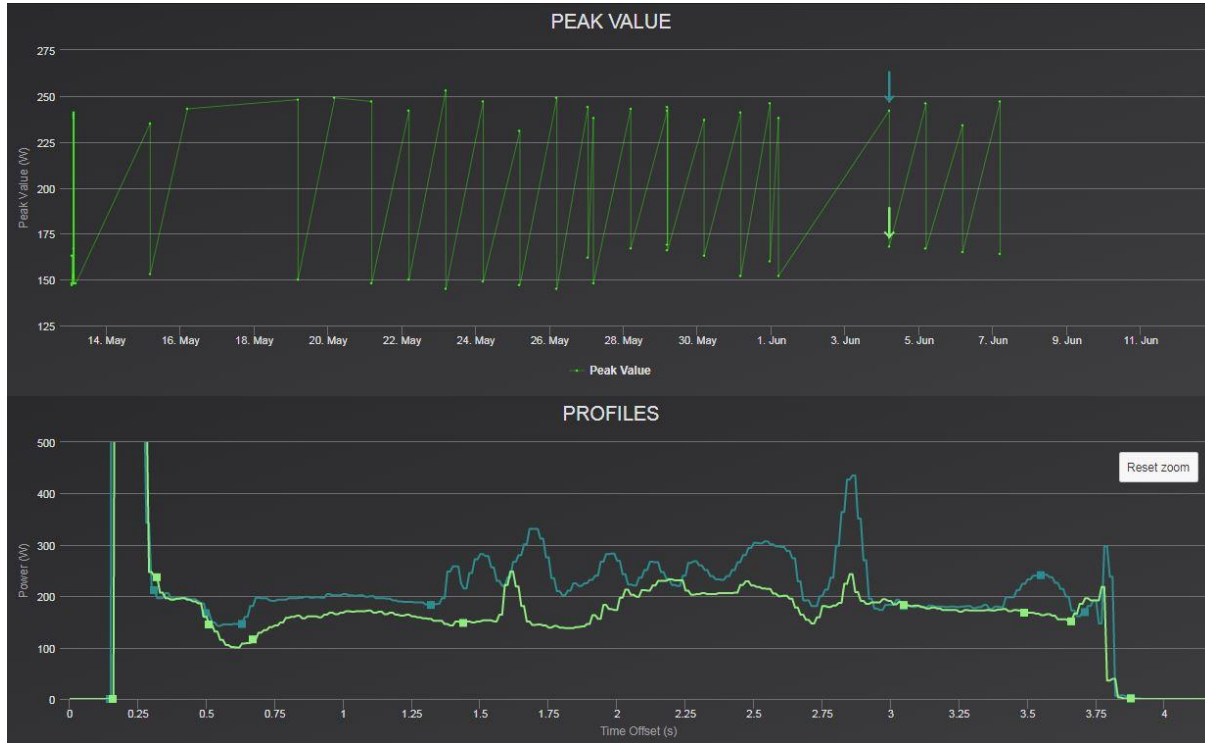
3) Condition Assessment – Assessing results



4) Degradation Identification – Calibration



4) Degradation Identification – Statistics



5) Diagnosis Communication – Summary Page

Test system

State	UTE	Name	Health Issue	Health Change	Last Maint.	Planned Action	Maint. Det.
Red		W231	Traverse Force High	20	—		
Yellow		E225A	Lock Force Variation	20	—		
Yellow		N207	Unlock Force Variation	7	—		
Yellow		N214B	Lock Force High	13	—		
Yellow		N217B	Unlock Force High	6	—		
Yellow		N218B	Unlock Force High	22	—		
Yellow		N228B	Unlock Force Variation	45	—		
Yellow		NW210A	Lock Force High	25	—		
Yellow		S208A	Unlock Force High	20	—		
Yellow		S209	Unlock Force High	20	—		
Yellow		W207A	Unlock Force High	54	—		
Yellow		W225A	Unlock Force High	66	—		
Yellow		W226A	Unlock Force High	17	—		

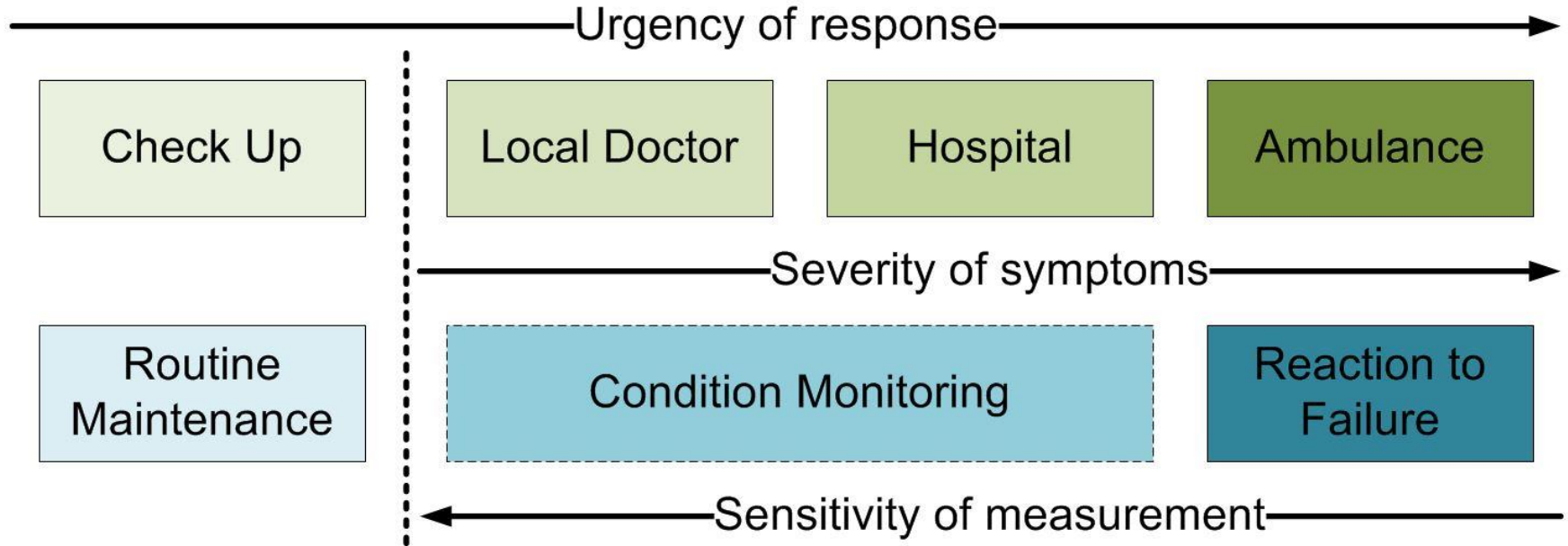
Navigation: Previous | Page 2 of 2 | 20 rows | Next

5) Diagnosis Communication – Investigation Page

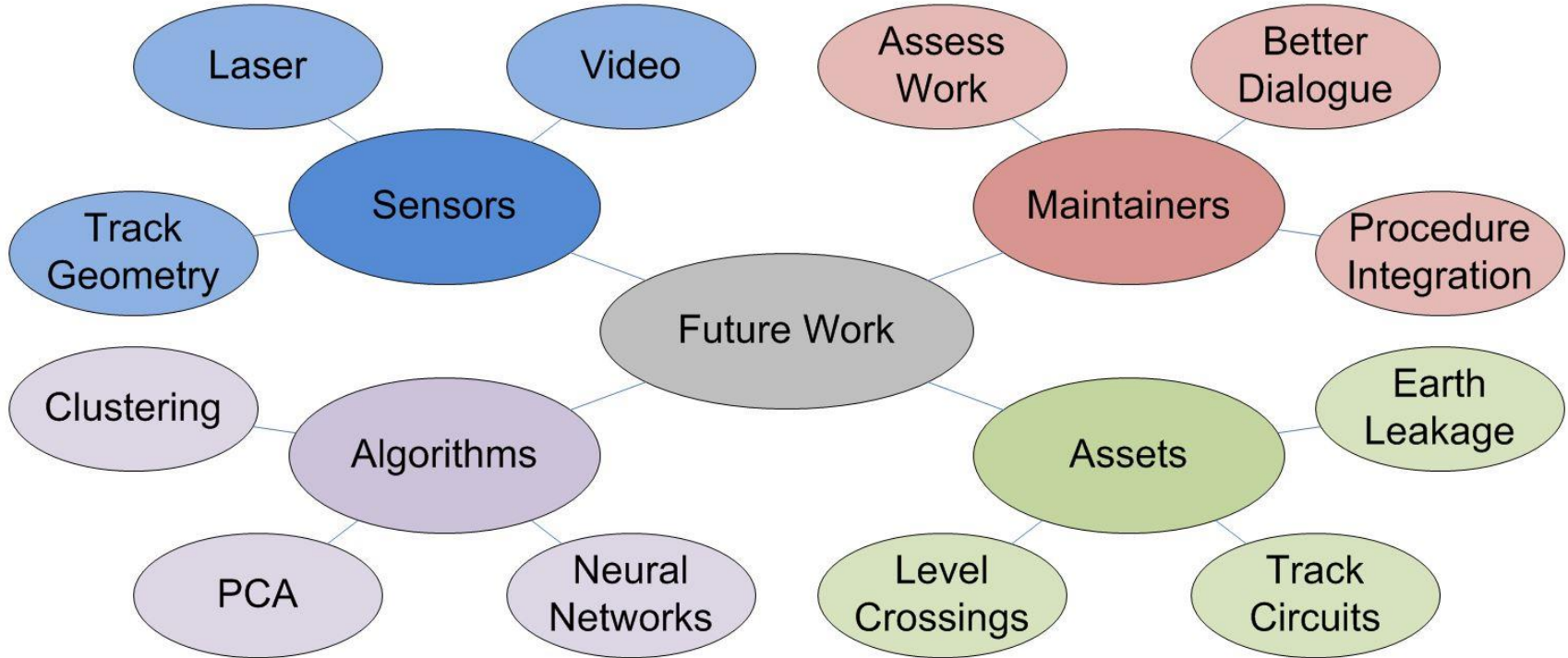


Test system

Results and Benefits



Future Work



Balfour Beatty