Introduction to optimization methods pdf

PAGE 1 OPTIMIZATION PAGE 2 is an important tool in making decisions and in analyzing physical systems. In mathematical terms, the optimization problem is the problem of finding the best solution from among a series of all viable solutions. Building a Model The first step in the optimization process is to build the appropriate model; Modeling is the process of identifying and expressing in mathematical terms the purpose, variables, and limitations of the problem. The goal is a quantitative measure of the performance of the system that we want to minimize or maximize. In manufacturing, we may want to maximize profits or minimize production costs, whereas in fitting experimental data into models, we may want to minimize the total observed data deviations from predicted data. A variable or unknown is the system component that we want to find the value of. In manufacturing, a variable may be the amount of each resource consumed or the time spent on each activity, whereas in a data pass, the variable will be a parameter model. The limitation is a function that describes the relationship between variables and that determines the allowed value for the variable. In manufacturing, the amount of resources consumed cannot exceed the available amount. Determining issue type The second step in the optimization process is to determine which optimization category your model is in. The Optimization Issue Type page provides several guidelines to help you classify your optimization model; for different types of optimization issues, there are linked pages with some basic information, links to algorithms and software, and online and print resources. For an alphabetical list of all types of optimization issues, see Optimization Problem Type: Alphabetical List. Selecting Software The third step in the optimization process is to select the appropriate software for the type of optimization issue you're solving. Optimization software comes in two types of related packages but is very different: Solver software deals with finding solutions for specific examples of optimization models. Solver takes the model example as input, implements one or more solution methods, and returns the result. Modeling software is designed to help people formulate optimization models and analyze their solutions. The modeling system takes as input a description of the optimization problem in symbolic form and allows the solution output to be viewed in the same terms; conversion to the form required by the algorithm is done internally. Modeling systems vary the extent to which they support data importer, call solver, process results, and integrate with larger applications. Modeling systems are usually built around the language of modeling to represent the problem in symbolic form. modeling may be specific to the system or adapted from programming language or scripting. Most modeling systems support a variety of solvers, while more popular solvers can be used with many different modeling systems. Since packages of two types are often bundled for marketing or operating convenience, the differences between them are sometimes obscured, but it's important to keep in mind when trying to sort out the many alternatives available. Commercial Solvers vs. Open Source Solvers are developed with considerable effort and, while usually more powerful and reliable, they are often quite expensive. Some commercial systems are available for free under reasonable conditions for educational and academic research purposes. Many offer a limited-size free student version (or demo) for experiments with small problem instances. Open source breakers make their source code freely available under one of the standard open source licenses; many of these are available through the COIN-OR repository (www.coin-org.org). Many open source solvers are also available as precompmpimpip binaries for more popular platforms. NEOS Solvers If you don't have access to the solver you need at your institution and you'd rather not download a demo version or a free solver, you can access for free a number of commercial solvers and be freely available on NEOS SERVER. Server.