

CLAIMS

1. A system comprising:
 - (a) an input unit configured to receive a plurality of sensor data and parametric tool measurements from a semiconductor manufacturing tool; and
 - (b) a high-dimensional variable selection unit in electronic communication with the input unit configured to:
 - (i) determine a list of critical parameters from the plurality of sensor data and parametric tool measurements;
 - (ii) 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 $(Y-BX)^2 + \lambda(\|X\| + \|X\|^2)$; and
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
 - (iii) re-parameterize the high-dimensional variable selection model in a hierarchical manner, wherein a hierarchy for re-parameterization is decided based on a weight of the input parameter.
2. The system of claim 1, wherein the semiconductor manufacturing tool is a semiconductor inspection tool.
3. The system of claim 1, wherein the semiconductor manufacturing tool comprises a stage, a light source, an image processor, and optics connected to the input unit.
4. The system of claim 1, further comprising a display that is connected to the high-dimensional variable selection unit and is configured to display the critical parameters.

5. The system of claim 1, wherein the high-dimensional variable selection unit is further configured to modify 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.
6. The system of claim 5, wherein the semiconductor manufacturing tool is a semiconductor inspection tool.
7. The system of claim 1, wherein the high-dimensional variable selection unit is further configured to modify 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.
8. The system of claim 7, wherein the semiconductor manufacturing tools are semiconductor inspection tools.
9. The system of claim 1, wherein the high-dimensional variable selection unit is further configured to develop a specification for the semiconductor manufacturing tool based on the list of critical parameters.
10. The system of claim 9, wherein the semiconductor manufacturing tool is a semiconductor inspection tool.