

State Detection and Segmentation (SDS)

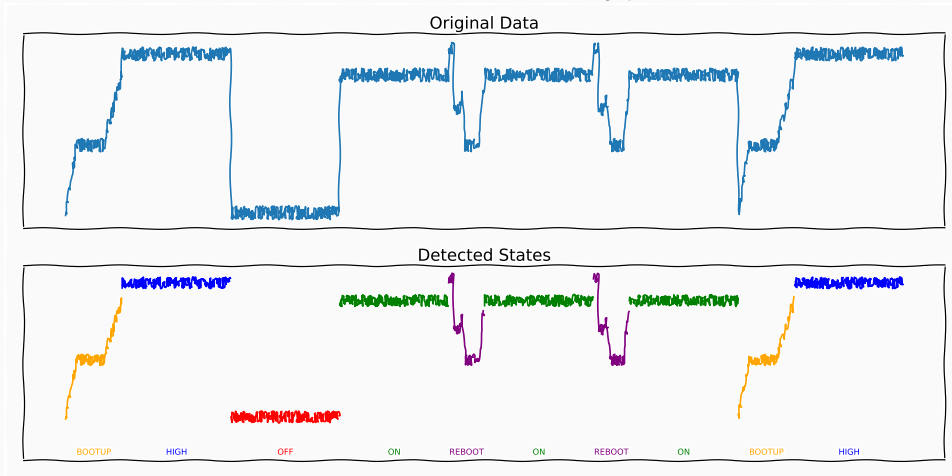
May the best detector win.

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University of Waterloo - EET2 Project

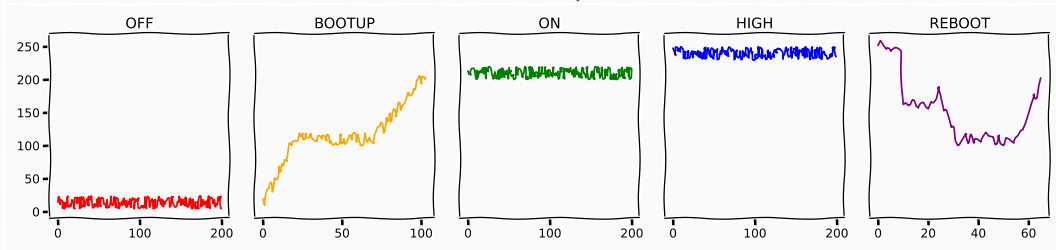
Goal

Detect the state of the machine at any point in time.



Training Data

Proto Examples:

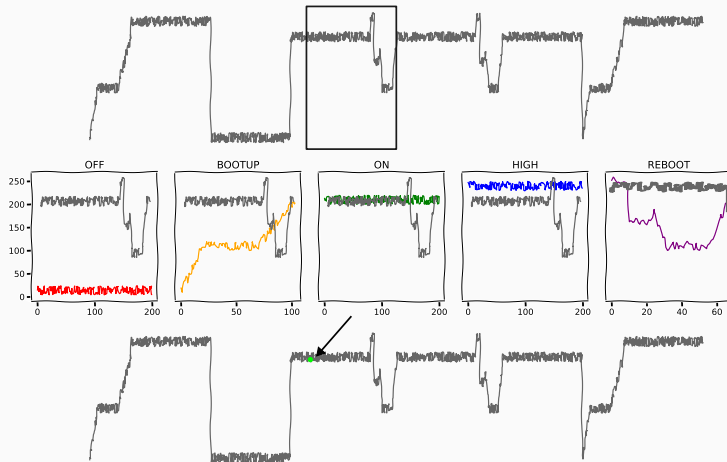


- Not exacts examples.
- Various lengths.
- Tile any trace completely.

- Synthetically generated input trace & protos.
- Trace start at randomly selected sample.
- Score: global accuracy $\left(\frac{TP + TN}{TP + TN + FP + FN} \right)$

Simplest Detector

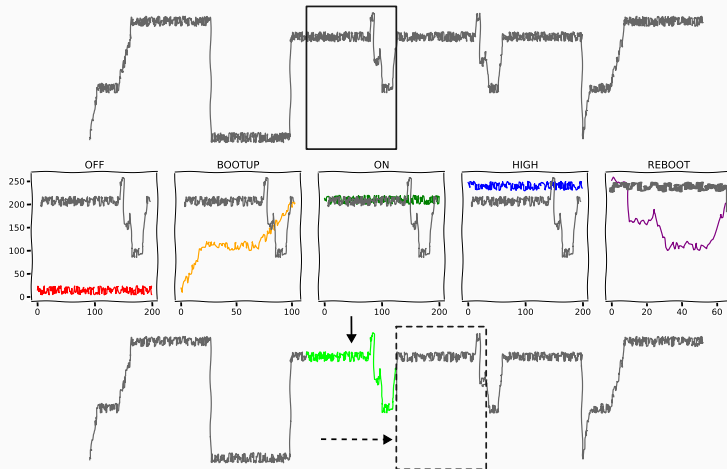
Label each sample with the closest proto example.



Detector Score	Simplest 0.32
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Confident Detector

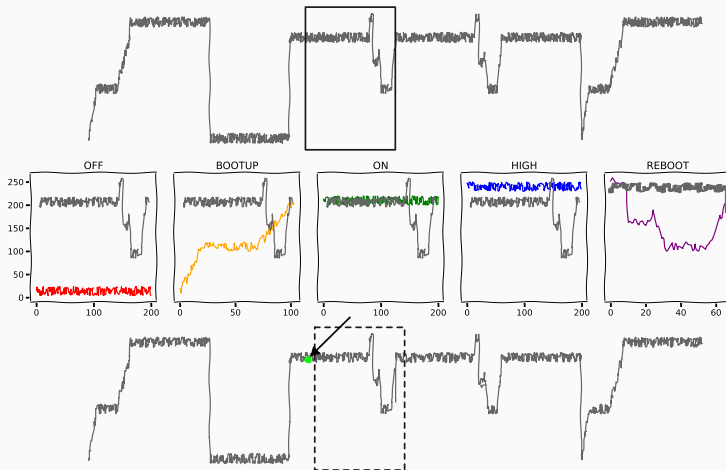
The complete length of the closest proto example is assigned the label.



Detector	Simplest	Confident
Score	0.32	0.69

Cautious Detector

The complete length of the closest proto example is assigned the label, but still moves by 1 sample.

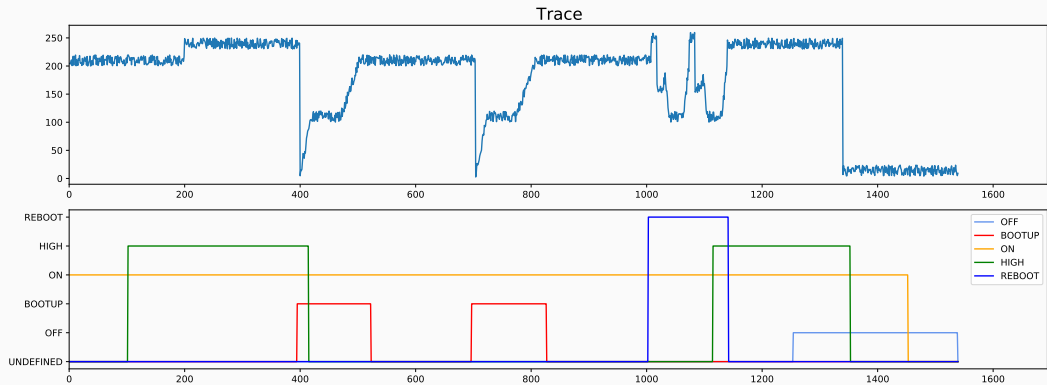


Detector	Simplest	Confident	Cautious
Score	0.32	0.69	0.39

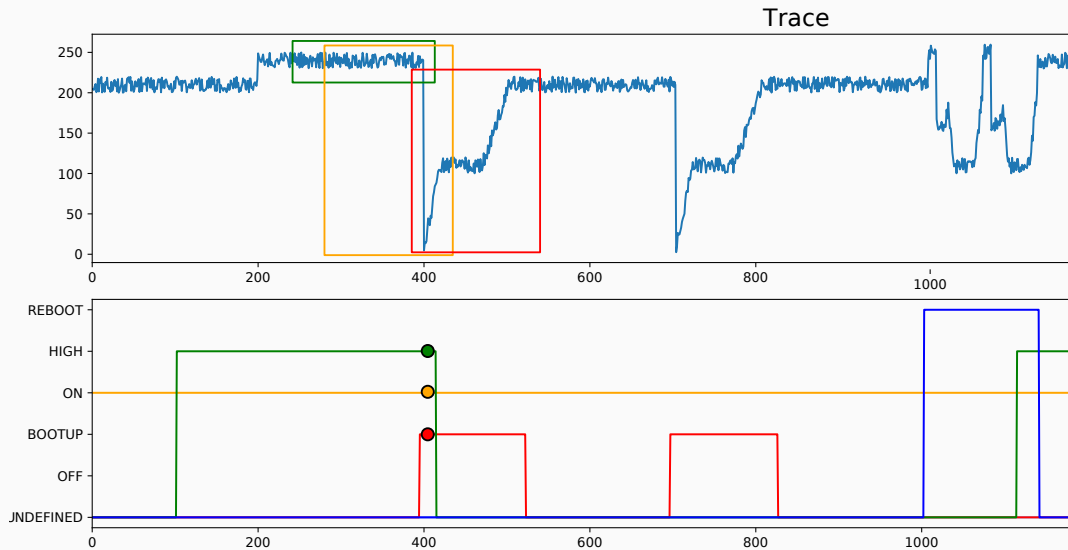
Let's be smart

- ~~Respect Causality~~ → Use all data available.
- Proto example represent the whole trace.
- Try to place each example as best as possible independently.

Generous label Activation



Generous label Activation

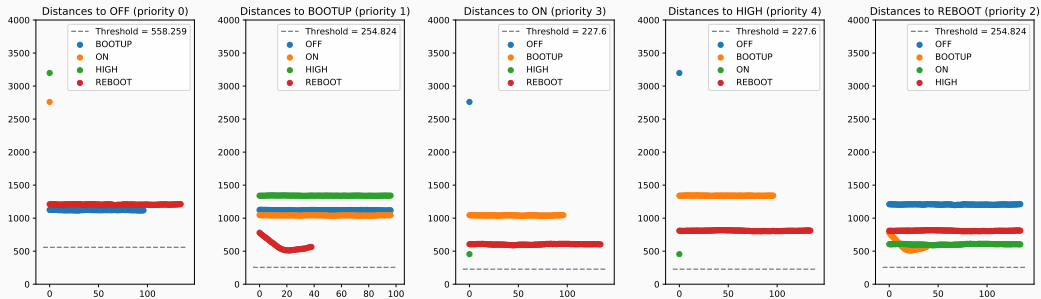


Inter-protos Distances

- Minimize overlaps.
- Resolve overlap conflicts.

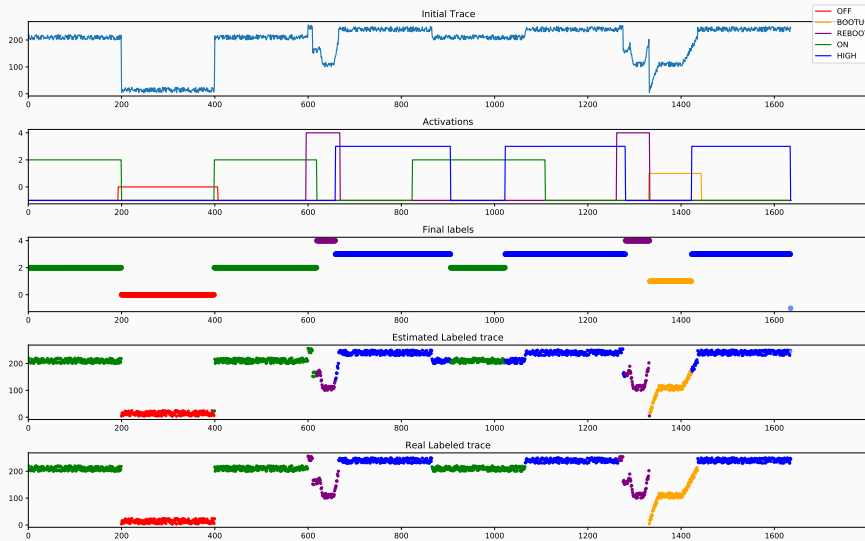
→ Compute inter-protos distances.

Inter-protos Distances

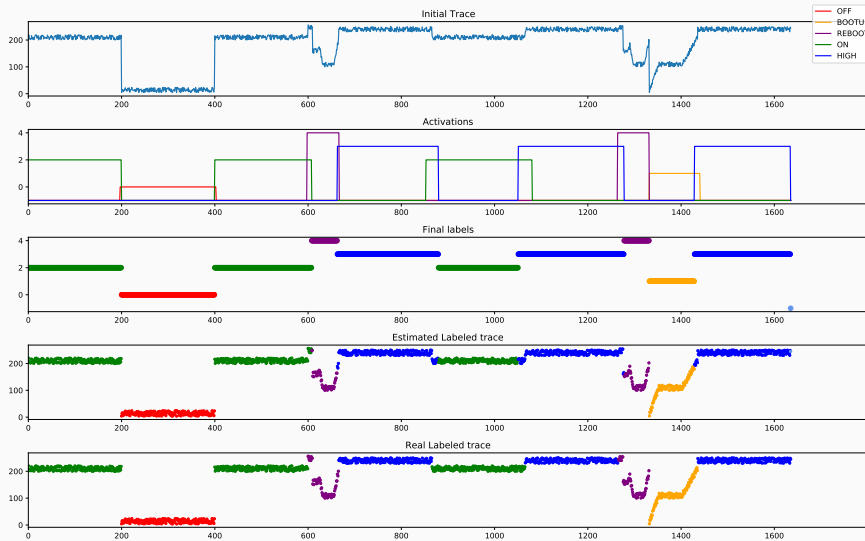


! Hyper-parameter: threshold placement coefficient (default=1)

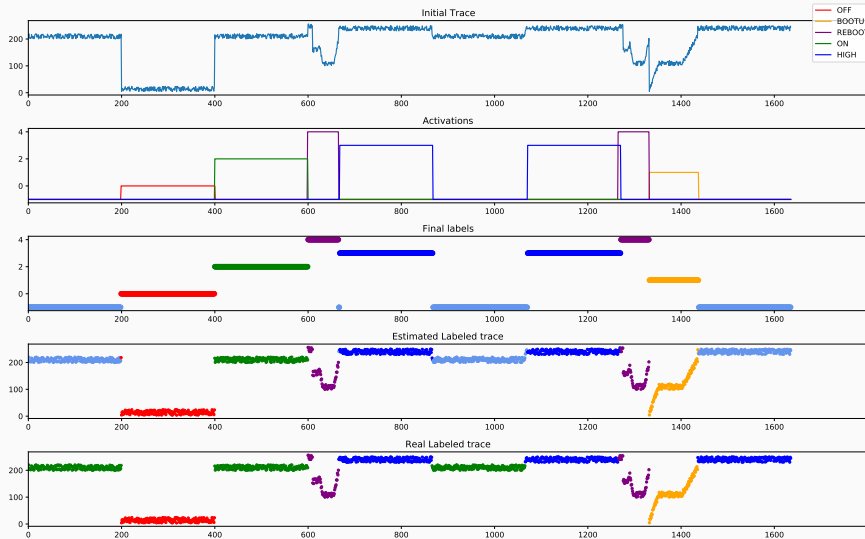
Detection



Detection



Detection



Scoreboard

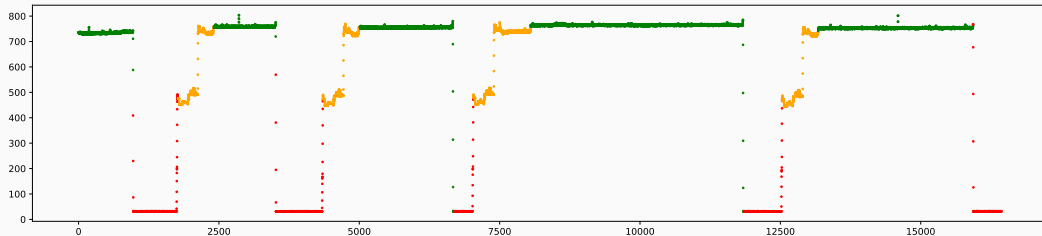
Detector Score	Simplest	Confident	Cautious	Inter-distances
	0.32	0.69	0.39	0.91 - 0.99

Future Work

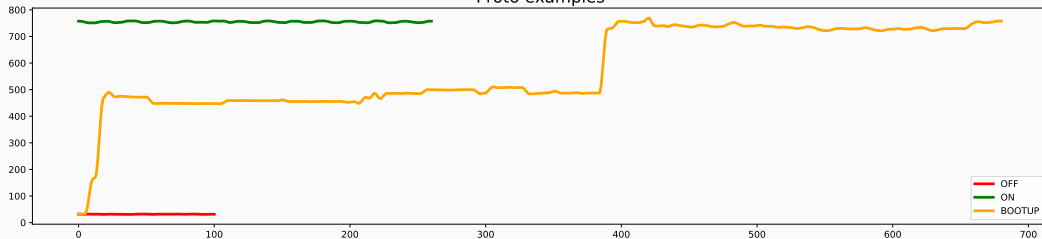
- Generate real data.
- Evaluate impact of imperfect protos.
- Evaluate possibility of incomplete proto dictionary.
- Evaluate possibility of automatic threshold optimization.

Real Data

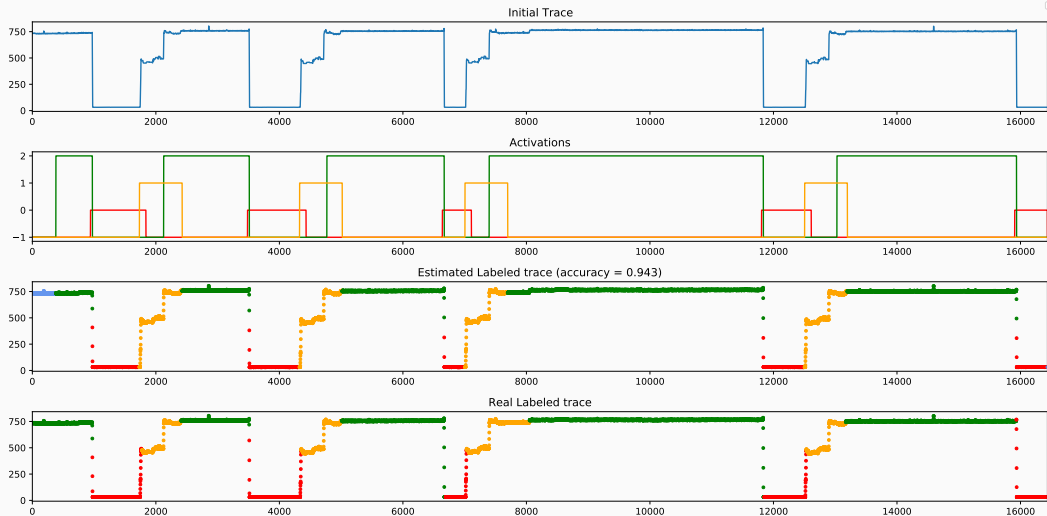
Hand-labeled trace



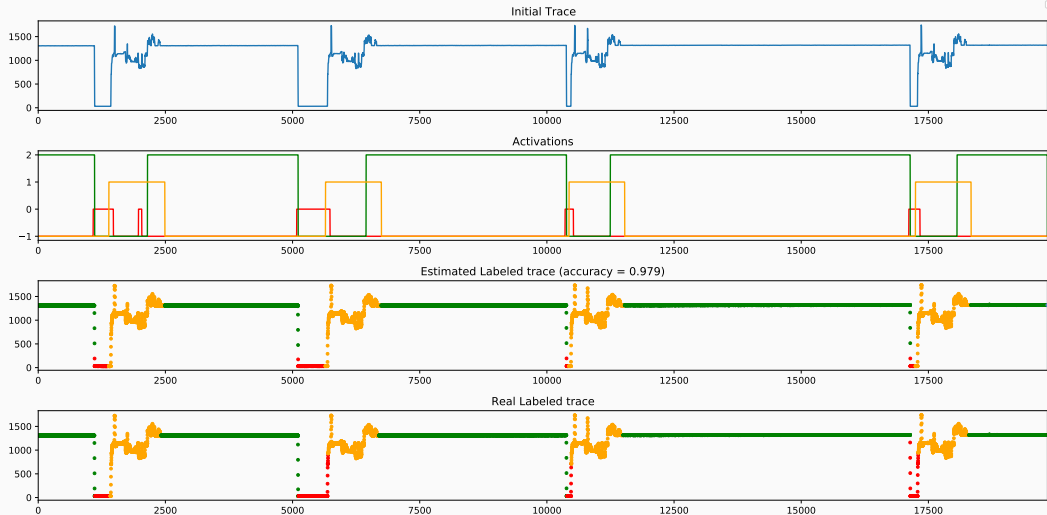
Proto examples



Real Data (ASUS)



Real Data (LINKSYS)



Increasing Complexity

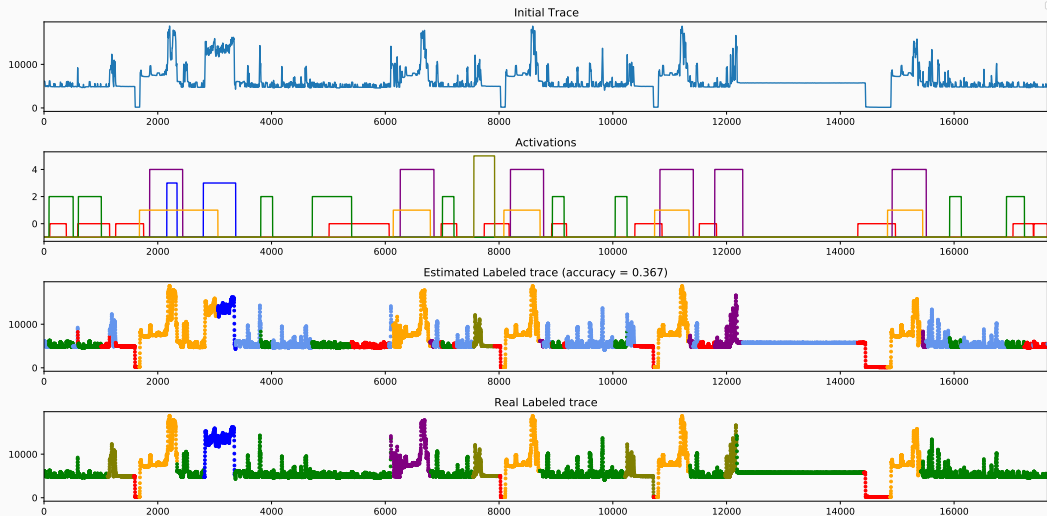


ROUTER



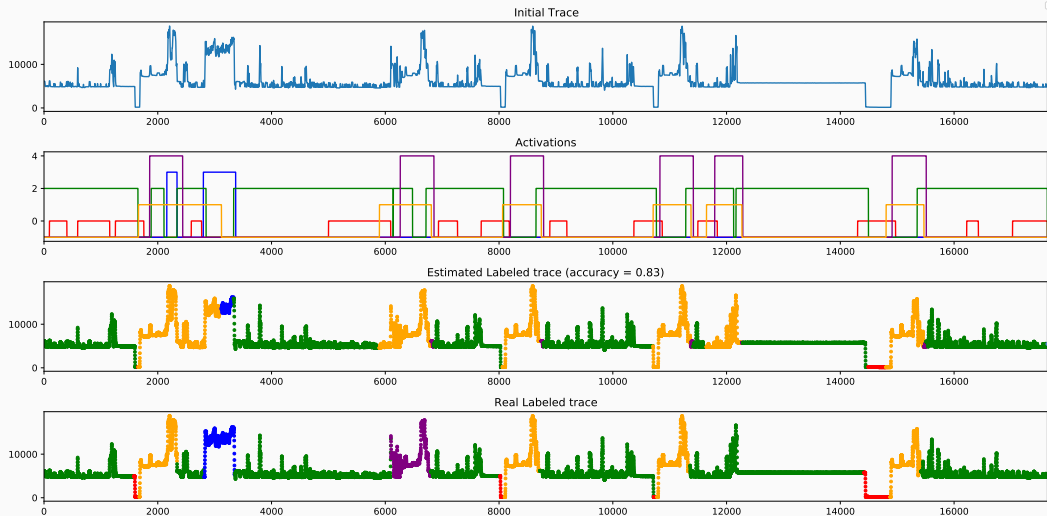
NUC PC

NUC Windows Machine



1. Remove Shutdown Patterns.

NUC Windows Machine



1. Remove Shutdown Patterns.
2. Separate BIOS and OS states.

NUC Windows Machine

