

Claims

1. A method comprising: receiving a plurality of sensor data and parametric tool measurements from a semiconductor manufacturing tool; analyzing the plurality of sensor data and parametric tool measurements using a high-dimensional variable selection model, wherein the high-dimensional variable selection model includes a formula $(\min(Y - BX))^2 + \lambda(\|X\| + \|X\|^2)$, wherein Y is a performance measurement of the semiconductor manufacturing tool, X is a vector of input parameter, B is a vector of coefficient to estimate, and λ controls a degree that parameter coefficients are penalized; and generating a list of critical parameters from the plurality of sensor data and parametric tool measurements using the analyzed sensor data and parametric tool measurements.
2. The method of claim 1, further comprising modifying a setting for at least one of the critical parameters on the semiconductor manufacturing tool to bring the semiconductor manufacturing tool back to a normal status.
3. The method of claim 1, further comprising modifying a setting for at least one of the critical parameters on the semiconductor manufacturing tool to match results of the semiconductor manufacturing tool with that of another semiconductor manufacturing tool.
4. The method of claim 1, further comprising developing a specification for the semiconductor manufacturing tool based on the list of critical parameters.
5. The method of claim 1, wherein the semiconductor manufacturing tool is a semiconductor inspection tool.
6. The method of claim 1, further comprising collecting the plurality of sensor data and parametric tool measurements while the semiconductor manufacturing tool is idle.
7. The method of claim 1, further comprising re-parameterizing the high-dimensional variable selection model in a hierarchical manner.
8. A device for determining a list of critical parameters comprising: a processor; an electronic storage device in electronic communication with the processor; and a communication port in electronic communication with the processor; wherein the processor is programmed to: receive a plurality of sensor data and parametric tool measurements from a semiconductor manufacturing tool at the communication port; analyze the plurality of sensor data and parametric tool measurements using a high-dimensional variable selection model, wherein the high-dimensional variable selection model includes a formula $(\min(Y - BX))^2 + \lambda(\|X\| + \|X\|^2)$, wherein Y is a performance measurement of the semiconductor manufacturing tool, X is a vector of input parameter, B is a vector of coefficient to estimate, and λ controls a degree that parameter coefficients are penalized; and generate a list of critical parameters from the plurality of sensor data and parametric tool measurements using the analyzed sensor data and parametric tool measurements.
9. The device of claim 8, wherein the semiconductor manufacturing tool is a semiconductor inspection tool.

10. The method of claim 8, wherein the processor is further programmed to collect the plurality of sensor data and parametric tool measurements while the semiconductor manufacturing tool is idle.

11. The method of claim 8, wherein the processor is further programmed to re-parameterize the high-dimensional variable selection model in a hierarchical manner.