Staff Changes - MFCF Director

Marek Stastna, Applied Mathematics, will be stepping down as Director of MFCF and Associate Dean of Computing after three years of service. As of July 1, 2017, Steve Vavasis, Combinatorics and Optimization has taken over this position.

GPU server

Robyn Landers

GPU computing is an increasingly attractive way of reducing time-to-solution by taking advantage of the massively parallel nature of GPUs. Development environments such as CUDA assist with adapting code to run on GPUs. Some applications such as Matlab and R have built-in functions that make it easy to take advantage of GPUs.

During the spring term MFCF will be deploying a GPU server in the research environment. This machine has two multi-core CPUs, a large amount of memory, and four NVIDIA Pascal P100 GPUs. (These are the same GPUs that the new Graham computing cluster at UW's SHARCNET site has.) Installed software will include CUDA, Caffe, Theano, Torch, Anaconda, Matlab, and R.

Last term, a graduate student working with MFCF gave a talk illustrating the benefits of GPU computing with examples in Matlab and R. The slides from this talk are posted on our web site at: https://uwaterloo.ca/math-faculty-computing-facility/sites/ca.math-faculty-computing-facility/files/uploads/files/an_introduction_to_gpu_computing2.pdf

Link to CUDA:
http://www.nvidia.ca/object/cuda_home_new.html

Link to GPU computing with Matlab:

Links to GPU computing with R:
http://www.r-tutor.com/gpu-computing
https://cran.r-project.org/package=gputools
MFCF to has adopted RT4 request tracking system
Robyn Landers

For many years MFCF has used a locally-developed request tracking system based on a heavily-customized very early version of an open-source product called RT. Many of you are familiar with creating requests in this system. Meanwhile IST and others around campus have been using the official RT product through major versions 3 and 4. With the recent release of RT version 4.4, the product has advanced to the point where it can meet our needs satisfactorily.

IST has just upgraded to RT 4.4, and MFCF switched to RT 4.4 on June 30, 2017. Those of you who also use IST's RT will thus have only one request tracking system to learn. A custom form has been provided to make ticket creation easier for you. We anticipate other behind-the-scenes benefits such as the ability of different IT units on campus to collaborate on requests and share knowledge by virtue of using a common request tracking system. Details of the switch to RT can be found here: https://uwaterloo.ca/math-faculty-computing-facility/new-request-tracking-system

Stay tuned for MC 3008 computing lab renovation
Debbie Brown

Construction began at the beginning of June with a target completion date of mid-August. MC 3008 will be modernized with new flooring, fresh paint, upgraded LED lighting, ceiling mounted data projector, automatic screen, new desks, thin clients and 27” monitors. MFCF acknowledges MEF for their generous funding allocation toward the upgraded computer hardware.

MC 3008 is a bookable lab for tutorials/classes and we are optimistic that it will be very popular with instructors.

MATLAB
Marek Stastna

Matlab is a widely used tool for mathematics based computation with considerable online resources. While there are many complete beginner resources, as well as really specialized tools (e.g. signal analysis), there isn’t much out there for the mathematically sophisticated user who wants to get better at Matlab.

The key to Matlab success is balancing what is built in with what you build yourself. Often this is
wrapped up in that old mathematics chestnut of notation. Some readers may recall taking a physics course as undergraduates and being frustrated at seeing the imaginary number referred to as “j” instead of “i”. Some fields have much more involved “in house” notation. It does not make sense to spend an afternoon figuring out the signal processing toolbox’s notation only to find the built in script is opaque and only sort of does what you want. On the other hand, far too many hand built Matlab codes rely on an excessive number of loops (which are the ultimate no-no in Matlab) and clumsy reimplementations of standard Matlab functions.

We have built a series of tutorial scripts that cover Matlab basics from the point of view of beginning graduate students. We have also built more advanced scripts that cover specific topics (e.g. stochastic differential equations). Many of these also show off vectorization tricks for speeding up code. The book “Spectral Methods in Matlab” by L.N. Trefethen influenced the coding philosophy used, though we have tried for more general utility than just Spectral Methods for Partial Differential Equations (PDEs). Even when considering PDEs we tried to balance elegant theory with actual utility in practice. For example we spend considerable effort on non-trivial boundary conditions.

The codes can be found at: https://uwaterloo.ca/math-faculty-computing-facility/mathematical-applications/matlab-tutorials

**Maple**
Emilee Carson

Maple is a commonly-used tool in mathematics as well as in some undergraduate math courses at the University of Waterloo. It is a powerful tool, as it can perform both symbolic and numeric computations. It can be difficult to get started with Maple, as it is quite different from most other mathematical software out there (such as Matlab, Python), and many of the sample worksheets available online are out of date.

A key feature of Maple is the ability to add formatted text, tables, and hidden start-up code to a worksheet. These allow for nicely formatted documents that are easy to follow.

We have updated several outdated worksheets, and developed a collection of new ones that cover Maple basics for undergraduate Applied Mathematics students. We have also built worksheets that cover specific topics from upper year courses (e.g. Burgers’ vortex). Several of these are interactive worksheets with animations that offer easy manipulation of parameters to demonstrate course concepts.

These worksheets can be found at: https://uwaterloo.ca/applied-mathematics/current-undergraduates/maple-worksheets

**New MFCF web pages**

MFCF has revamped our web pages during the the Winter 2017 term to conform to the Waterloo Content Management System (WCMS) responsive design. Visitors will now be able to easily navigate from their desktop, tablet, or smartphone. The site has also been organized so you can
find MFCF services in different ways, such as category, alphabetical, audience, and most popular. This should make it easier to find information that you need at your fingertips much faster.
https://uwaterloo.ca/math-faculty-computing-facility/
Feedback is always welcome by sending an email to mfcfhelp@uwaterloo.ca

sHelp us help you

Do you know a way we could make math computing better? Is there something you'd like to hear about in these newsletters. Do you want to write an article?
Email Lori Suess at lcsuess@uwaterloo.ca or fill out a Request. We'd love to hear what you have to say!

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