

## Multi-Criteria Variable Selection for Process Monitoring

Luan Jaupi\*

Conservatoire National des Arts et Métiers, Paris, France [jaupi@cnam.fr](mailto:jaupi@cnam.fr)

Philippe Durand

Conservatoire National des Arts et Métiers, Paris, France [durand@cnam.fr](mailto:durand@cnam.fr)

Darius Ghorbanzadeh

Conservatoire National des Arts et Métiers, Paris, France

[ghorbanzadeh@cnam.fr](mailto:ghorbanzadeh@cnam.fr)

Dyah E. Herwindiati

Tarumanagara University, Jakarta, Indonesia [herwindiati@untar.ac.id](mailto:herwindiati@untar.ac.id)

Variable selection methods for process monitoring have focused mainly on the explained variance performance criteria. However, explained variance efficiency is a minimal notion of optimality and does not necessarily result in an economically desirable selected subset, as it makes no statement about the measurement cost or other engineering criteria. For many applications, it may be useful for external information to influence the selection process. For example, some variables may be easier and cheaper to carry out than others or they might be very important according to some engineering criteria. Neglecting this information in statistical process control, would be counterproductive. This presentation will describe a statistical methodology for variable selection that makes use of cost and variability evaluation criteria. A double-reduction of dimensionality is applied in conjunction with engineering and economic criteria. The subset of relevant variables is selected in a manner that retains, to some extent, the structure and information carried by the full set of original variables. A real application from automotive industry will be used to illustrate the method.

**Key Words:** Process control, dimension reduction, variance efficiency, measurement cost