U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Clean. Reliable. Nuclear.

Using “Big Data” to help understand NPP challenges

Advanced Sensors and Instrumentation
Annual Webinar

October 31 – November 1, 2018

Tom Gruenwald
Blue Wave

Project Overview
Chattering Valve

- Problem:
  - Hatch 1 observes sporadic ~0.2Hz chattering in Safety Relief Valves (SRVs)
  - Hatch 2 (very similar reactor) does not chatter
    - Chattering valves moved from Hatch 1 to Hatch 2 do not chatter
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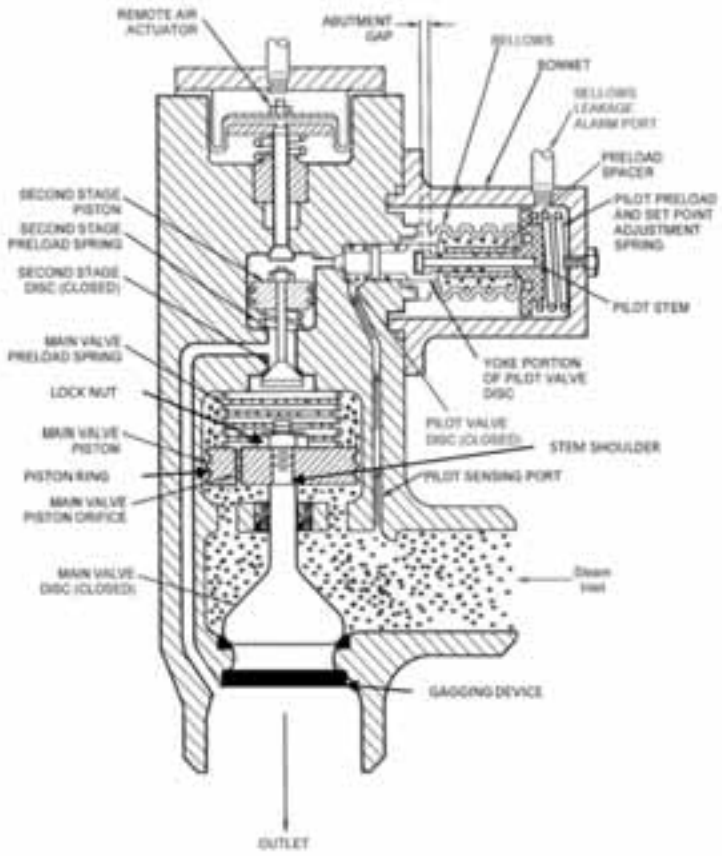
  - To quickly and autonomously identify chattering valves
  - Create a model which predicts chattering and identify its root cause



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- 1.8 TB of data provided for Hatch 1
- There are 32 million data points per year, per valve.
- There are eleven three-stage valves at SNP's Hatch1
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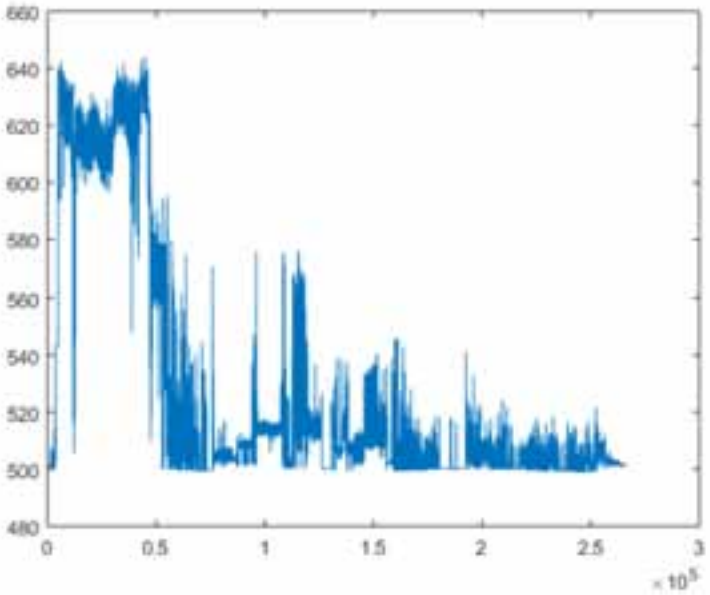

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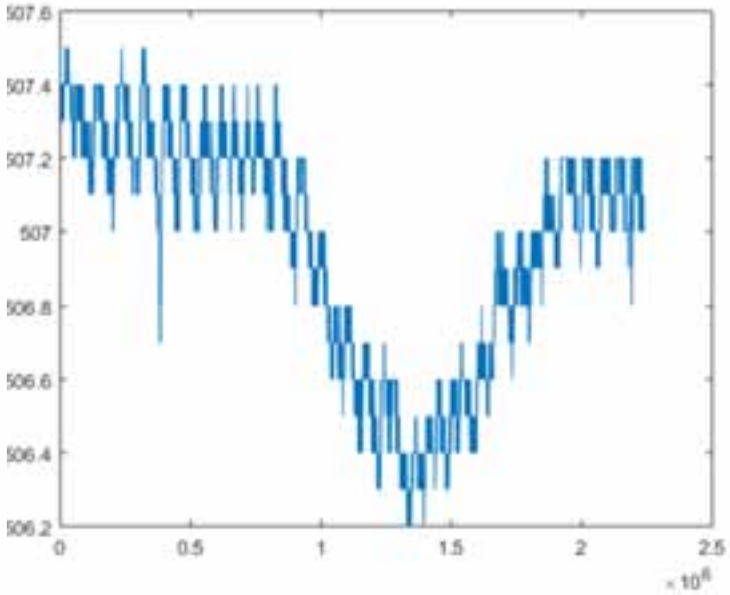

Chattering Valve

- 5 Batches, 1.81 TB
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  - Latest date: 04/30/2017
  - 1Hz time log
- 3,722 Sensor-Check pairs
  - 28 Service Groups;
  - “YOKO1”: 44 Variables, 11SRVs × 4 Thermocouple sensors per SRV
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modbus2	rtp10
modbus3	rtp11
plasma	valves
ppc	yoko1
relay	yoko2
rtp1	yoko3
rtp2	yoko4
rtp3	yoko5

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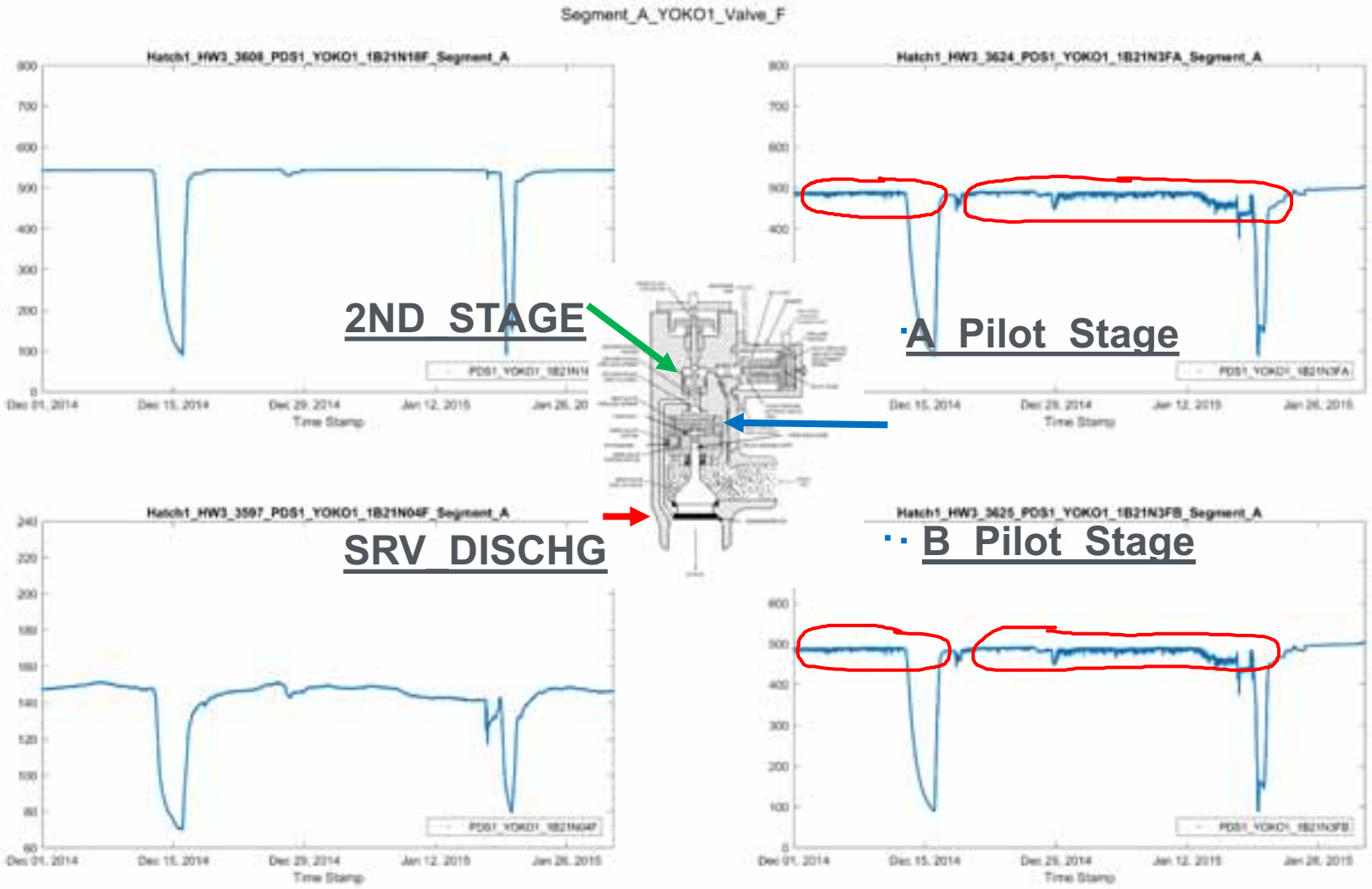

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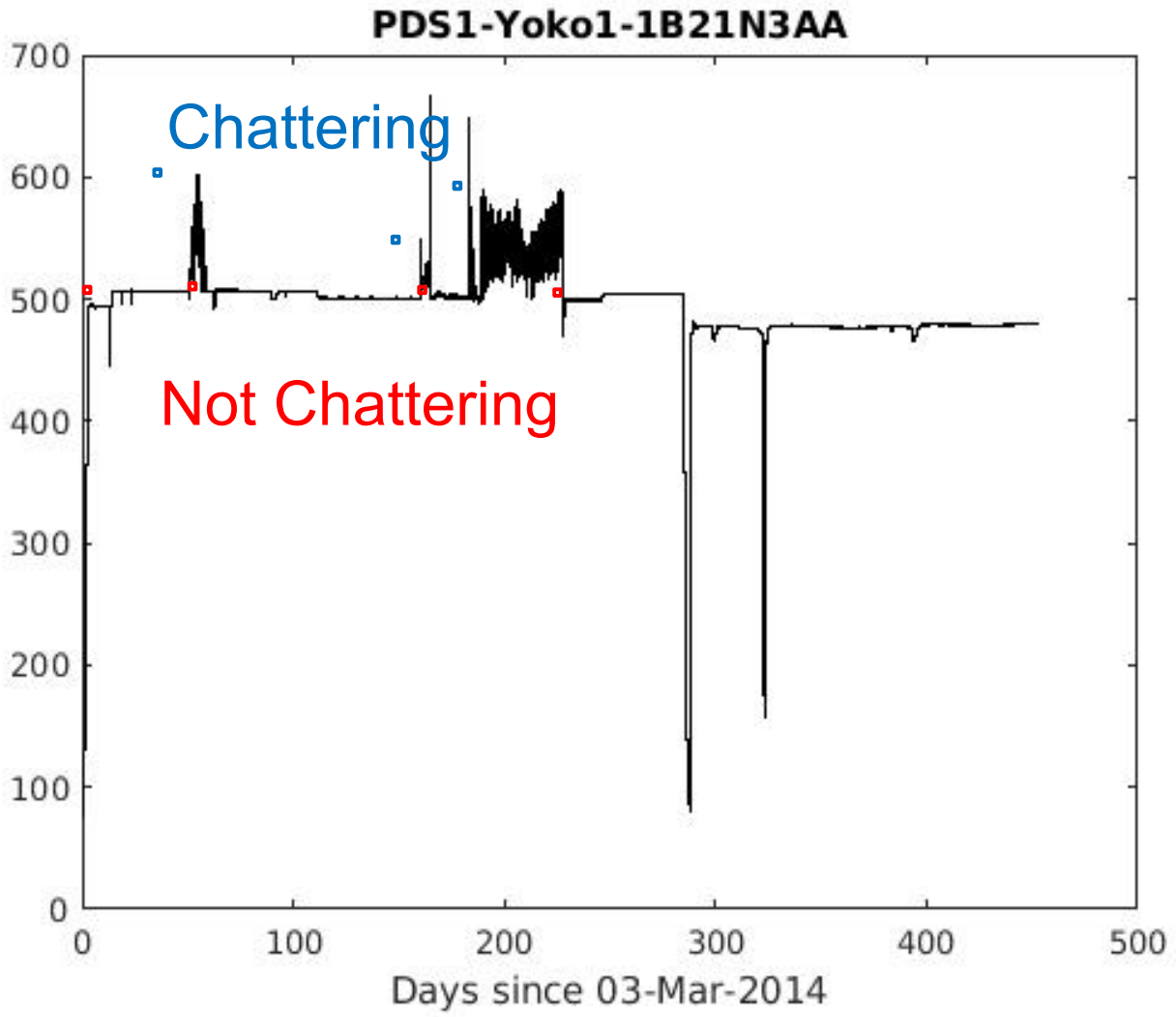
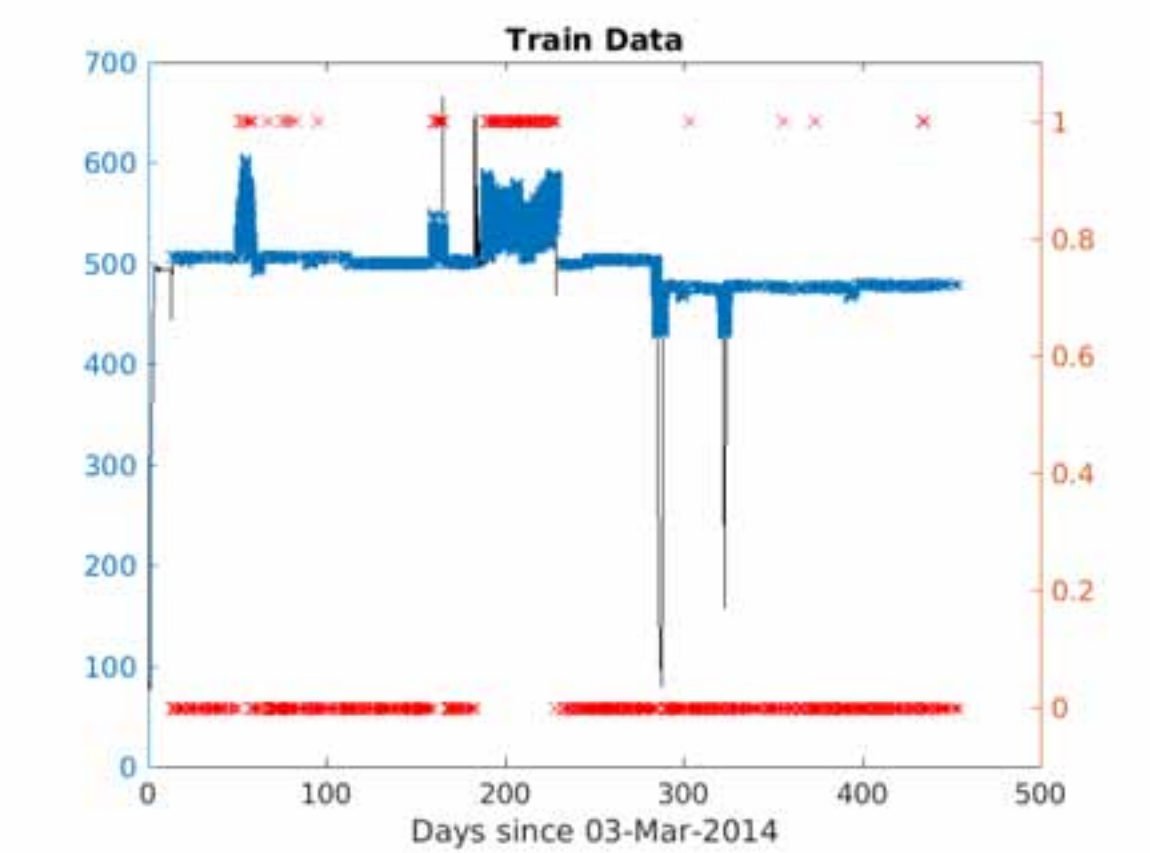
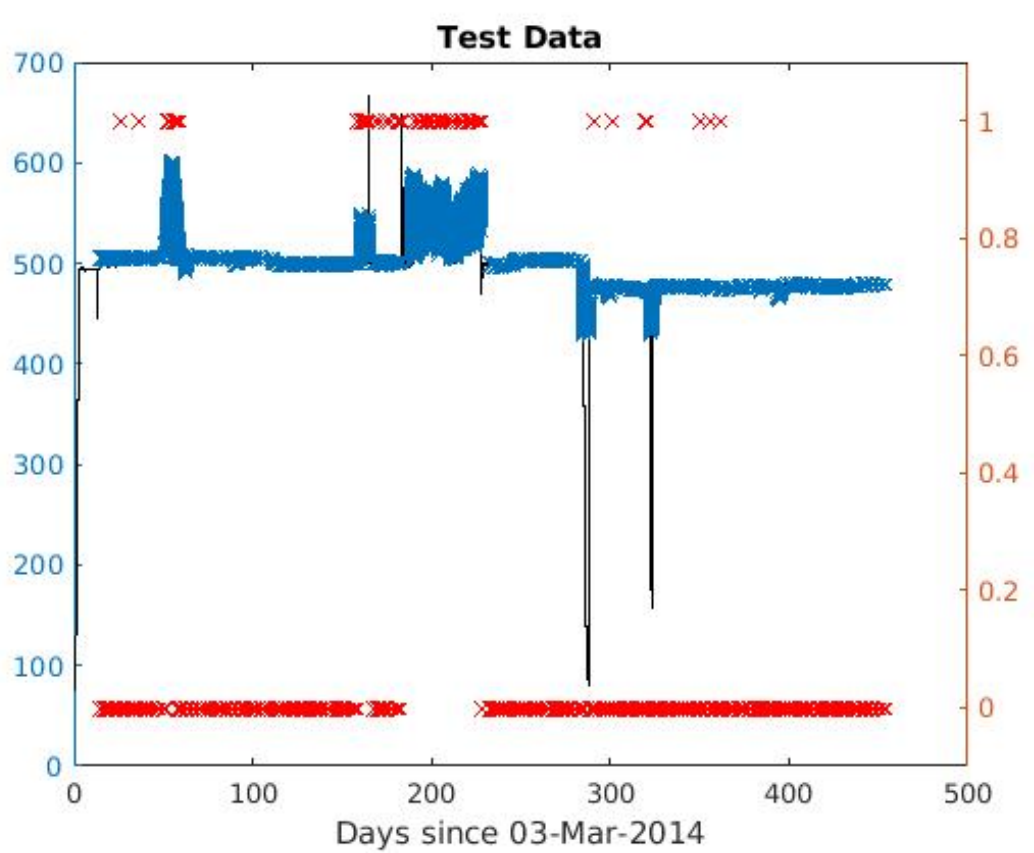
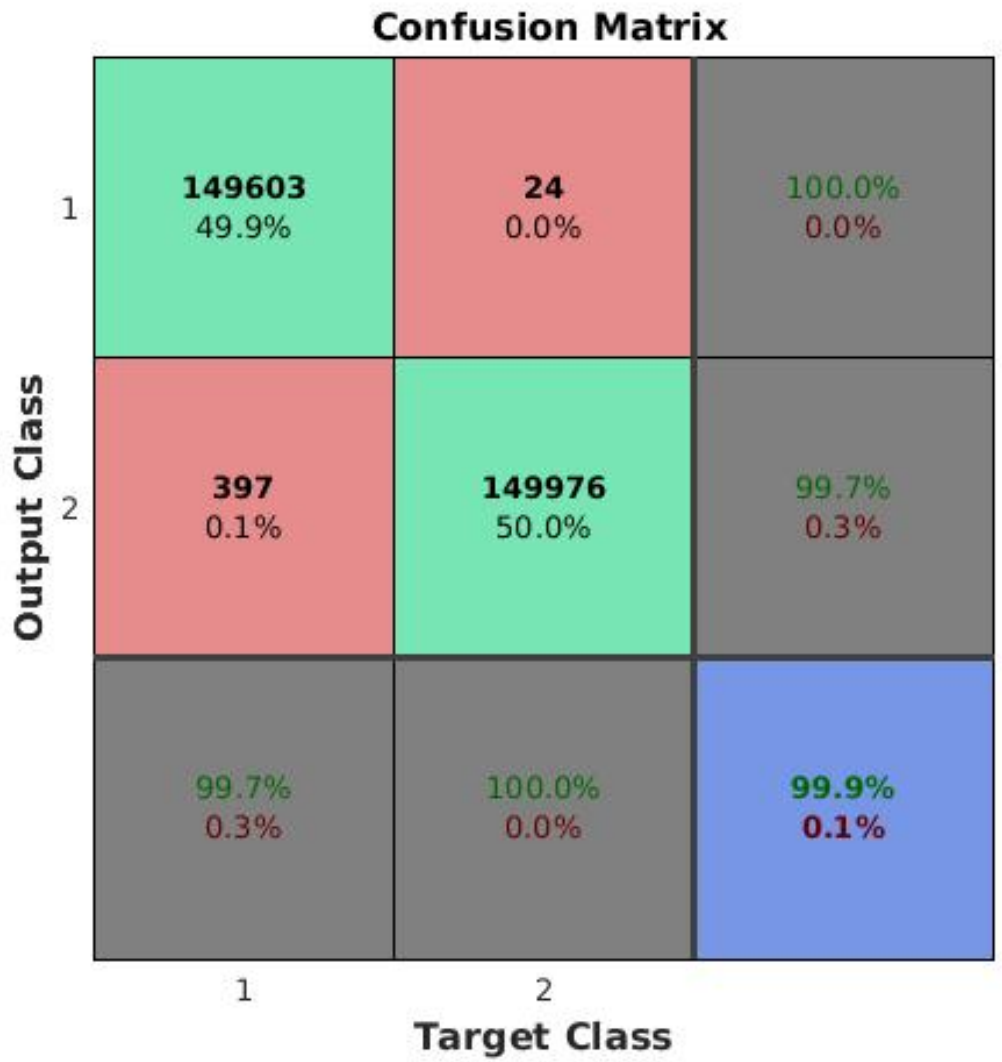


Bagged tree classifier





Bagged Tree Classifier – Confusion Matrix



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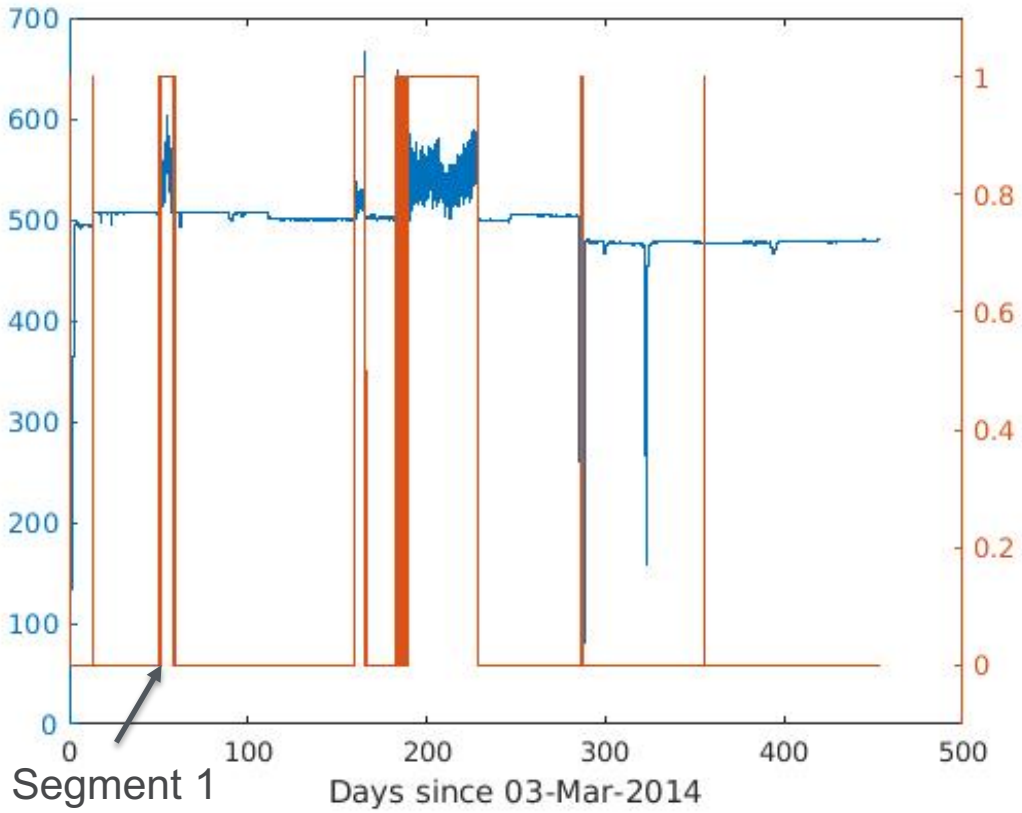
10 point smoothing



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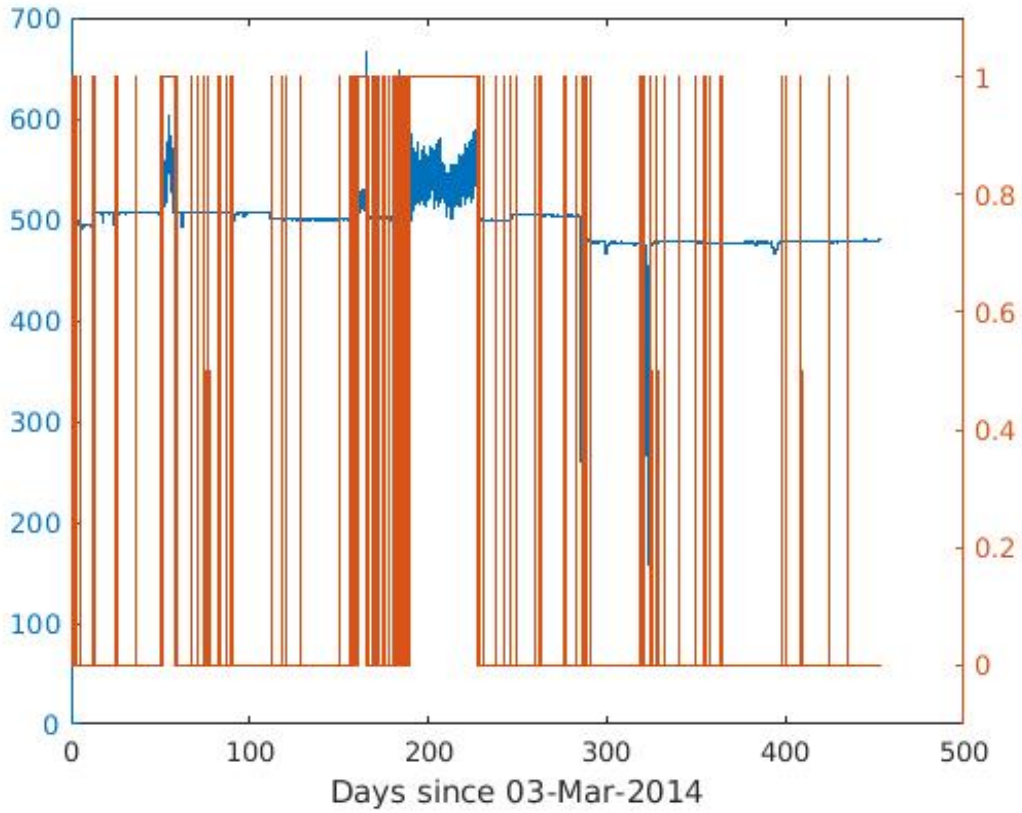
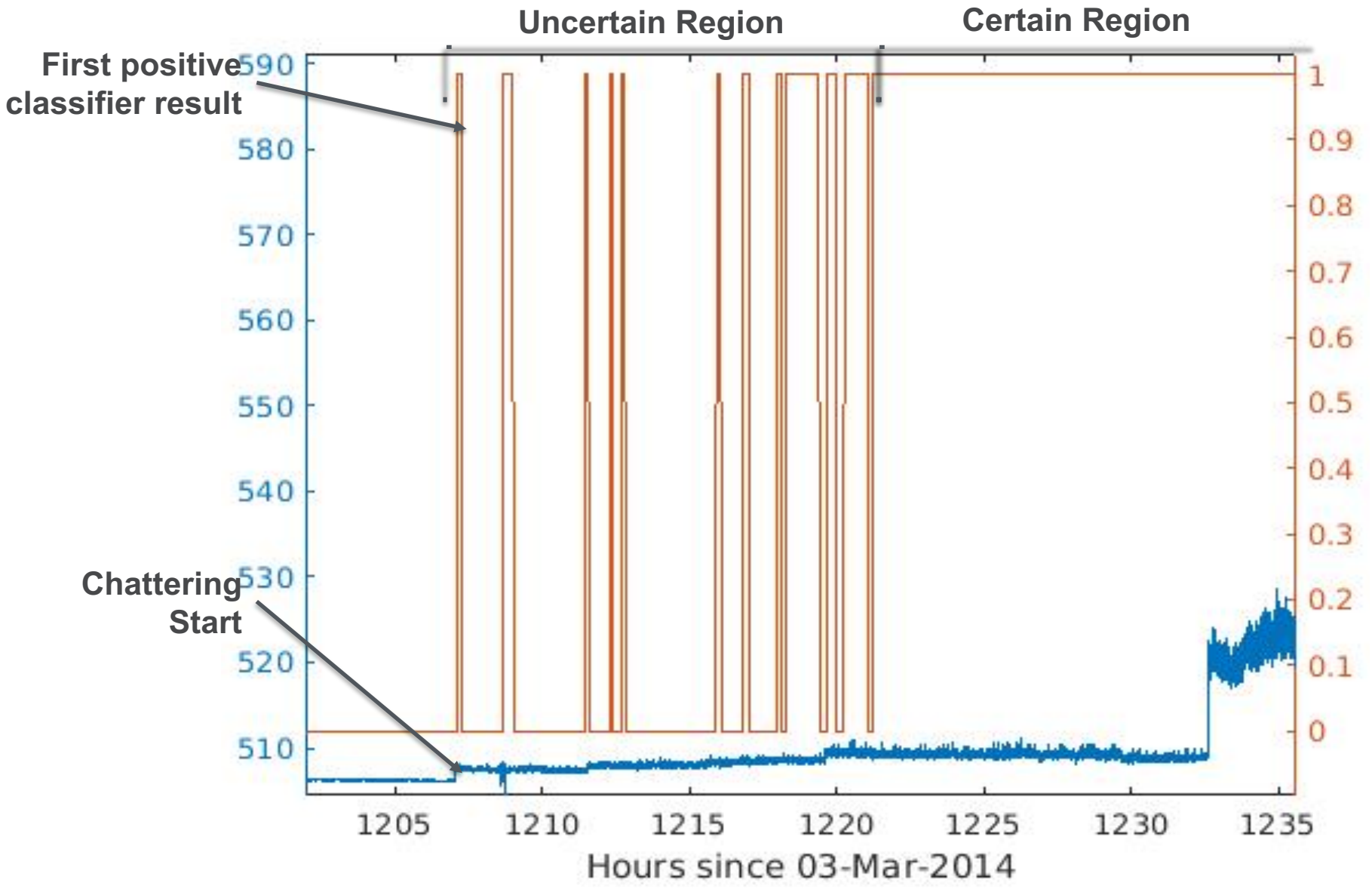
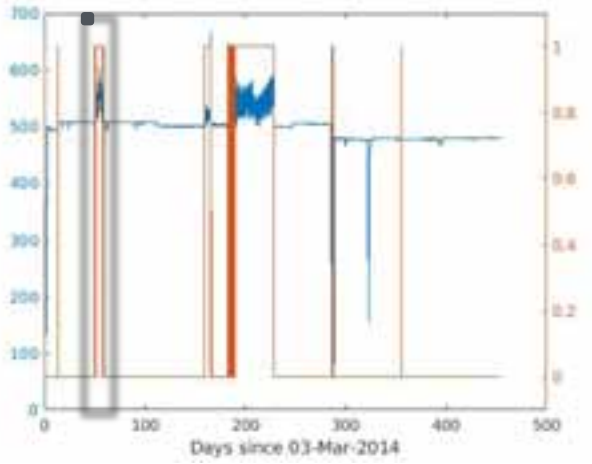


Segment 1 – Time Response





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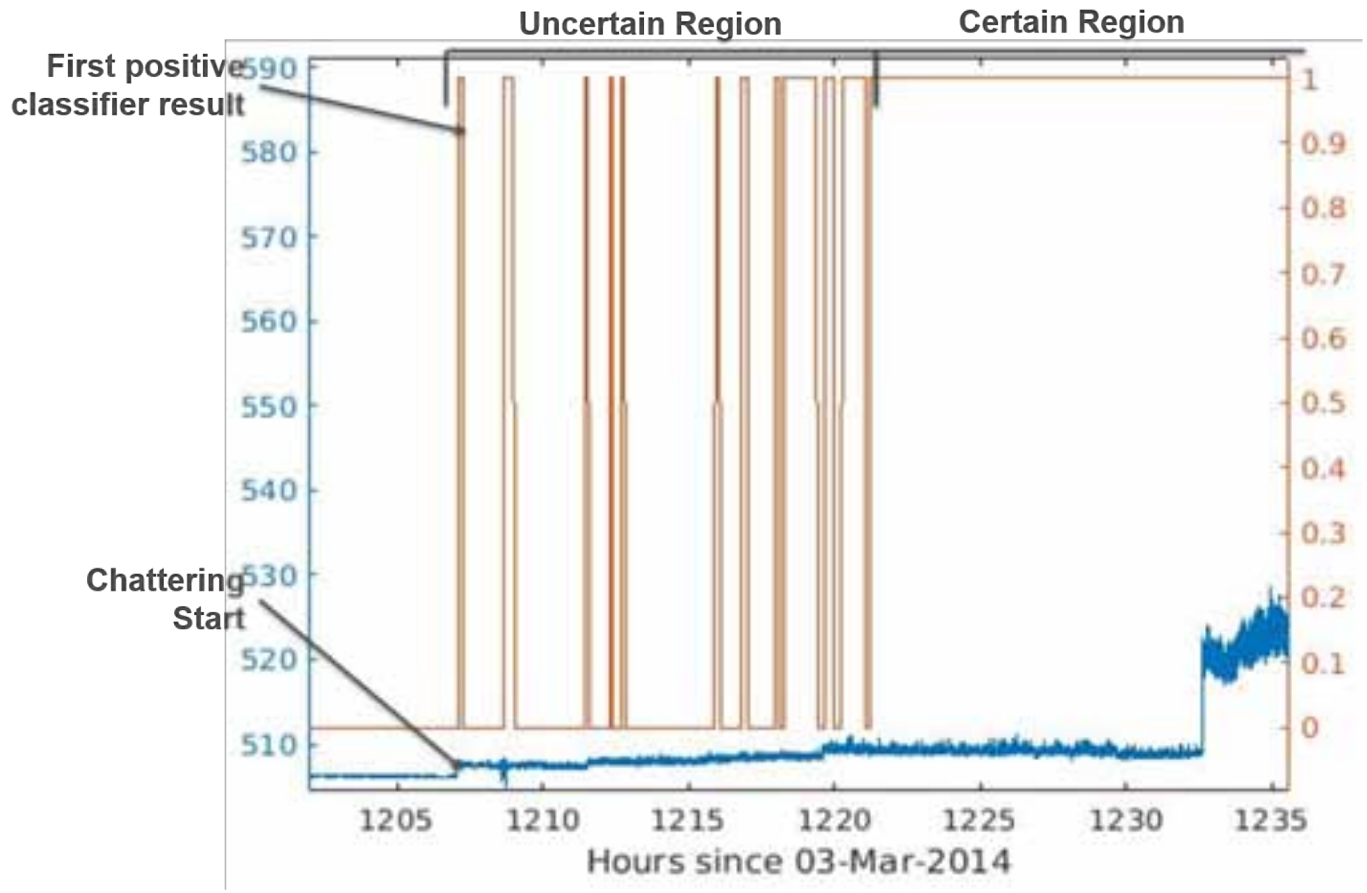

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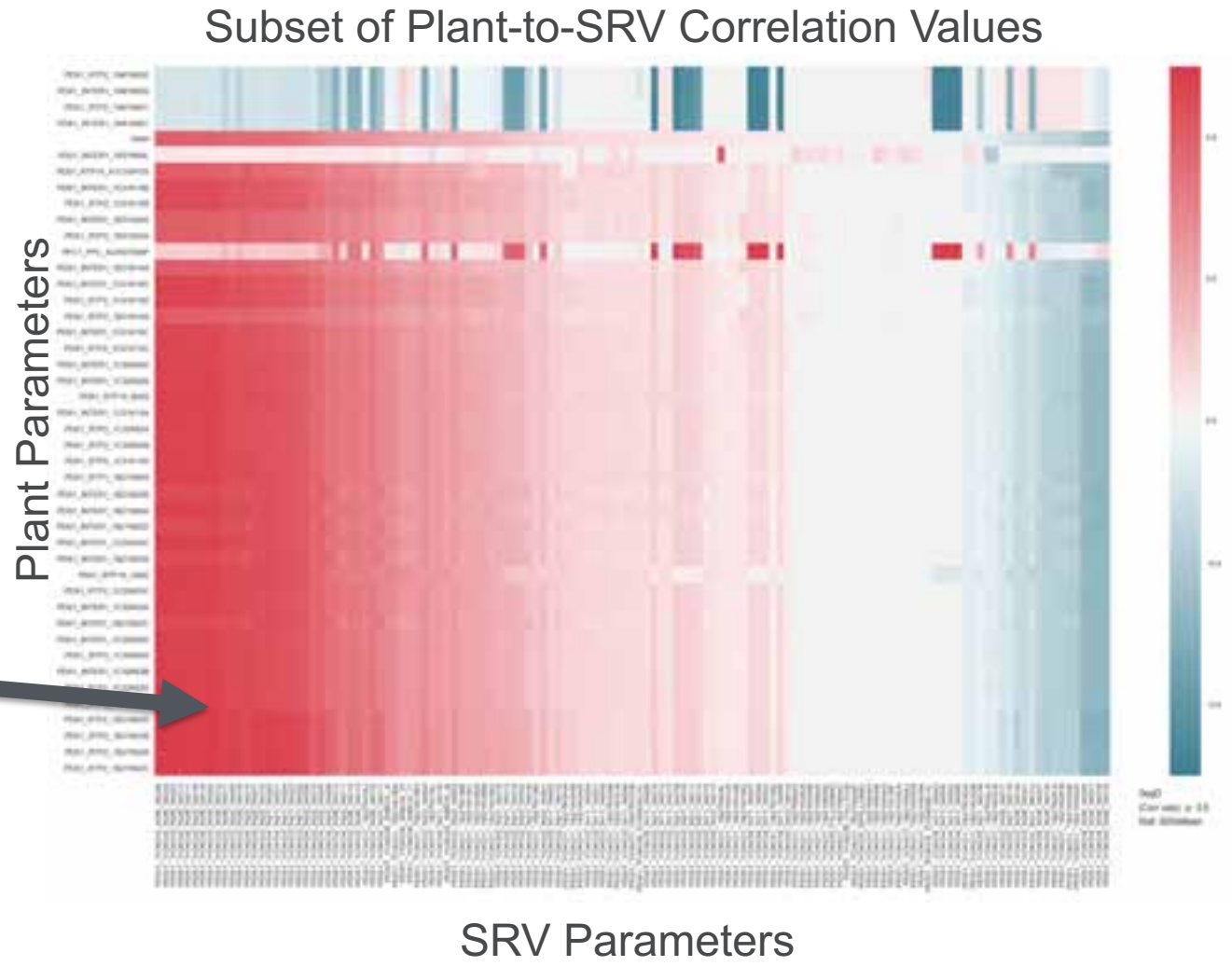

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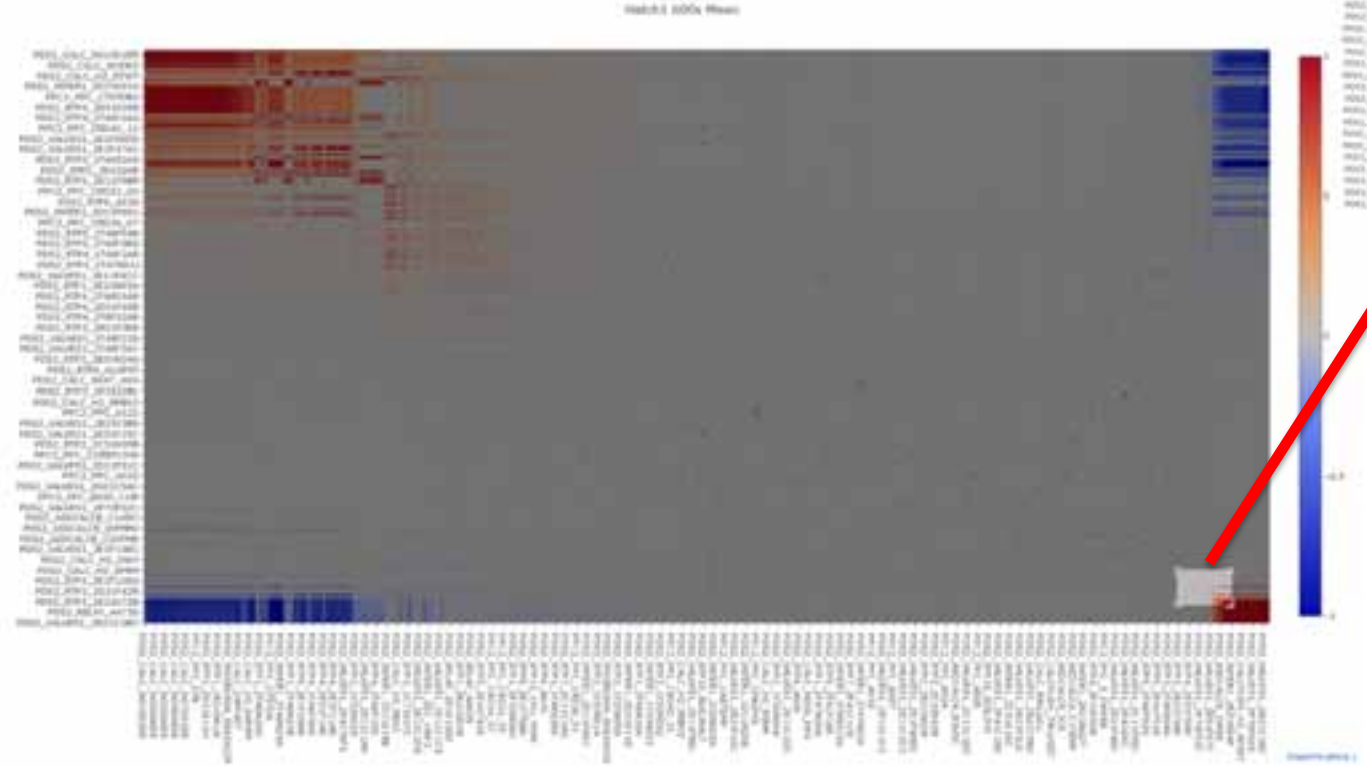

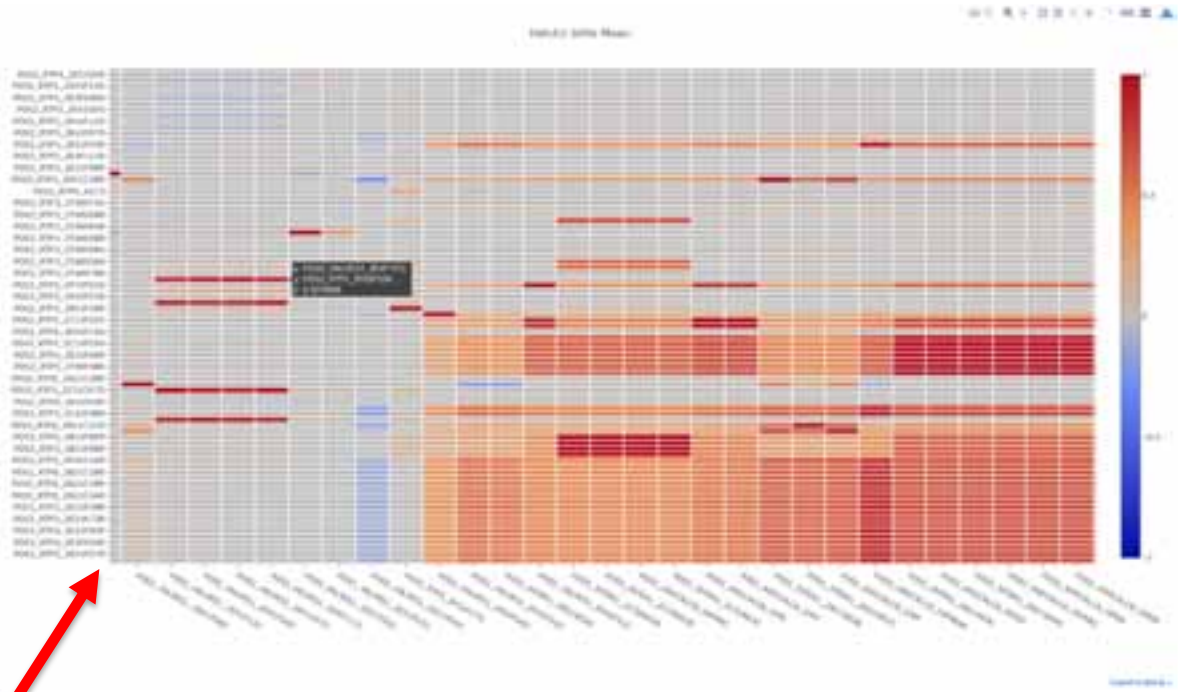

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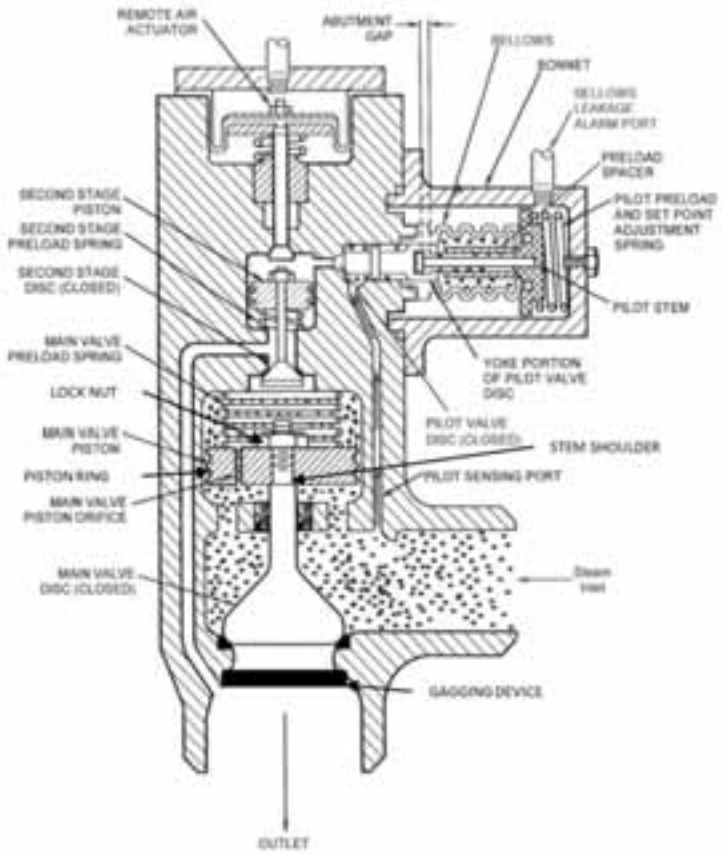

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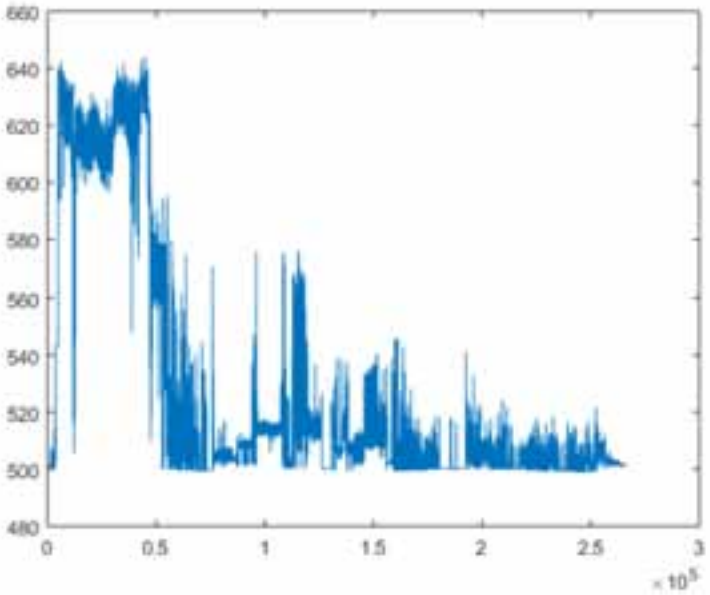

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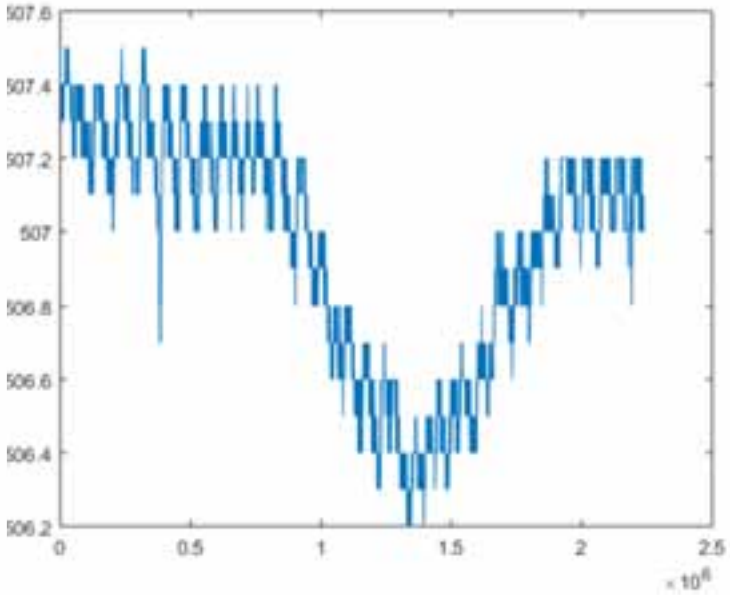

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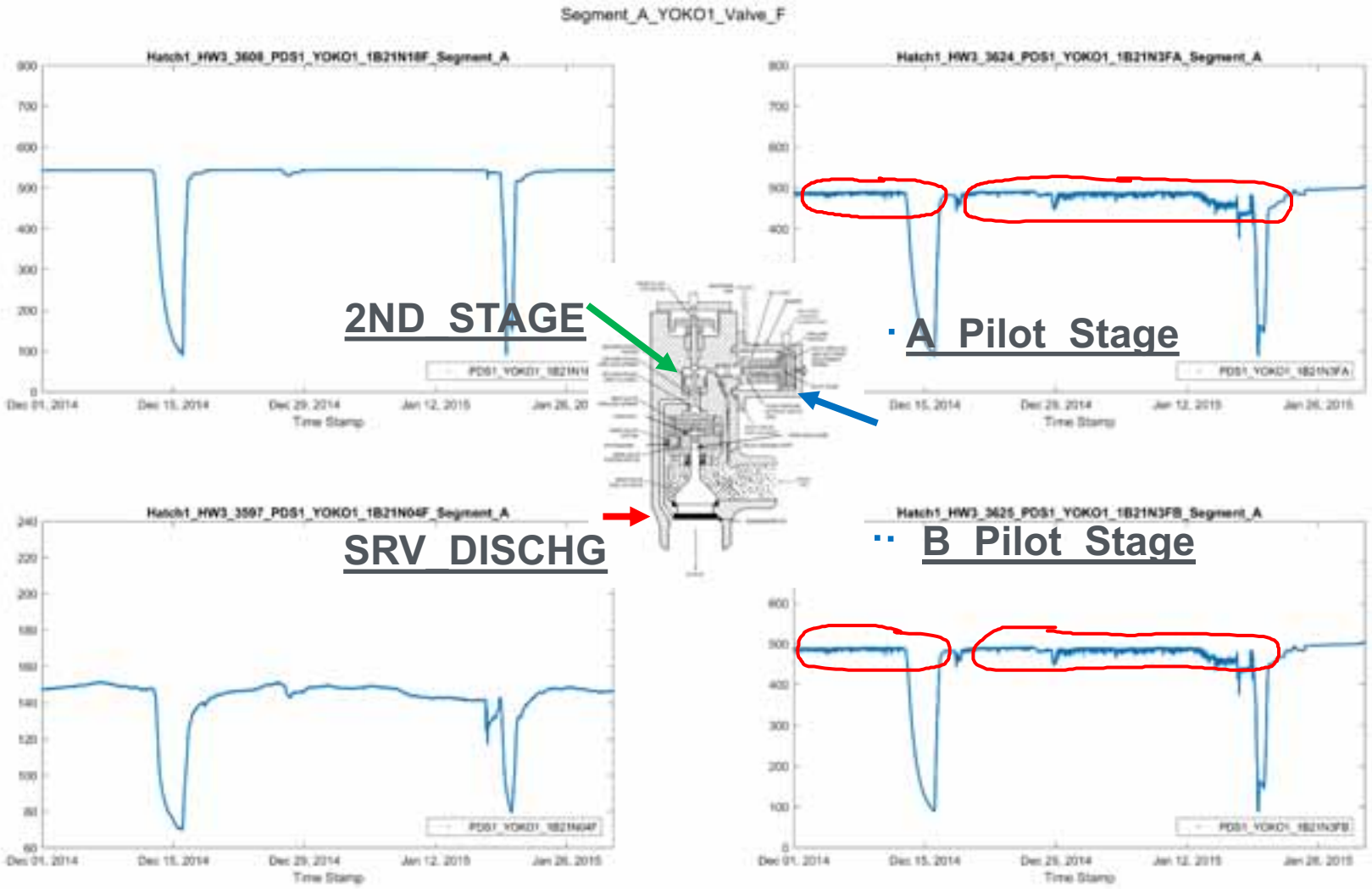

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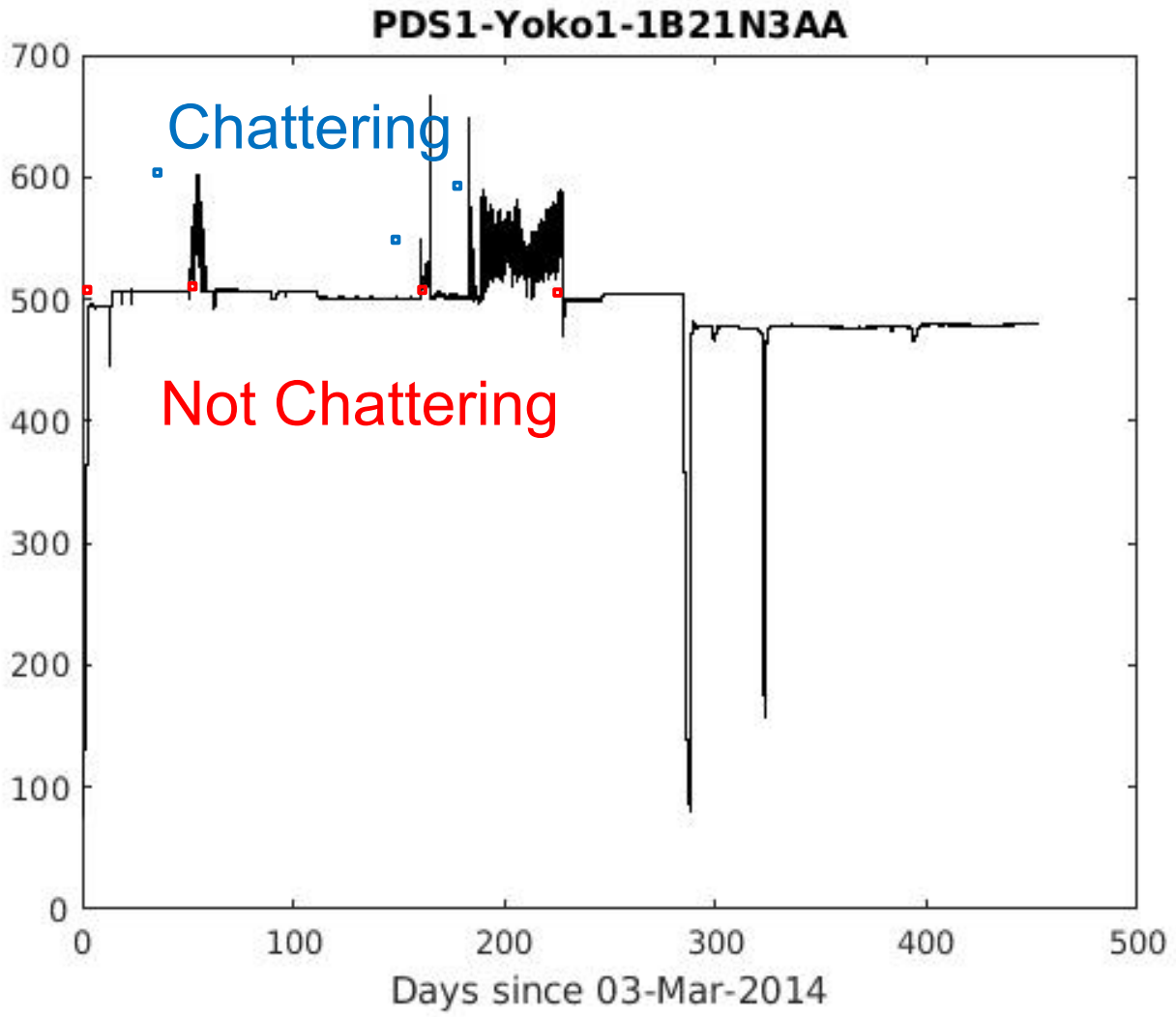

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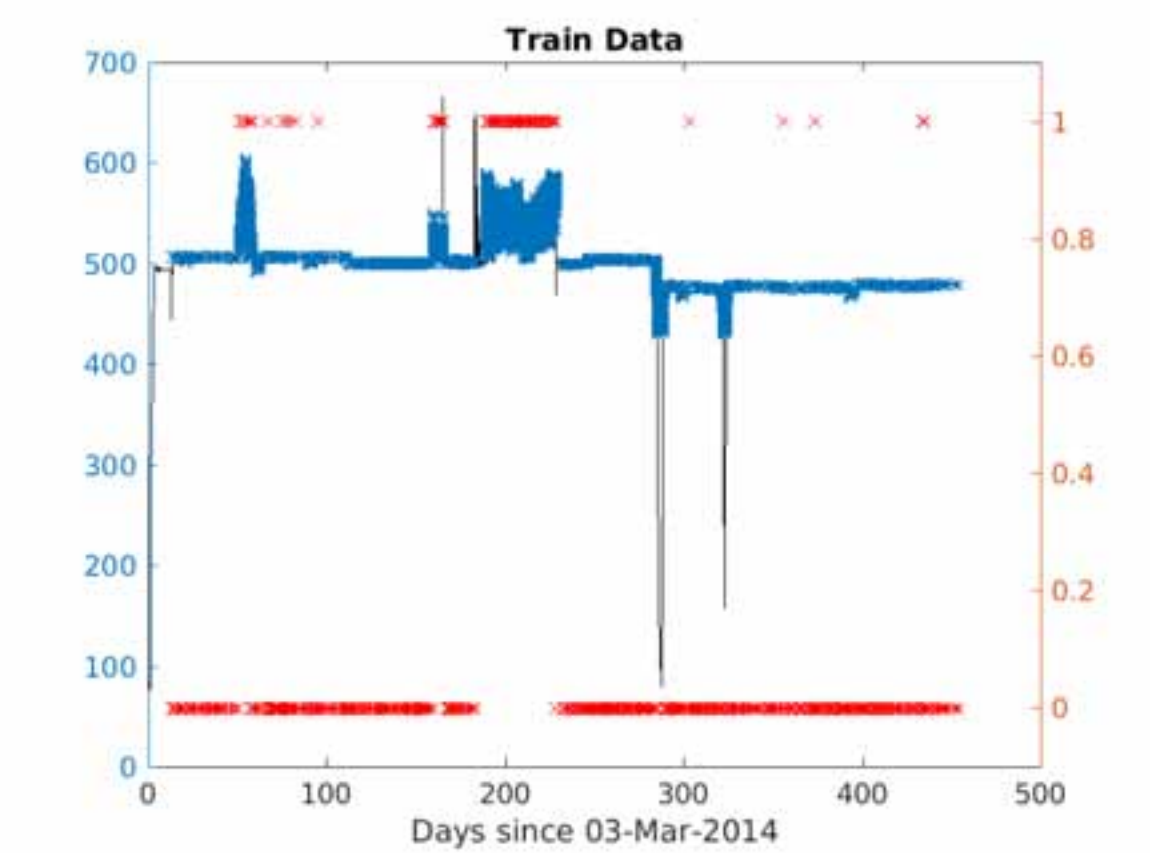

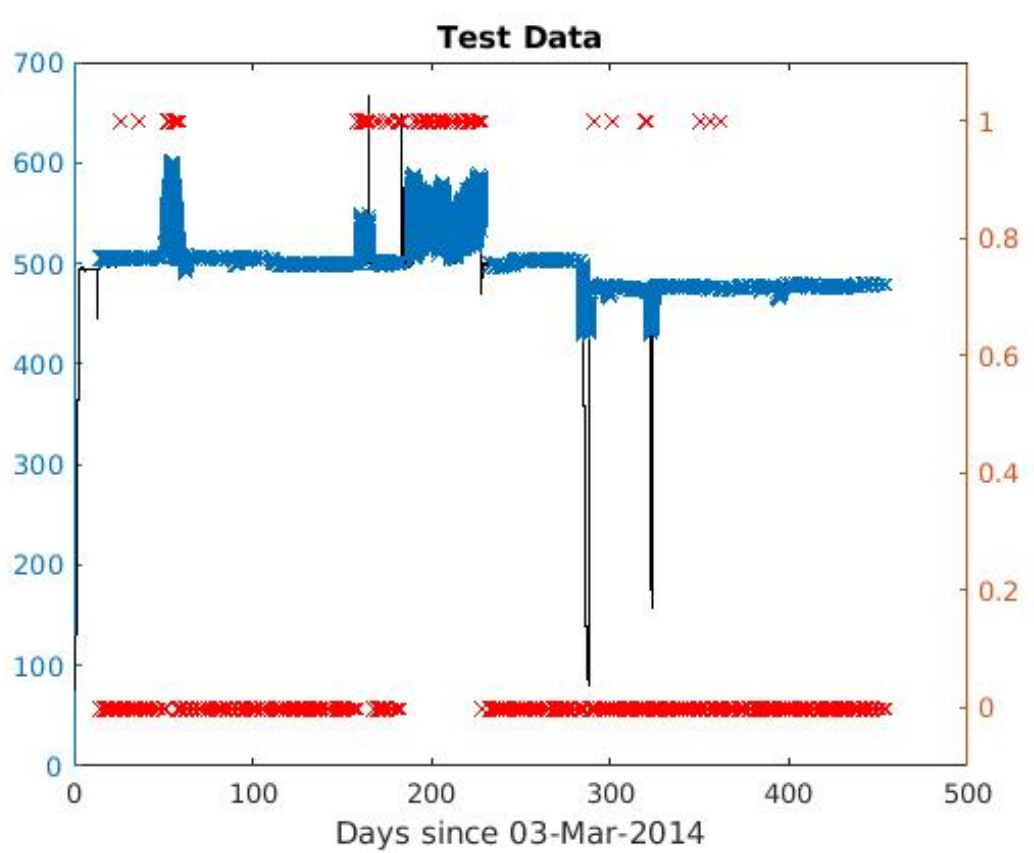

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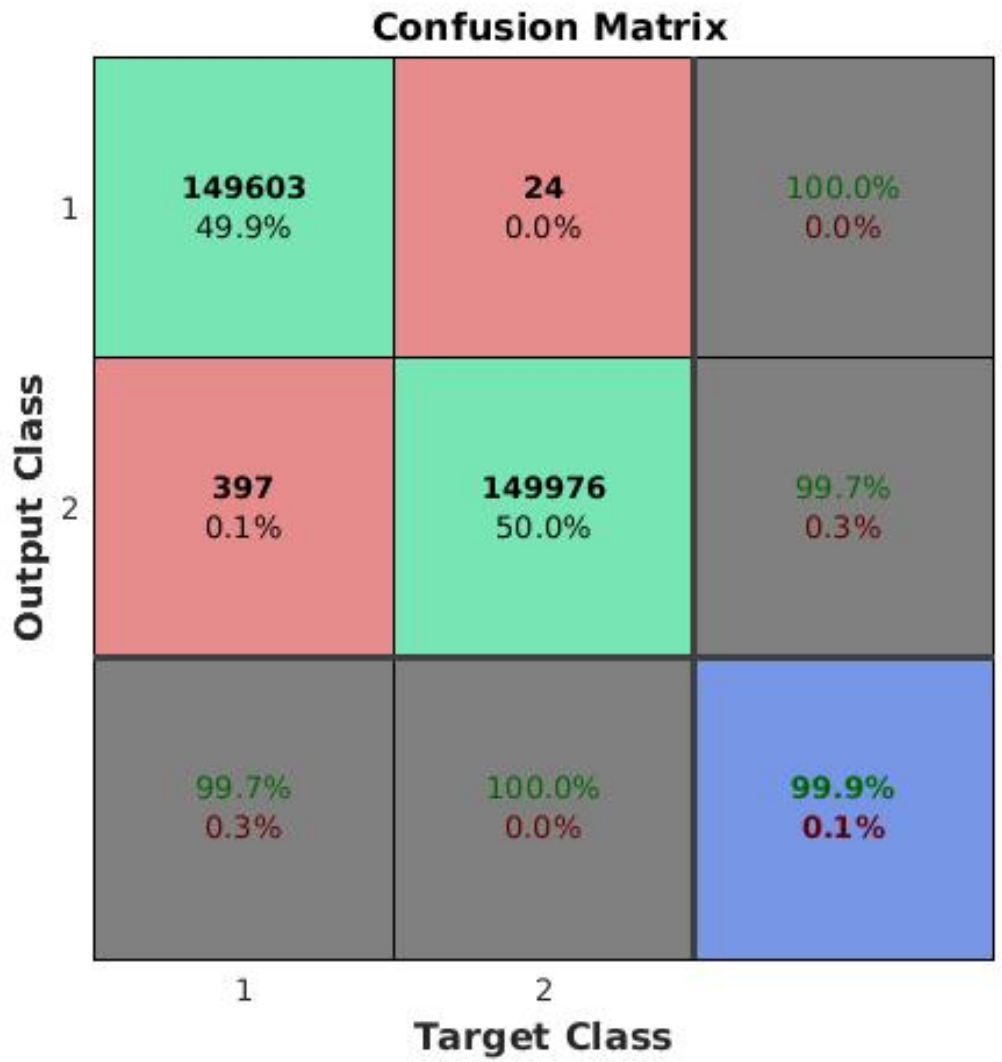

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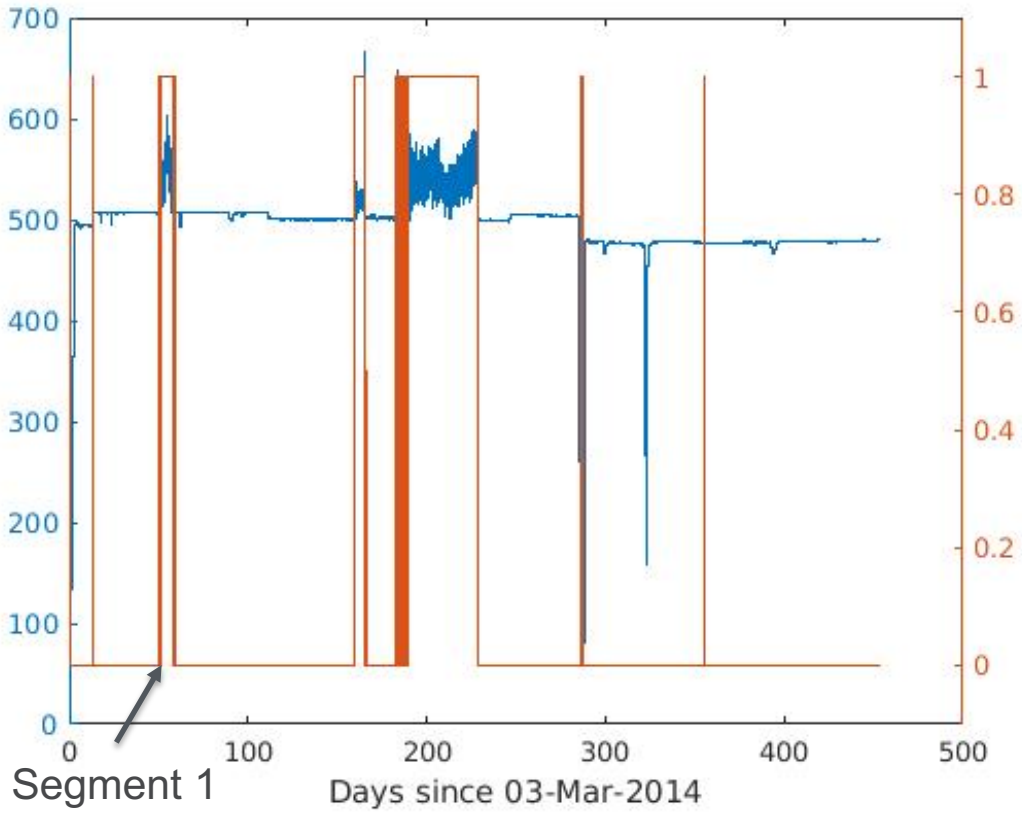

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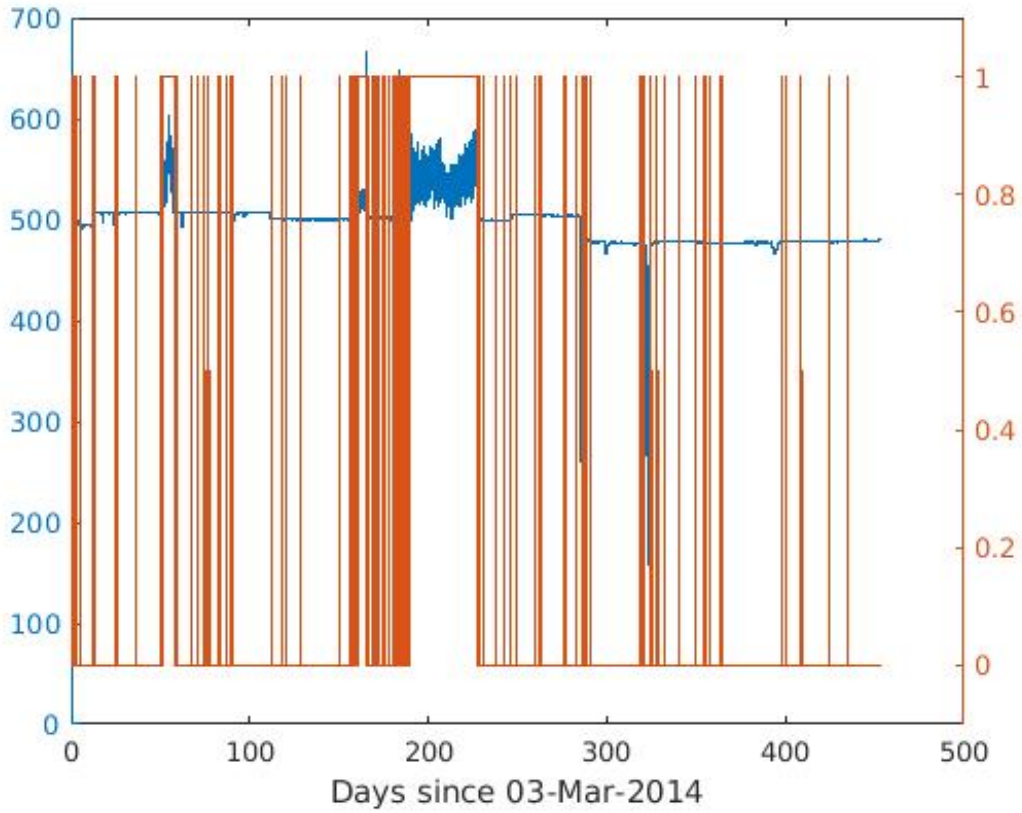

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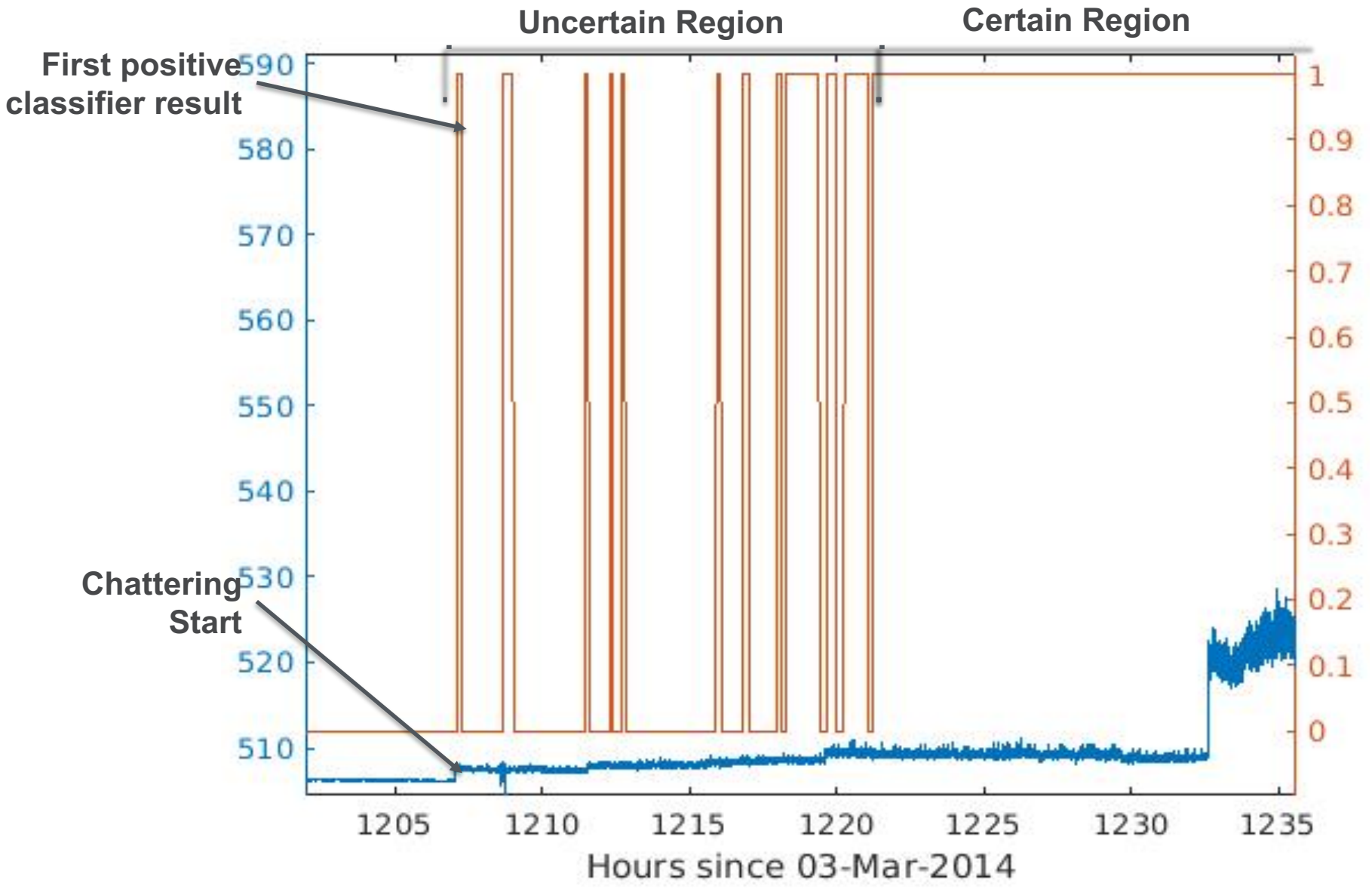

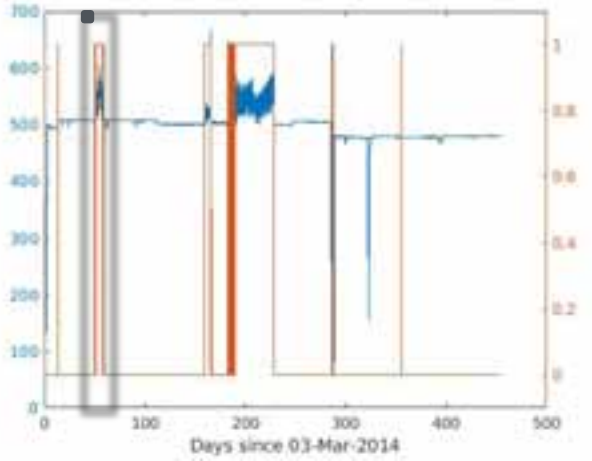

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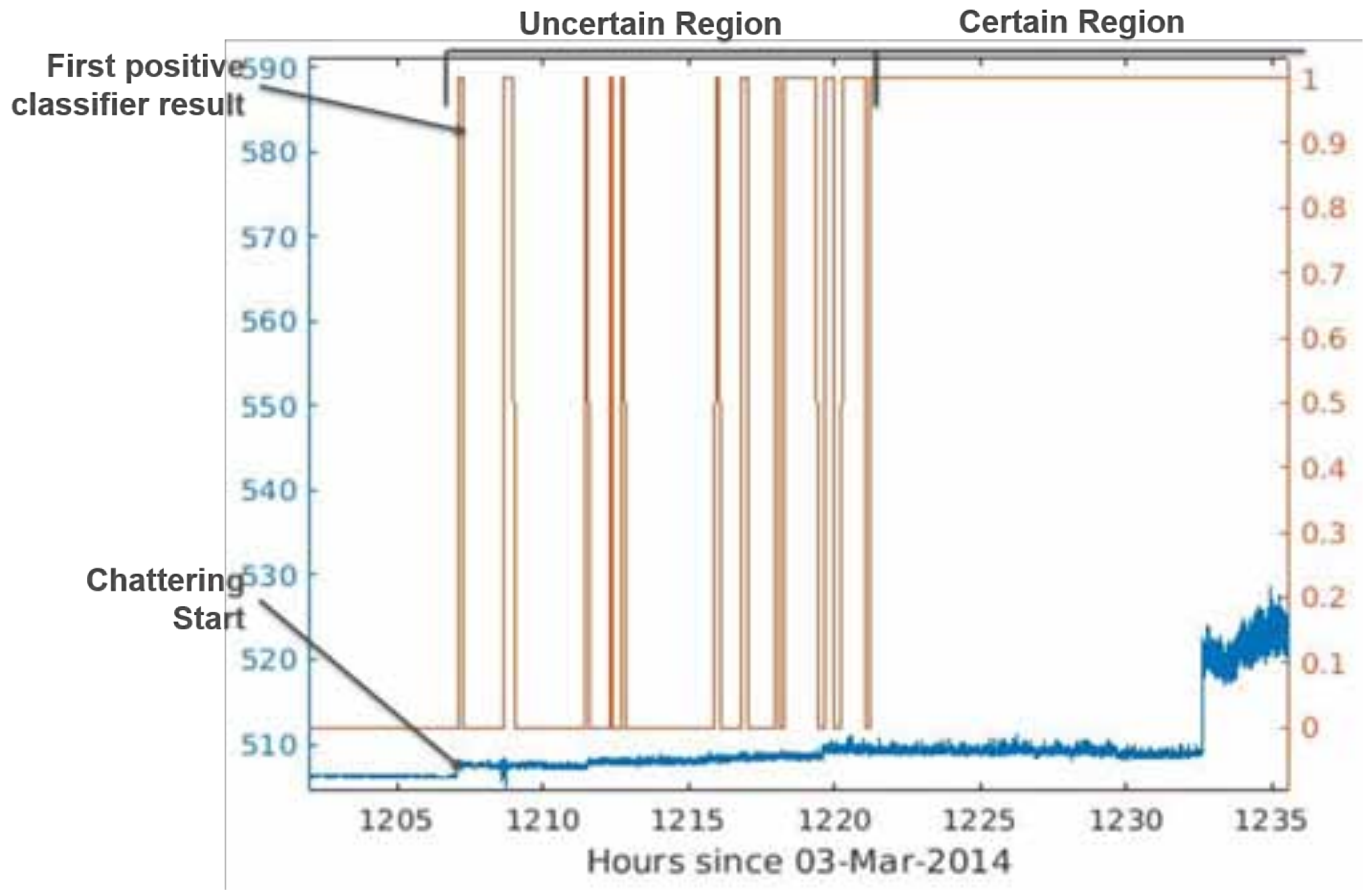

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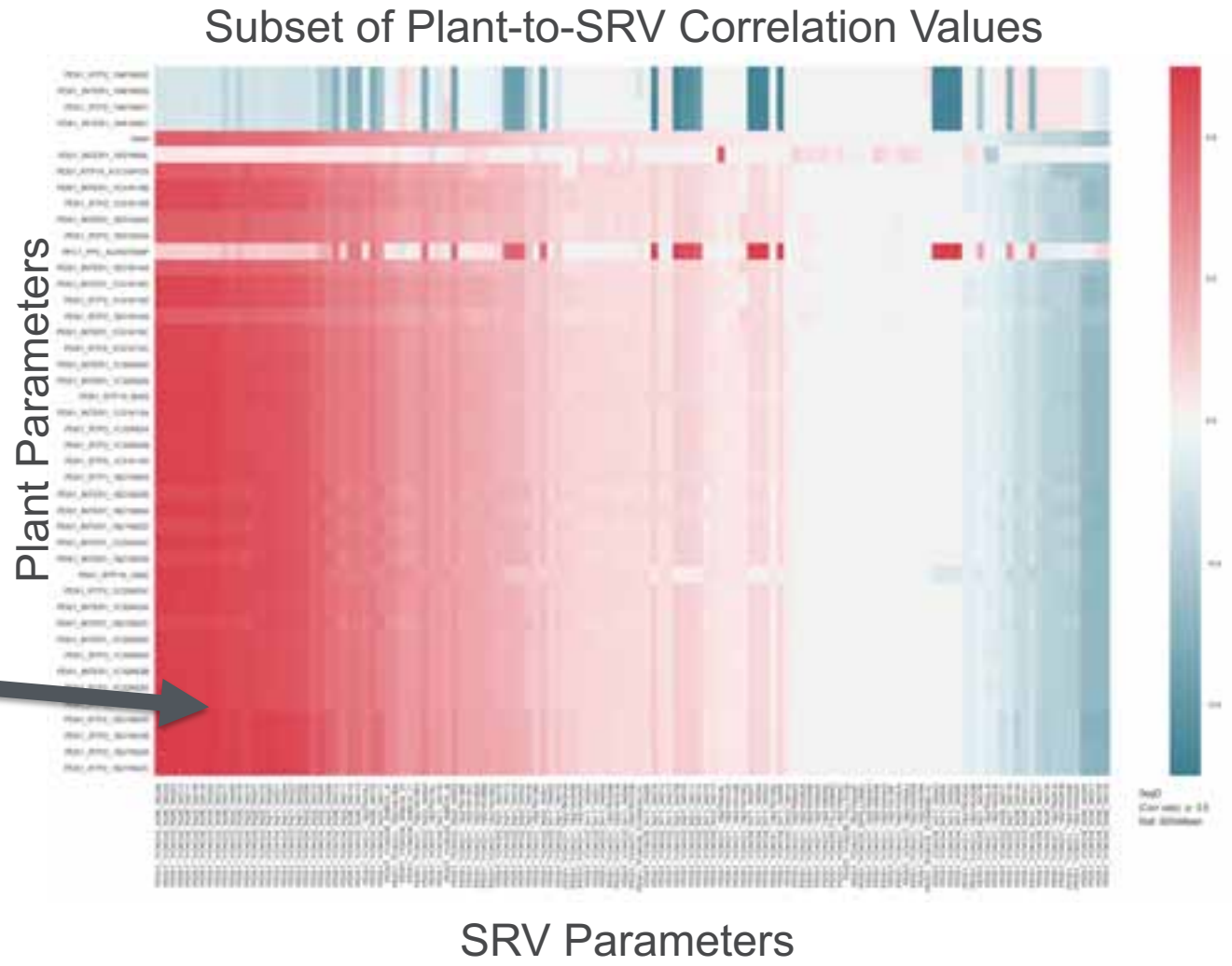

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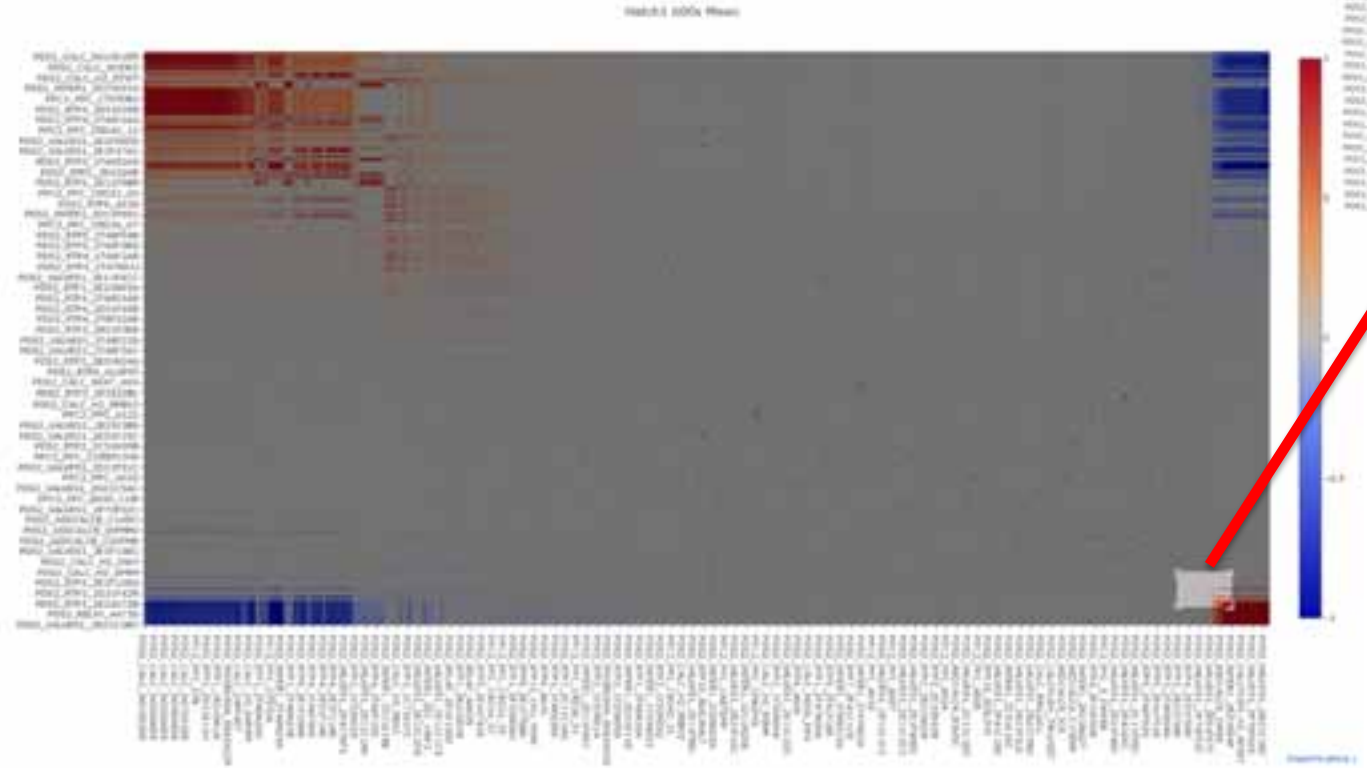

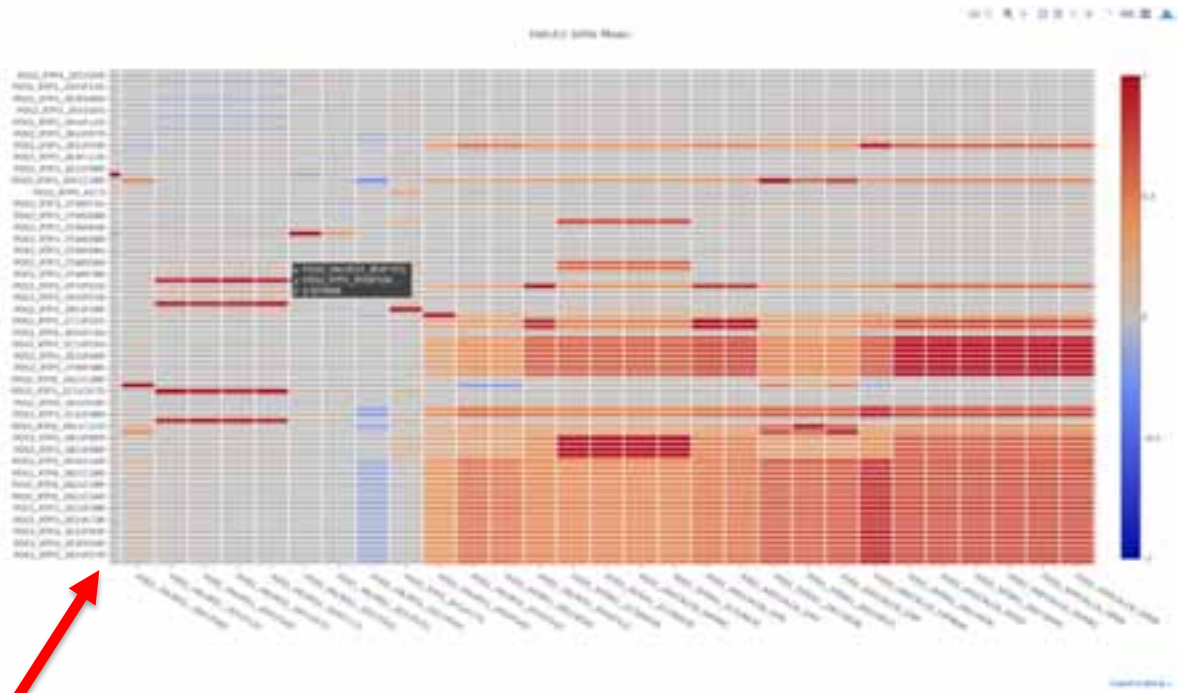

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