



<Proposal> Research Topics for IEOR, IIT Bombay

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1. Pattern Identification in Automotive Engineering product documentation

Research theme/s: Advanced computational engineering, Computer science, Artificial intelligence, Industrial Engineering

Brief Research Problem : The Mercedes Benz product overview (stored as propositional formulas over codes/attributes) specifies technical dependencies between codes (especially customer selectable option codes). While in principle it is possible to interpret the product overview as a large Boolean formula implicitly describing the complete set of feasible and released products, in practice the data base contains declarative instructions for order processing algorithms, e.g. algorithms scanning the data base one or several times to apply step by step each rule to an input code/attribute list. Using the product overview for enhanced algorithmic processing involves evaluation of complex and large boolean expressions multiple times. These Boolean expressions are not written in its minimized (normal) form and further simplification can be done through Boolean algebra, re-writing different rules or finding patterns in different propositions formulas and suggestions on different data structure such as BDD (binary decision diagram).

Project aims: The aim of this project is to enhance existing algorithms for

- A) Minimizing bracketed boolean expressions by applying boolean algebra (“syntactical expression minimization”)
- B) Exploiting redundancies to transform the product overview to a more compact but equal representation

Expected out comes: The developed solution is expected to reduce the rule evaluation time (by applying approaches A and B) to provide a better structure for solving underlying decision making problems.

2. Quantitative methods development for Forecasting automotive mid-long secondary (part/component) demands

Research theme/s: Operations Research, Advanced computational engineering , Production Planning

Brief research problem : Building optimization based model for configurations generation and selection

- How do we plan configurations/product variants that we will build, with such huge variety?
 - Given a large (millions) set of known configurations, how to select relatively smaller set of configurations with some i/p demand characteristics and constraints.
- How do we account for product changes in fast changing technology?
 - Product documentation and rules governing configurations

Project aims: The aim of this project is to improve the current part demands forecasting by effectively considering different planning information such as rules from product documents, customer buying behaviours and sales estimates.

Expected out comes: Better part forecast will improve planning qualities in production and logistics considerably.



Thank You