Accelerating MATLAB® Performance

1001 tips to speed up MATLAB programs
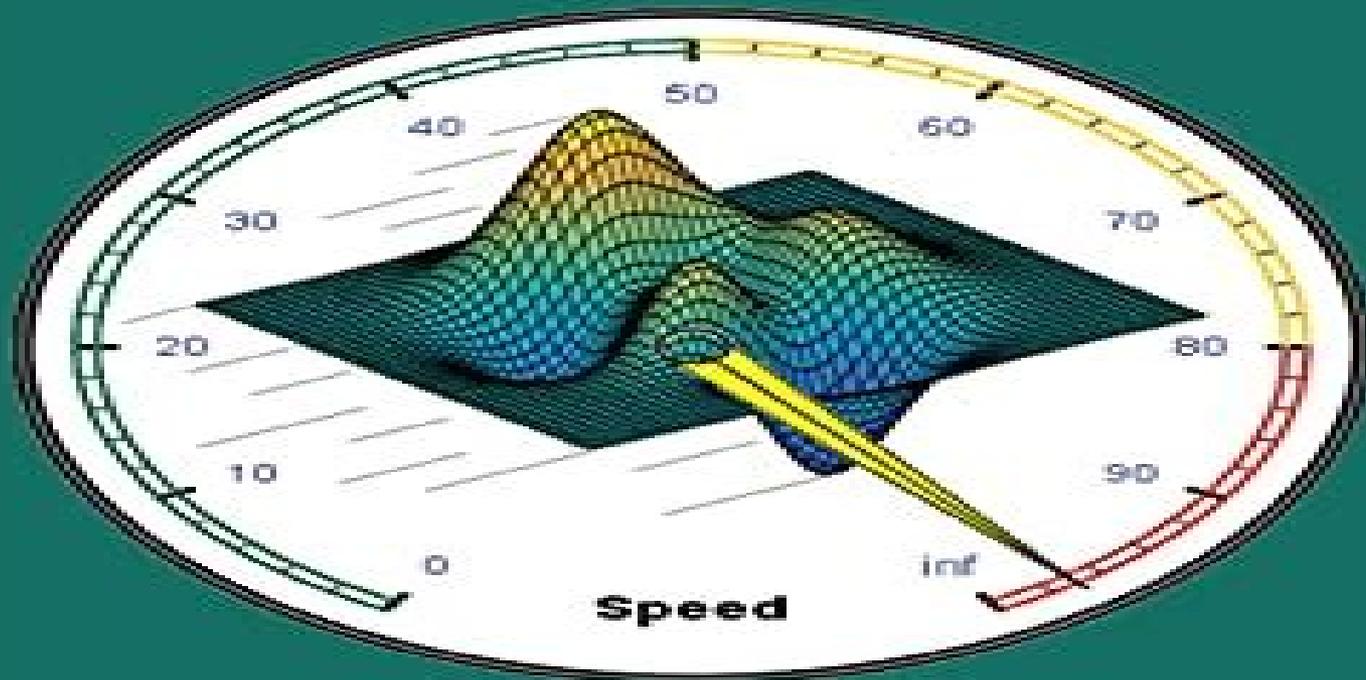
Speed

Yair Altman

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Accelerating Matlab Performance 1001 Tips To Speed Up:

Accelerating MATLAB Performance Yair M. Altman,2014-12-11 The MATLAB programming environment is often perceived as a platform suitable for prototyping and modeling but not for serious applications One of the main complaints is that MATLAB is just too slow Accelerating MATLAB Performance aims to correct this perception by describing multiple ways to greatly improve MATLAB program speed Packed with thousands of helpful tips it leaves no stone unturned discussing every aspect of MATLAB Ideal for novices and professionals alike the book describes MATLAB performance in a scale and depth never before published It takes a comprehensive approach to MATLAB performance illustrating numerous ways to attain the desired speedup The book covers MATLAB CPU and memory profiling and discusses various tradeoffs in performance tuning It describes both the application of standard industry techniques in MATLAB as well as methods that are specific to MATLAB such as using different data types or built in functions The book covers MATLAB vectorization parallelization implicit and explicit optimization memory management chunking and caching It explains MATLAB s memory model and details how it can be leveraged It describes the use of GPU MEX FPGA and other forms of compiled code as well as techniques for speeding up deployed applications It details specific tips for MATLAB GUI graphics and I O It also reviews a wide variety of utilities libraries and toolboxes that can help to improve performance Sufficient information is provided to allow readers to immediately apply the suggestions to their own MATLAB programs Extensive references are also included to allow those who wish to expand the treatment of a particular topic to do so easily Supported by an active website and numerous code examples the book will help readers rapidly attain significant reductions in development costs and program run times **Linear Programming Using MATLAB®** Nikolaos Ploskas,Nikolaos Samaras,2017-10-28 This book offers a theoretical and computational presentation of a variety of linear programming algorithms and methods with an emphasis on the revised simplex method and its components A theoretical background and mathematical formulation is included for each algorithm as well as comprehensive numerical examples and corresponding MATLAB code The MATLAB implementations presented in this book are sophisticated and allow users to find solutions to large scale benchmark linear programs Each algorithm is followed by a computational study on benchmark problems that analyze the computational behavior of the presented algorithms As a solid companion to existing algorithmic specific literature this book will be useful to researchers scientists mathematical programmers and students with a basic knowledge of linear algebra and calculus The clear presentation enables the reader to understand and utilize all components of simplex type methods such as presolve techniques scaling techniques pivoting rules basis update methods and sensitivity analysis Numerical Methods and Optimization in Finance Manfred Gilli,Dietmar Maringer,Enrico Schumann,2019-08-16 Computationally intensive tools play an increasingly important role in financial decisions Many financial problems ranging from asset allocation to risk management and from option pricing to model calibration can be efficiently handled using modern computational techniques

Numerical Methods and Optimization in Finance presents such computational techniques with an emphasis on simulation and optimization particularly so called heuristics This book treats quantitative analysis as an essentially computational discipline in which applications are put into software form and tested empirically This revised edition includes two new chapters a self contained tutorial on implementing and using heuristics and an explanation of software used for testing portfolio selection models Postgraduate students researchers in programs on quantitative and computational finance and practitioners in banks and other financial companies can benefit from this second edition of Numerical Methods and Optimization in Finance Introduces numerical methods to readers with economics backgrounds Emphasizes core simulation and optimization problems Includes MATLAB and R code for all applications with sample code in the text and freely available for download **Transient Analysis of Power Systems** Juan A. Martinez-Velasco,2020-02-10 A hands on introduction to advanced applications of power system transients with practical examples Transient Analysis of Power Systems A Practical Approach offers an authoritative guide to the traditional capabilities and the new software and hardware approaches that can be used to carry out transient studies and make possible new and more complex research The book explores a wide range of topics from an introduction to the subject to a review of the many advanced applications involving the creation of custom made models and tools and the application of multicore environments for advanced studies The authors cover the general aspects of the transient analysis such as modelling guidelines solution techniques and capabilities of a transient tool The book also explores the usual application of a transient tool including over voltages power quality studies and simulation of power electronics devices In addition it contains an introduction to the transient analysis using the ATP All the studies are supported by practical examples and simulation results This important book Summarises modelling guidelines and solution techniques used in transient analysis of power systems Provides a collection of practical examples with a detailed introduction and a discussion of results Includes a collection of case studies that illustrate how a simulation tool can be used for building environments that can be applied to both analysis and design of power systems Offers guidelines for building custom made models and libraries of modules supported by some practical examples Facilitates application of a transients tool to fields hardly covered with other time domain simulation tools Includes a companion website with data input files of examples presented case studies and power point presentations used to support cases studies Written for EMTP users electrical engineers Transient Analysis of Power Systems is a hands on and practical guide to advanced applications of power system transients that includes a range of practical examples Nonlinear and Constrained Control Emanuele Garone,Ilya Kolmanovsky,Tam W. Nguyen,2025-09-22 This book focuses on recent advances in and applications of constrained and nonlinear control The first part concentrates on theoretical aspects highlighting synergies between constrained and nonlinear control and explaining challenges and opportunities The second part examines practical applications This collection originated from a workshop at the Royal Academy of Belgium The volume features contributions from authors

based in both academia and industry Each chapter provides an introduction to a specific research area reports new findings and comments on challenges and future research opportunities The book serves as an entry point for readers interested in recent developments in constrained and nonlinear control   *R and MATLAB* David E. Hiebeler,2018-09-03 The First Book to Explain How a User of R or MATLAB Can Benefit from the Other In today s increasingly interdisciplinary world R and MATLAB users from different backgrounds must often work together and share code R and MATLAB is designed for users who already know R or MATLAB and now need to learn the other platform The book makes the transition from one platform to the other as quick and painless as possible Enables R and MATLAB Users to Easily Collaborate and Share Code The author covers essential tasks such as working with matrices and vectors writing functions and other programming concepts graphics numerical computing and file input output He highlights important differences between the two platforms and explores common mistakes that are easy to make when transitioning from one platform to the other   **Accelerating MATLAB with GPU Computing** Jung W. Suh,Youngmin Kim,2013-11-18 Beyond simulation and algorithm development many developers increasingly use MATLAB even for product deployment in computationally heavy fields This often demands that MATLAB codes run faster by leveraging the distributed parallelism of Graphics Processing Units GPUs While MATLAB successfully provides high level functions as a simulation tool for rapid prototyping the underlying details and knowledge needed for utilizing GPUs make MATLAB users hesitate to step into it Accelerating MATLAB with GPUs offers a primer on bridging this gap Starting with the basics setting up MATLAB for CUDA in Windows Linux and Mac OS X and profiling it then guides users through advanced topics such as CUDA libraries The authors share their experience developing algorithms using MATLAB C and GPUs for huge datasets modifying MATLAB codes to better utilize the computational power of GPUs and integrating them into commercial software products Throughout the book they demonstrate many example codes that can be used as templates of C MEX and CUDA codes for readers projects Download example codes from the publisher s website http booksite elsevier com 9780124080805 Shows how to accelerate MATLAB codes through the GPU for parallel processing with minimal hardware knowledge Explains the related background on hardware architecture and programming for ease of use Provides simple worked examples of MATLAB and CUDA C codes as well as templates that can be reused in real world projects   Big Data Processing With Matlab A. Smith,2017-11-12 Big data analytics examines large amounts of data to uncover hidden patterns correlations and other insights With today s technology it s possible to analyze your data and get answers from it almost immediately an effort that s slower and less efficient with more traditional business intelligence solutions MATLAB has the tools to work with large datasets and apply the necessary data analysis techniques Parallel computing allows you to carry out many calculations simultaneously Large problems can often be split into smaller ones which are then solved at the same time The main reasons to consider parallel computing are to Save time by distributing tasks and executing these simultaneously Solve big data problems by distributing data Take advantage of your desktop

computer resources and scale up to clusters and cloud computing Parallel Computing Toolbox provides you with tools for a local cluster of workers on your client machine MATLAB Distributed Computing Server software allows you to run as many MATLAB workers on a remote cluster of computers as your licensing allows Most MathWorks products enable you to run applications in parallel For example Simulink models can run simultaneously in parallel MATLAB Compiler and MATLAB Compiler SDK software let you build and deploy parallel applications Several MathWorks products now offer built in support for the parallel computing products without requiring extra coding Many applications involve multiple segments of code some of which are repetitive Often you can use for loops to solve these cases The ability to execute code in parallel on one computer or on a cluster of computers can significantly improve performance in many cases Parallel Computing Toolbox software improves the performance of such loop execution by allowing several MATLAB workers to execute individual loop iterations simultaneously Even running local workers all on the same machine as the client you might see significant performance improvement on a multicore multiprocessor machine So whether your loop takes a long time to run because it has many iterations or because each iteration takes a long time you can improve your loop speed by distributing iterations to MATLAB workers When working interactively in a MATLAB session you can offload work to a MATLAB worker session to run as a batch job The command to perform this job is asynchronous which means that your client MATLAB session is not blocked and you can continue your own interactive session while the MATLAB worker is busy evaluating your code The MATLAB worker can run either on the same machine as the client or if using MATLAB Distributed Computing Server on a remote cluster machine If you have an array that is too large for your computer s memory it cannot be easily handled in a single MATLAB session Parallel Computing Toolbox software allows you to distribute that array among multiple MATLAB workers so that each worker contains only a part of the array Yet you can operate on the entire array as a single entity Each worker operates only on its part of the array and workers automatically transfer data between themselves when necessary as for example in matrix multiplication A large number of matrix operations and functions have been enhanced to work directly with these arrays without further modification When writing code for Parallel Computing Toolbox software you should advance one step at a time in the complexity of your application Verifying your program at each step prevents your having to debug several potential problems simultaneously If you run into any problems at any step along the way back up to the previous step and reverify your code   Efficient JIT Compilation of MATLAB Loops Matthieu Dubet,2014 MATLAB is a dynamic numerical scripting language widely used by scientists engineers and students It is praised because it allows fast prototyping especially for numerical programs which manipulate matrices However numerical software can be computationally heavy and MATLAB as most interpreted languages suffers from slow performance as compared to traditionally compiled languages such as FORTRAN or C One way to provide better performance for interpreted languages is through just in time compilation where the program or part of the program is compiled at run time In this thesis we

introduce SJIT a just in time compiler for MATLAB which focuses on providing good performance while keeping the compilation time extremely small It is designed to integrate easily and transparently into an existing interpreter for MATLAB named McVM and generates highly efficient assembly code intensive parts of the program namely loops In addition to its use for accelerating whole MATLAB programs it is also suitable for accelerating the execution of fragments of MATLAB code inside an interactive environment such as a read eval print loop In addition to the SJIT compiler this thesis also contributes an efficient framework to develop static dataflow analyses and a type inference analysis implemented within this framework The SJIT compiler has been evaluated both in terms of compilation time and execution time on a collection of MATLAB benchmarks using traditional features such as matrices and structures The results show that 1 the achieved performance is several times faster than the original MATLAB implementation and 2 that the compilation time is very reasonable taking only a small fraction of the overall time

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