

# NEC AI technology applicable to accelerator monitoring and equipment maintenance

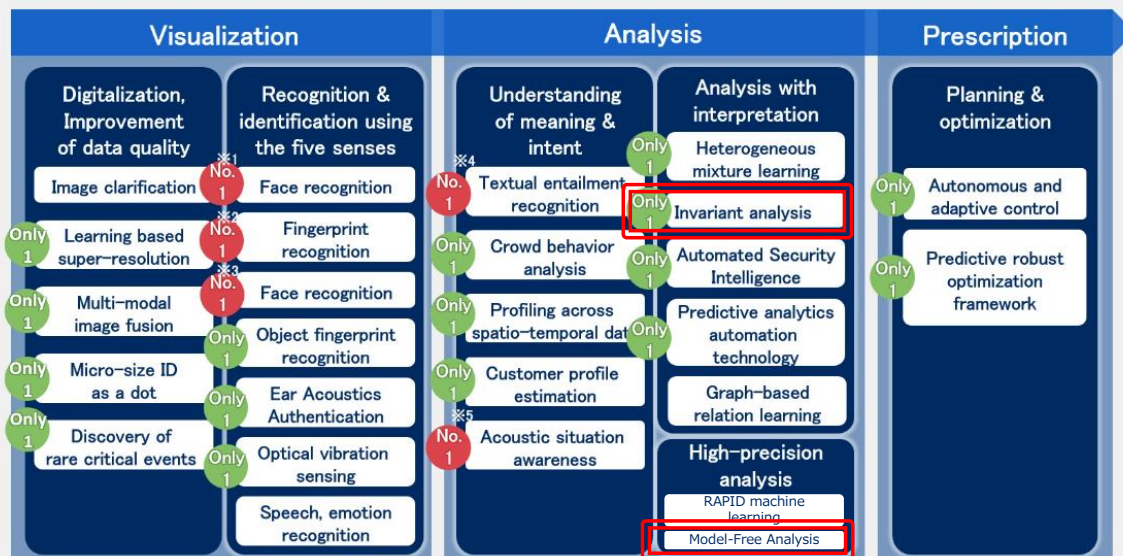
30 October, 2019  
NEC Corporation  
Mayumi Takagi

## Introduce SIAT(Invariant Analysis) and Model-Free Analysis



NEC the WISE

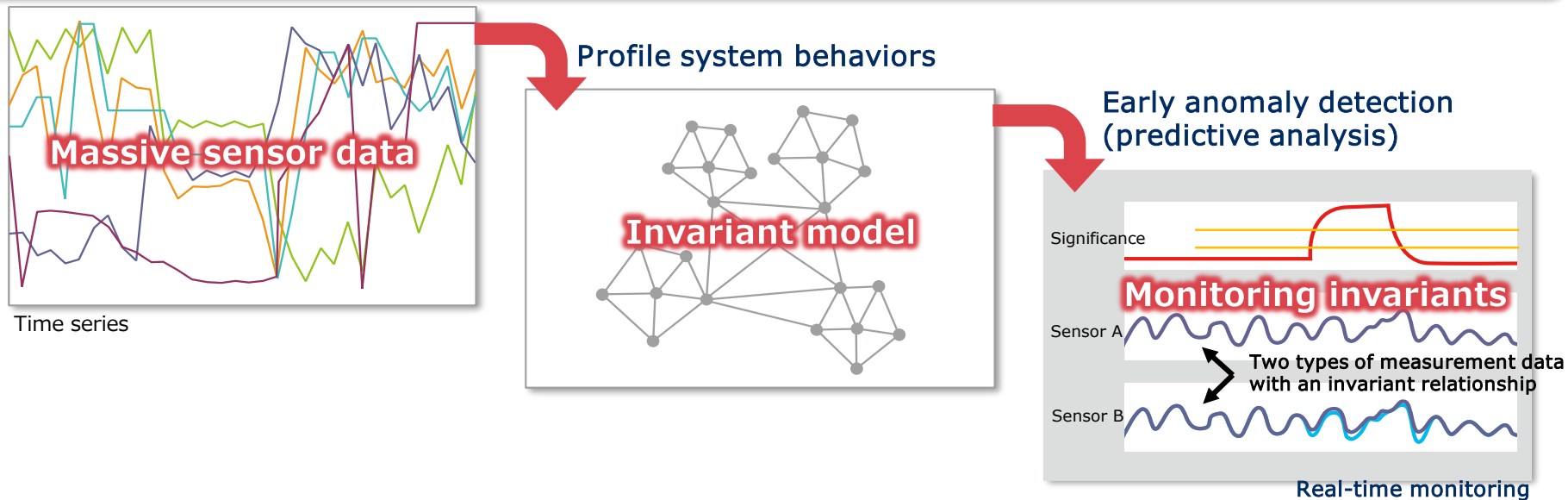
AI technologies from NEC  
for enriching human intellect and creativity



\*1 : Ranked 1<sup>st</sup> four consecutive times in task assessment sponsored by NIST, \*2 : Ranked 1<sup>st</sup> five times in task assessment sponsored by NIST, \*3 : Ranked 1<sup>st</sup> in task assessment sponsored by NIST (2018) \*4 : Ranked 1<sup>st</sup> in task assessment sponsored by NIST (2012) , \*5 : Ranked 1<sup>st</sup> in task assessment sponsored by IEEE AASP Challenge DCASE2016

# SIAT - Steps for automatic anomaly detection

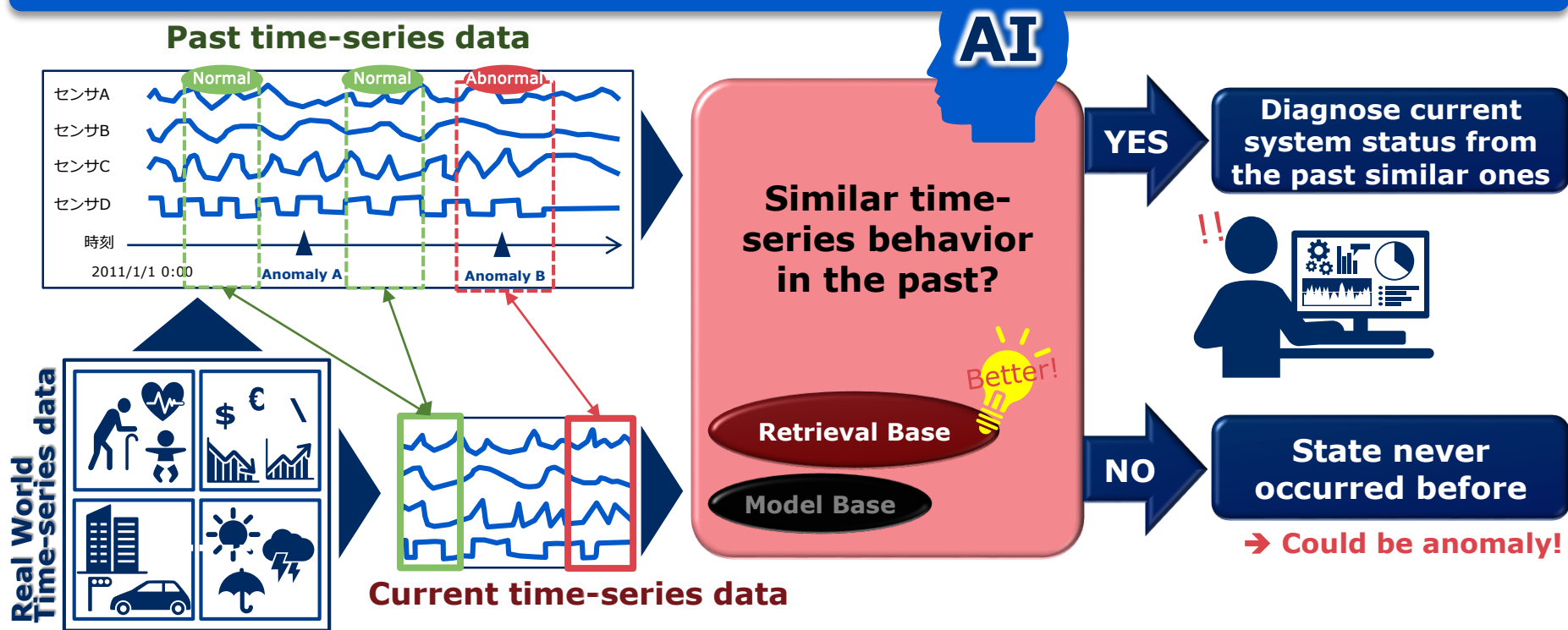
## Automated analysis without domain knowledge



1. Exhaustively and automatically extract constant relationships among massive data, and model complex system behaviors.
2. Using the model and sensor data monitored in real time, detect anomalies that are hard to find by using manual searches and monitoring.

# Model-Free Analysis - Concept of Time-Series Data Model-Free Analysis

By enabling to retrieve the system states similar to the current ones from the past, one can distinguish various states quickly and accurately



# Example of J-PARC

## Application of NEC AI for High Intensity Proton Accelerator Facility





# Example of Real-Time Monitoring Screen

ボイラモデル監視



[全体モデル]破壊インバリエントの割合



[全体モデル]異常度ランク TOP5

センサ名	Score
Tag97	0.729991555
Tag95	0.729977667
Tag65	0.666666687
Tag75	0.500001192

[全体モデル]異常度ランキング1位センサデータ



[ボイラモデル]破壊インバリエントの割合



[ボイラモデル]異常度ランク TOP5

センサ名	Score
Tag97	0.729991555
Tag95	0.729977667
Tag65	0.666666687
Tag74	0.500000000

[ボイラモデル]異常度ランキング1位センサデータ



[タービンモデル]破壊インバリエントの割合



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[タービンモデル]異常度ランキング1位センサデータ



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