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The JuliaCon 2019 Committee

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Chris Rackauckas (program chair)

Lyndon White (program vice-chair)

Viral B. Shah

Stefan Karpinski

Cheryl Fong

Kelly Shen

Monday 22

Mon, 22 Jul 2019 07:30|Other

Breakfast (Workshops)

JuliaCon Committee

Breakfast will be provided in the PH Galley

Mon, 22 Jul 2019 08:30|PH 111N

Excelling at Julia: basics and beyond

Huda Nassar Jane Herriman

This tutorial targets both new and moderately experienced Julia users. After covering the basics and tools for data science, we will delve into topics such as memory management, type stability, and profiling.

Huda Nassar is Ph.D. candidate in the Computer Science department at Purdue University. Her research focuses on large scale network science and she is an active user of Julia. She is the author of MatrixNetworks.jl and had delivered multiple Julia tutorials (at places such as PyData 2016, and Purdue WiDS 2018).

Jane Herriman is a PhD student at the California Institute of Technology, an enthusiastic Julia user, a JuliaCon organizer, and a board member at NumFOCUS. She has delivered about 50 Julia tutorials.

Mon, 22 Jul 2019 08:30|PH 211N

Intermediate Julia for Scientific Computing

David P. Sanders

This is a workshop aimed at people who already know basic Julia usage and wish to explore some more advanced topics that make Julia special, namely defining and using types, and metaprogramming.

Professor at the National University of Mexico.

Has been using Julia since early 2014.

Main co-author of the JuliaIntervals suite of packages.

Has given Julia tutorials all over the world, some of which are available on YouTube and have over 100,000 views.

Mon, 22 Jul 2019 08:30|PH 103N

Solving Differential Equations in Julia

Chris Rackauckas

This workshop is for both experienced DifferentialEquations.jl users and newcomers. The first hour of the workshop will introduce the user to DifferentialEquations.jl, describing the basic workflow and the special features which are designed to make solving hard equations (automatic sparsity detection, Jacobian coloring, polyalgorithms, etc.) easy. After the introduction, the workshop will break out into groups to work on exercises, where the developers of the library's components will be available for any questions. Some of the exercises are designed for beginners to learn how to solve differential equations and fit models to data, while others are for experienced users to learn the newest performance-enhancement features and upgrade to GPU-accelerated workflows.

Chris' research and software combines AI with differential equation models of human organs to give patients accurate and personalized drug doses: reducing pain and complications for patients while reducing treatment costs for hospitals.

Chris Rackauckas is an applied mathematics instructor at the Massachusetts Institute of Technology and a senior research analyst at the University of Maryland, School of Pharmacy in the Center for Translational Medicine. Chris's recent work is focused on bringing personalized medicine to standard medical practice through the proliferation of mathematical software. His work on developing the DifferentialEquations.jl solver suite along with over a hundred other Julia packages, not only earned him the inaugural Julia Community Prize and front page features in tech community sites, it is also the foundation of the PuMaS.jl package for Pharmaceutical Modeling and Simulation, set to release in March 2019. Chris' work with PuMaS makes it possible to predict the optimal medication dosage for individuals, reducing the costs and potential complications associated with treatments. The software is currently being tested in the administration of treatment for neonatal abstinence syndrome (NAS), an opioid withdrawal disorder in newborn babies. NAS requires medically administered morphine doses every four hours to prevent the infants from experiencing withdrawal symptoms. PuMaS is being used to predict personalized safe dosage regimens by incorporating realistic biological models (quantitative systems pharmacology) and deep learning into the traditional nonlinear mixed effects (NLME) modeling framework. This software and its methodology are also being tested in clinical trials at Johns Hopkins University for its ability to predict an individual's drug response to vancomycin and automatically prescribe optimal doses directly from a patient's health records.

Chris started this work while completing his Masters and Ph.D. at the University of California, Irvine where he was awarded the Mathematical and Computational Biology institutional fellowship, the Graduate Dean's Fellowship, the National Science Foundation's Graduate Research Fellowship, the Ford Predoctural Fellowship, the NIH T32 Predoctural Training Grant, and the Data Science Initiative Summer Fellowship. His research with his advisor, Dr. Qing Nie, focused on the methods for simulating stochastic biological models and detailing how the randomness inherent in biological organisms can be controlled using stochastic analysis. Chris bridged the gap between theory and practice by having a "wet lab bench" in Dr. Thomas Schilling's lab, where these methodologies were tested on zebrafish. Fluorescence Light Microscopy (FLIM) measurements of retinoic acid in the zebrafish hindbrain showed that the predicted control proteins could attenuate inherent biological randomness. The result was a verified mathematical theory for controlling the randomness in biological signaling. Chris received the Kovalevsky Outstanding Ph.D. Thesis Award from the Department of Mathematics upon graduation and was showcased in an interview "Interdisciplinary Case Study: How Mathematicians and Biologists Found Order in Cellular Noise" in iScience.

As an undergraduate at Oberlin College, Chris was awarded the NSF S-STEM scholarship and the Margaret C. Etter Student Lecturer Award by the American Crystallographic Association, an award usually given for PhD dissertations, for his work on 3+1 dimensional incommensurate crystal structure identification of H-acid. This award was given for Service Crystallography for its potential impact on industrial dye manufacturing.

Mon, 22 Jul 2019 08:30|PH 203N

Machine Learning Workshop

Matt Bauman

Demystify machine learning buzzwords by learning how to train and use your own neural network in this interactive workshop. We'll cover the foundational principles that underpin modern machine learning and demonstrate how Julia makes it easy and fast.

Matt Bauman is a Senior Research Scientist at [Julia Computing](https://www.juliacomputing.com), focusing on teaching and training as well as continuing to improve Julia's array infrastructure. He's been contributing to both the core language and multiple packages since 2014. At his previous position as a Data Science Fellow at the University of Chicago's Center for Data Science and Public Policy, he longed for dot-broadcasting in Python. He recently defended his PhD in Bioengineering from the University of Pittsburgh, focusing on neural prosthetics.

Mon, 22 Jul 2019 12:00|Other

Lunch

JuliaCon Committee

Lunch will be held in the SMC 2nd Floor Lobby

Mon, 22 Jul 2019 13:30|PH 111N

Writing a package – a thorough guide

Fredrik Ekre

Kristoffer Carlsson

In this workshop, we will go through all the necessary steps to create a Julia package. The goal of the workshop is that attendees should be well prepared for getting started with package writing in Julia.

FE I am a PhD student in computational material mechanics and use Julia both for research, procrastination and as a hobby.

KC I used to be a PhD student at Chalmers University of Technology doing research in material science. Now I work for JuliaComputing, doing all kinds of different Julia stuff.

Mon, 22 Jul 2019 13:30|PH 211N

Parallel Computing Workshop

Avik Sengupta

Matt Bauman

Parallel computing is hard. Julia can make it much easier. In this workshop, we discuss modern trends in high performance computing, how they've converged towards multiple types of parallelism, and how to most effectively use these different types in Julia.

Avik Sengupta is VP of Engineering at Julia Computing, Inc. In that role he is responsible for all product development and software engineering at the company. He's a contributor to the open source Julia programming language, and maintainer of many Julia packages. Previously, Avik has worked on large, complex solutions for world's leading investment banks, creating single dealer platforms, equity research services and risk and trading systems. Over the past decade, he has co-founded 2 startups working on AI/ML in the financial services sector.

Avik is the author of "Julia High Performance", a book about performance optimisation in Julia. He has an MBA

from IIM Bangalore, and an MS in Computational Finance from Carnegie Mellon University.

Matt Bauman is a Senior Research Scientist at [Julia Computing](https://www.juliacomputing.com), focusing on teaching and training as well as continuing to improve Julia's array infrastructure. He's been contributing to both the core language and multiple packages since 2014. At his previous position as a Data Science Fellow at the University of Chicago's Center for Data Science and Public Policy, he longed for dot-broadcasting in Python. He recently defended his PhD in Bioengineering from the University of Pittsburgh, focusing on neural prosthetics.

Mon, 22 Jul 2019 13:30|PH 103N

Pharmaceutical Modeling and Simulation with Pumas

Chris Rackauckas

Vijay Ivaturi

Pharmacometics is commonly used to optimize drug doses and pre-screen drugs before clinical trials. In this workshop, users familiar with Julia will learn about pharmacometrics and how to perform the model simulations, while pharmacometricians will learn how to use Julia to build the models they know from their field. The focus will be on simulating bioequivalance studies with Bioequivalence.jl, performing nonlinear mixed-effects modeling (NLME) simulation and estimation with Pumas.jl, and non-compartmental analysis (NCA) with the PumasNCA submodule.

Biography

Mon, 22 Jul 2019 13:30|PH 203N

Handling Data with DataFrames.jl

Bogumił Kamiński

A case-study based tutorial on working with tabular data using the [DataFrames.jl](https://github.com/JuliaData/DataFrames.jl) package.

I am a researcher in the fields of operations research and computational social science.

For development work I mostly use Julia language.

You can find more information about me on [my personal website](http://bogumilkaminski.pl/about/) or [GitHub](https://github.com/bkamins).

Tuesday 23

Tue, 23 Jul 2019 07:30|Other

Breakfast

Breakfast will be held in the SMC 2nd Floor Lobby

Tue, 23 Jul 2019 08:30|NS Room 130

Opening Remarks

JuliaCon Committee
Welcome to Juliacon!

This opening session will let you know all the details of what is going on, and will include the important information and what to do in-case of emergencies.

Tue, 23 Jul 2019 08:40|NS Room 130

Keynote: Professor Madeleine Udell

Professor Madeleine Udell
Madeleine Udell is Assistant Professor of Operations Research and Information Engineering and Richard and Sybil Smith Sesquicentennial Fellow at Cornell University. She studies optimization and machine learning for large scale data analysis and control, with applications in marketing, demographic modeling, medical informatics, engineering system design, and automated machine learning. Her research in optimization centers on detecting and exploiting novel structures in optimization problems, with a particular focus on convex and low rank problems.

These structures lead the way to automatic proofs of optimality, better complexity guarantees, and faster, more memory-efficient algorithms. She has developed a number of open source libraries for modeling and solving optimization problems, including [Convex.jl](https://github.com/JuliaOpt/Convex.jl), one of the top tools in the Julia language for technical computing.

Tue, 23 Jul 2019 09:30|NS Room 130

Debugging code with JuliaInterpreter

Tim Holy Sebastian Pfitzner
We present a Julia debugger and demonstrate a variety of interfaces for accessing it. We also describe the infrastructure that provides intriguing new capabilities to the Julia ecosystem.

> Neuroscientist and developer of the Julia language and its packages.

Tue, 23 Jul 2019 10:00|NS Room 130

Sponsor Address: Intel

Paul Petersen
An address from one of our sponsors.

Tue, 23 Jul 2019 10:05|NS Room 130

Julia Survey Results

Viral B. Shah
A presentation on the results of the 2019 Julia Survey

Tue, 23 Jul 2019 10:15|NS Room 130

Sponsor Address: Relational AI

Nathan Daly
A talk from one of our gracious sponsors.

> Nathan Daly is a Software Engineer at [RelationalAI](http://relational.ai). He was first introduced to the idea of contributing to JuliaLang as one small way to help fight climate change by making scientific computing a little bit easier: http://worrydream.com/ClimateChange

Tue, 23 Jul 2019 10:20|Other

Morning break

A break for coffee

Tue, 23 Jul 2019 11:00|Room 349

Pkg, Project.toml, Manifest.toml and Environments

Fredrik Ekre
One of the major features of Julia's new package manager is _package environments_. This presentation will explain how environments work, what they are useful for and how to use them effectively.

> I am a PhD student in computational material mechanics and use Julia both for research, procrastination and as a

hobby.

Tue, 23 Jul 2019 11:00|Elm B

The Linguistics of Puzzles: Solving Cryptic Crosswords in Julia

Robin Deits

If you like using serious scientific tools to do silly things, then this talk is for you. Join me as I explore the intersection of computational linguistics, algorithm design, and machine learning in an effort to seriously overthink cryptic crossword clues.

Robin recently finished his PhD in robotics from MIT and is excited to have finally completed 23rd grade. He now works at Boston Dynamics, where he trains humanoid robots to do tricks. While at MIT, he helped to start the [JuliaRobotics organization](http://www.juliarobotics.org/), dedicated to developing and promoting Julia tools to advance the field of robotics.

In his free time, he enjoys writing and solving puzzles, especially when he can figure out how to use Julia to solve them faster.

Tue, 23 Jul 2019 11:00|BOF

Dynamical Modeling in Julia

Chris Rackauckas

A lot of people are building tooling for differential equation based models in Julia for various domains. DifferentialEquations.jl, DynamicalSystems.jl, PuMaS.jl, Modia.jl, QuantumOptics.jl, etc. and the list goes on. The purpose of this BoF is to gather the developers who are interested in this topic in order to learn about the priorities and gripes within the community in order to plan for the next developments.

Chris' research and software combines AI with differential equation models of human organs to give patients accurate and personalized drug doses: reducing pain and complications for patients while reducing treatment costs for hospitals.

Chris Rackauckas is an applied mathematics instructor at the Massachusetts Institute of Technology and a senior research analyst at the University of Maryland, School of Pharmacy in the Center for Translational Medicine. Chris's recent work is focused on bringing personalized medicine to standard medical practice through the proliferation of mathematical software. His work on developing the DifferentialEquations.jl solver suite along with over a hundred other Julia packages, not only earned him the inaugural Julia Community Prize and front page features in tech community sites, it is also the foundation of the PuMaS.jl package for Pharmaceutical Modeling and Simulation, set to release in March 2019. Chris' work with PuMaS makes it possible to predict the optimal medication dosage for individuals, reducing the costs and potential complications associated with treatments. The software is currently being tested in the administration of treatment for neonatal abstinence syndrome (NAS), an opioid withdrawal disorder in newborn babies. NAS requires medically administered morphine doses every four hours to prevent the infants from experiencing withdrawal symptoms. PuMaS is being used to predict personalized safe dosage regimens by incorporating realistic biological models (quantitative systems pharmacology) and deep learning into the traditional nonlinear mixed effects (NLME) modeling framework. This software and its methodology are also being tested in clinical trials at Johns Hopkins University for its ability to predict an individual's drug response to vancomycin and automatically prescribe optimal doses directly from a patient's health records.

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mathematical theory for controlling the randomness in biological signaling. Chris received the Kovalevsky Outstanding Ph.D. Thesis Award from the Department of Mathematics upon graduation and was showcased in an interview "Interdisciplinary Case Study: How Mathematicians and Biologists Found Order in Cellular Noise" in iScience.

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Tue, 23 Jul 2019 11:00|Elm A

Intelligent Tensors in Julia

Katharine Hyatt, Matthew Fishman

We present ITensors.jl, a ground-up rewrite of the C++ ITensor package for tensor network simulations in Julia. We will motivate the use of tensor networks in physics and give some examples for how ITensors.jl can help make the use and development of tensor network algorithms easier for researchers, users, and developers.

Katharine Hyatt graduated in June 2018 with a PhD in condensed matter physics from UC Santa Barbara. She now works as a postdoctoral researcher at the Flatiron Institute's Center for Computational Quantum Physics, searching for new numerical methods to investigate many-body systems in two (and higher dimensions) and interesting applications for them. She is also a sometime Julia language contributor.

Matthew Fishman graduated in the spring of 2018 with a PhD in physics from Caltech. His thesis was on the development of new tensor network algorithms for studying quantum many-body systems. In the fall of 2019, he started as an Associate Data Scientist at the Center for Computational Quantum Physics, part of the Flatiron Institute in New York City. There, he is a developer of the ITensor library, a leading software package for performing tensor network calculations.

Tue, 23 Jul 2019 11:30|Room 349

FilePaths: File system abstractions and why we need them

Rory Finnegan

Have you ever found yourself writing code that special cases different local and remote [filesystems](https://en.wikipedia.org/wiki/File_system)?

FilePath types are a great way to encapsulate filesystem specific logic and provide a common [abstraction](https://en.wikipedia.org/wiki/Abstraction_layer) for interacting with various types of paths (e.g., posix, windows, S3, FTP).

A software developer with an interest in computational neuroscience.

Tue, 23 Jul 2019 11:30|Elm B

Counting On Floating Point

Jeffrey Sarnoff

DoubleFloats.jl offers performant types, Double64 and Double32, with twice the precision of Float64 and Float32. Attendees will gain a working knowledge of how to apply the package in support of more reliably accurate results.

to be added

Tue, 23 Jul 2019 11:30|Elm A

A general-purpose toolbox for efficient Kronecker-based learning

Michiel Stock

Pairwise learning is a machine learning paradigm where the goal is to predict properties of pairs of objects. Applications include recommender systems, such as used by Amazon, molecular network inference and ecological interaction prediction. Kronecker-based learning systems provide a simple, yet elegant method to learn from such pairs. Using tricks from linear algebra, these models can be trained, tuned and validated on large datasets. The Julia package Kronecker.jl aggregates these tricks, such that it is easy to build such learning systems.

I am a postdoctoral researcher at the KERMIT (knowledge-based systems) group at Ghent University.

Machine intelligence and living systems fascinate me. In my research, I develop intelligent techniques to understand, predict and control biological networks. My main toolbox involves a mix of machine learning, optimization, bioinformatics and graph theory. I use these methods to predict how plants, animals, microorganisms and molecules interact with each other.

Much of my work involves working together with others, translating biological problems as mathematical or computational ones. Every year, I try to engage students students in projects and theses, doing cool things such as making a beer classifier or designing new proteins.

During my years as a teaching assistant, I was involved in various courses on data analytics and computational intelligence, including statistics, probability theory and machine learning. Now, I am the responsible teacher for the course 'Selected Topics in Mathematical Optimization', learning master students of bioinformatics how solve concrete problems.

Tue, 23 Jul 2019 11:40|Room 349

Ultimate Datetime

Jay Dweck

Ultimate datetime is a datetime data type, which eliminates many of the limitations and inaccuracies of the datetime datatypes generally employed in computer languages. Ultimate datetime enables representation of datetimes from the Big Bang through to the year 100,000,000,000 with attosecond precision, while properly handling leap seconds, the full range of time zones, and accounting for precision and uncertainty.

Most recently, Jay has been consulting on large-scale cloud migrations for financial firms. Prior to this, he served as the CTO for Arxis Capital, a wholesale market maker and high frequency proprietary trading firm. He has also consulted for hedge funds, focusing on unified modeling of trades and positions across all asset classes, and from front to back office.

Jay joined Morgan Stanley in 2007 as a Managing Director and Global Head of Strategies and Technology for the Institutional Securities Group (ISG). In this capacity, Jay created Morgan Stanley Innovative Data, Environments, Analytics & Systems (IDEAS), an integrated quantitative and technology organization formed to create a sustainable, commercial advantage for Morgan Stanley by reshaping the Firm's businesses around innovative people, processes and systems. Following the creation of IDEAS, Jay ran Morgan Stanley Strats & Modeling (MSSM), which focused on revenue generation across the breadth of the Firm's Sales & Trading and banking businesses through the development of innovative analytics and technology. Jay was appointed to the Firm's Management Committee in 2009.

Prior to joining Morgan Stanley, Jay was the head of Core Strategies, and then Equities Strategies for the Global Strategies Group at Goldman Sachs. He was also the chief technology officer for Fixed Income, Equities and Financing Strategies. He joined Goldman Sachs in 1994 in Fixed Income and became a managing director in 1997 and a partner in 2000.

During his career Jay was president of 100% Software Solutions, a vice president at Simulation Sciences Inc., president of JSD Simulation Service Company, a member of the MIT Energy Lab and a vice president of the Merix Corporation.

Jay is a member of the Phi Beta Kappa, Tau Beta Pi, Sigma Xi, AIChE, ACM and MAA societies. He also serves on the board of the Perlman Music Program, and served on the MIT Chemical Engineering Visiting Committee.

Jay earned BS, MS and Eng degrees in Chemical Engineering and a BS in Math from the Massachusetts Institute of Technology in 1977.

Tue, 23 Jul 2019 11:40|Elm B

Analyzing social networks with SimpleHypergraphs.jl

Bogumił Kamiński
Przemysław Szufel

A hypergraph is a generalization of a graph where a single edge can connect more than two vertices. Typical applications are related to social data analysis and include situations such as sending a single email to several recipients, a customer giving reviews to several restaurants or analyzing security vulnerabilities of information networks. In many situations the usage of a hypergraph rather than a classical graph allows to better capture and analyze dependencies within the network.

We will start by presenting the library and its functionality. As an example a use case with analysis of Yelp reviews will be shown. The presentation will be based on Jupyter notebook and will be very illustrative for researchers planning to do social network modelling in Julia.

In the second part of presentation we will show how we made use of typical Julia programming patterns to build the library. This includes overloading Array operators to provide a user an Array-like access to the hypegraphs data, using object composition as a standard inheritance mechanism for generating various representations (views) of a hypergraph and finally, making the hypegraph data structures compatible with LightGraphs.jl by providing new method implementations. This should give the participants an overview of typical patterns used when extending the package ecosystem of the Julia language.

Acknowledgement: The project is financed by the Polish National Agency for Academic Exchange.

I am a researcher in the fields of operations research and computational social science.

For development work I mostly use Julia language.

You can find more information about me on [my personal website](http://bogumilkaminski.pl/about/) or [GitHub](https://github.com/bkamins).

Przemysław Szufel is an Assistant Professor in Decision Support and Analysis Unit at SGH Warsaw School of Economics, he also a visiting researcher in Ryerson University (Toronto) and a member of Computational

Methods in Industrial Mathematics Lab in The Fields Institute for Research in Mathematical Sciences in Toronto.

His current research focuses on practical application and methods for execution of large-scale simulations for numerical experiments and optimization. He is an author or a co-author of several Open Source tools for high performance and numerical simulation as well as papers on simulation-optimization algorithms. Przemysław is also a co-author of the book "Julia 1.0 Programming Cookbook: Over 100 numerical and distributed computing recipes for your daily data science workflow", Packt Publishing, 2018.

Tue, 23 Jul 2019 11:40|Elm A

Thread Based Parallelism part 2

Jeff Bezanson
Here about what is new in julia 1.2 and 1.3 with thread-based parallelism.

(note: due to a race condition, Thread Based Parallelism part 2 occurs before Thread Based Parallelism part 1)

Jeff is one of the creators of Julia, co-founding the project at MIT in 2009 and eventually receiving a Ph.D. related to the language in 2015. He continues to work on the compiler and system internals, while also working to expand Julia's commercial reach as a co-founder of Julia Computing, Inc.

Tue, 23 Jul 2019 11:50|Room 349

Smart House with JuliaBerry

Ahan Sengupta
Hardware and software scale model of a smart house that utilises the functions of a Raspberry Pi. It has several functions that could be transferred to a full-scale model using the same hardware.

I'm 13 years old and have a great interest in programming. I started coding in Scratch when I was 9 years old but I now code in Python and Julia. I also presented a poster at JuliaCon 2018.

Tue, 23 Jul 2019 11:50|Elm B

Recommendation.jl: Building Recommender Systems in Julia

Takuya Kitazawa
This talk demonstrates [Recommendation.jl](https://github.com/takuti/Recommendation.jl), a Julia package for building recommender systems. We will eventually see (1) a brief overview of common recommendation techniques, (2) advantages and use cases of their Julia implementation, and (3) design principles behind the easy-to-use, extensible package.

[Takuya Kitazawa](https://takuti.me), a senior engineer at Arm Treasure Data, is passionate about bridging a gap between scientific theory and real-world practice in the industry. At the organization building an enterprise-grade big data analytics platform, he has been practically acted as a data scientist, technical evangelist, consultant, machine learning engineer, and software engineer through the experience of contributing to [Apache Hivemall](https://github.com/apache/incubator-hivemall/), implementing out-of-the-box ML application, presenting at conferences, and working on a variety of customer-facing opportunities. His current interest is particularly in large-scale ML and its UI/UX matter, especially in the context of recommender systems and data streams.

Tue, 23 Jul 2019 11:50|Elm A

Thread Based Parallelism part 1

Jameson Nash
Here about what is new in julia 1.2 and 1.3 with thread-based parallelism.

(note: due to a race condition, Thread Based Parallelism part 1 occurs after Thread Based Parallelism part 2)

Tue, 23 Jul 2019 12:05|Other

Lunch

Lunch will be held in the SMC 2nd Floor Lobby

Tue, 23 Jul 2019 13:30|NS Room 130

Keynote: Dr Cynthia J Musante

Dr Cynthia J Musante
Dr. Cynthia J. (C.J.) Musante is Senior Scientific Director and Head of Quantitative Systems Pharmacology (QSP) in Early Clinical Development at Pfizer in Cambridge, MA. She received her Ph.D. in Applied Mathematics from North Carolina State University and has over eighteen years of experience in QSP modeling. At Pfizer, her group is responsible for developing and applying mechanistic models and disease platforms to enhance the robustness and quality of decision-making at the program and therapeutic strategy-level.

Dr. Musante is an advocate for model-informed drug discovery and development approaches. She currently serves as Treasurer and on the Board of Directors of the [International Society of Pharmacometrics](https://insp.memberclicks.net/) (ISoP), as Co-Chair of the [Innovation and Quality (IQ) Consortium](https://iqconsortium.org/about/) Clinical Pharmacology QSP Working Group, on the Scientific Programming Committee for the [American Society of Clinical Pharmacology and Therapeutics](https://www.ascpt.org/Member-Services/About-ASCPT), and formerly served as the inaugural Chair of ISoP's QSP Special Interest Group.

Tue, 23 Jul 2019 14:30|Room 349

MLJ - Machine Learning in Julia

Anthony Blaom
We present MLJ, Machine Learning in Julia, a new toolbox for combining and systematically tuning machine learning models.

Anthony Blaom carries out mathematics research and data science consulting. He resides in Auckland, New Zealand.

Anthony was initially trained as a mechanical engineer, topping his class at the University of Melbourne in 1991. After completing a MSc in Aeronautics and a PhD in Mathematics at Caltech in 1998, he joined the University of Auckland as a Lecturer. For a while he switched to part-time teaching, focusing on his young children, whom he homeschooled while living on the small island of Waiheke.

Anthony is a co-creator and the lead contributor to MLJ, a Julia machine learning platform developed at the Alan Turing Institute, London.

[home page](https://ablaom.github.io) • [github](https://github.com/ablaom)

Tue, 23 Jul 2019 14:30|Elm B

A New Breed of Vehicle Simulation

Tucker McClure

When you design an aircraft or spacecraft, it generally has to work the first time or the consequences are fiery destruction. You simulate a lot. Julia enables not merely a flexible and fast way to write a custom simulation, but in fact an entirely new and powerful breed of simulation architecture.

Tucker has been creating simulations and flight algorithms for aircraft and spacecraft for thirteen years and is currently the guidance, navigation, control, and simulation lead at Zipline International, whose autonomous aircraft deliver blood in emergencies in Rwanda. He loves sharing the subject with others; his online article is now the first result in Google to the query: "How do simulations work?" Throughout his career, he's built up a vision for a great simulation platform and was thrilled when he found Julia, which is the first language that allows him to bring those ideas together cleanly. He'll be interested in finding the best espresso in Baltimore.

Tue, 23 Jul 2019 14:30|BOF

JuliaDB Code and Chat

Josh Day

JuliaDB is an analytical data framework that offers typed dataframes, parallel processing, and limited out-of-core support. This session gives JuliaDB users and contributors the opportunity to discuss how JuliaDB works for them, tackle issues, and discuss the future of JuliaDB.

I am a PhD statistician who enjoys programming (particularly with Julia) for difficult optimization and machine learning problems. My niche is the intersection of statistics and computer science, which allows me to quickly translate whiteboard math into efficient programs. During my PhD years I researched on-line algorithms for statistics (single-pass algorithms for streaming and big data), an underused paradigm where statistics/models can be updated on new batches of data without revisiting past observations (see [**OnlineStats.jl**](https://github.com/joshday/OnlineStats.jl)). I am a [research scientist](https://www.seqstat.com/post/mm-algorithms/), [data scientist](https://www.seqstat.com/post/glmnet-tutorial/), [machine learning engineer](https://www.seqstat.com/post/juliaml/), and [software engineer](https://www.seqstat.com/post/whyjulia/). I contribute to a variety of open source data science tools, some of which can be found here: https://github.com/joshday.

Tue, 23 Jul 2019 14:30|Elm A

Generating documentation: under the hood of Documenter.jl

Morten Piibeleht

Documenter compiles docstrings, code snippets, and Markdown pages into HTML or PDF documents and can automatically deploy them as websites, making it easy to create manuals for Julia packages that are

immediately available to users. This talk explores what goes into making all of that happen.

Morten Piibeleht is a PhD student at Massey University, New Zealand, doing theory and computational work in the field of atomic physics and QED. In his spare time he is one of the maintainers of Documenter and the JuliaDocs organization.

Tue, 23 Jul 2019 15:00|Room 349

Merging machine learning and econometric algorithms to improve feature selection with Julia

Demian Panigo
Adán Mauri Ungaro
Nicolás Monzón
Valentin Mari

Working on our previous contributions for JuliaCon 2018 (see [GlobalSearchRegresssion.jl](https://github.com/ParallelGSReg/GlobalSearchRegression.jl), [GlobalSearchRegressionGUI.jl](https://github.com/ParallelGSReg/GlobalSearchRegressionGUI.jl), and [our JuliaCon 2018 Lighting Talk](https://bit.ly/2UC7dr1)) we develop a new GlobalSearchRegression.jl version merging LASSO and QR-OLS algorithms, and including new outcome capabilities. Combining machine learning (ML) and econometric (EC) procedures allows us to deal with a much larger set of potential covariates (e.g. from 30 to hundresds) preserving most of the original advantages of all-subset regression approaches (in-sample and out-of sample optimality, model averaging results and residuals tests for coefficient robustness). Additionally, the new version of GlobalSearchRegression.jl allows users to obtain LATEX and PDF outcomes with best model results, model averaging estimations and key statistics distributions

I'm president of APEL (http://apel.la/) and vice-Director of the Center of Workers' Innovation - CONICET/UMET in Argentina (http://citra.org.ar/). I have a PhD in Economics (EHESS-Paris, France) and I'm also teaching advanced macroeconomics and development economics at four different Universities (UNLP, UNDAV, UNQ and UNM). Working on industrial economics over the last three years (more precisely, automotive industry), I'm moving now to innovate on HPC in Econometrics.

https://www.researchgate.net/profile/Demian_Panigo

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Tue, 23 Jul 2019 15:00|Elm B

Modia3D: Modeling and Simulation of 3D-Systems in Julia

Andrea Neumayr

Model and simulate mechanical 3D-systems with hierarchical components, kinematic loops, and collision handling of convex bodies.

I am a PhD student and I've studied Mathematics. I've been working with Julia for more than two years now. I'm a developer of a modeling and simulation environment of 3D-systems called Modia3D. Our Julia package is https://github.com/ModiaSim/Modia3D.jl.

I'm interested in metaprogramming and numerical analysis in general and I want to learn more about Julia.

Tue, 23 Jul 2019 15:00|Elm A

Literate programming with Literate.jl

Fredrik Ekre

Literate programming is described as an _explanation of the program logic in a natural language, interspersed with traditional source code_. This presentation will describe how the `Literate.jl` package can be used for literate programming, and show how to generate multiple outputs, such as jupyter notebooks, or markdown pages, based on the same source file.

I am a PhD student in computational material mechanics and use Julia both for research, procrastination and as a hobby.

Tue, 23 Jul 2019 15:10|Room 349

Let's Play Hanabi!

Jun Tian

Games have been testbeds for Artificial Intelligence research for a long time. Here I will demonstrate how to play the fantastic [Hanabi card game](https://en.wikipedia.org/wiki/Hanabi_(card_game)) interactively in Julia REPL. Furthermore, I will introduce how to implement some state-of-the-art learning algorithms in pure Julia.

[Jun Tian](https://tianjun.me/about) is a software engineer working in Microsoft Beijing with a broad interest in Natural Language Understanding and Reinforcement Learning.

Tue, 23 Jul 2019 15:10|Elm B

TrajectoryOptimization.jl: A testbed for optimization-based robotic motion planning

Brian Jackson

Trajectory optimization is a fundamental tool for controlling robots with complex, nonlinear dynamics. TrajectoryOptimization.jl is devoted to providing a unified testbed for developing, comparing, and deploying algorithms for trajectory optimization.

I am a PhD student in the Mechanical Engineering department at Stanford University, advised by Dr. Zachary Manchester. My research focuses on developing algorithms to control robots with complex, nonlinear, and under-actuated dynamics. I am one of the two primary developers of TrajectoryOptimization.jl.

Tue, 23 Jul 2019 15:10|Elm A

Formatting Julia

Dominique Luna

Ever wish your code automatically beautiful? Tired of spacing out commas, wrangling parenthesis and indenting? Julia's formatter can do all this and more! Come find out how to use it your everyday workflow.

Dominique is a software engineer currently travelling and working on open source projects. Prior to that he worked developed educational content and simulators for Udacity's Self Driving Car and Autonomous Flight programs. He enjoys, in so specific order - cold showers, drinking coffee, doing handstands and petting animals.

Tue, 23 Jul 2019 15:20|Room 349

TSML (Time Series Machine Learning)

Paulito Palmes

TSML is a package for time series data processing, classification, and prediction. It provides common API for ML libraries from Python's ScikitLearn, R's caret, and native Julia MLs for seamless integration of heterogenous libraries to create complex ensembles for robust time-series prediction, clustering, and classification.

I am a research scientist at the IBM Dublin Research Lab working in the areas of analytics, datamining, optimization, development of intelligent agents using machine learning and evolutionary computation, neuroinformatics, and biomedical engineering.

Tue, 23 Jul 2019 15:20|Elm B

Non-Gaussian State-estimation with JuliaRobotics/Caesar.jl

Sam Claassens

Dehann Fourie

Navigation and mapping for robots require data fusion from various sensors, each producing uncertain and opportunistic measurement data.

We are continuing with a multi-year, native Julia factor graph based simultaneous localization and mapping (SLAM) inference system that grew out of research work on non-Gaussian state-estimation, and is the primary implementation of the "multimodal-iSAM" algorithm from robotics literature.

I am a software/electronic engineer with 10+ years experience developing software for control systems, robotics, and data analysis. I have a Master's in real-time control systems with specialization in UAV automation. I am contributing to Julia Robotics, focusing on a cloud framework for robot navigation.

I'm interested in navigation for robotics and state-estimation in general, and have worked a wide variety of robotic platforms before/during/after thesis research (2009-2010 & 2012-2017) from both the University of Johannesburg and MIT / Woods Hole Oceanographic Institute joint Program. I'm currently continuing research with the MIT Computer Science and Artificial Intelligence Laboratory, and a supporter of more open-source development for progress in both scientific and business development.

Tue, 23 Jul 2019 15:30|Other

Short break

A short break between sessions

Tue, 23 Jul 2019 15:45|Room 349

Porting a massively parallel Multi-GPU application to Julia: a 3-D nonlinear multi-physics flow solver

Ludovic Räss

We showcase the port to Julia of a massively parallel Multi-GPU solver for spontaneous nonlinear multi-physics flow localization in 3-D. Our contribution is a real-world example of Julia solving “the two language problem”.

Postdoctoral researcher at Standford University

Tue, 23 Jul 2019 15:45|Elm B

Solving Delay Differential Equations with Julia

David Widmann

Delay differential equations (DDEs) are used to model dynamics with inherent time delays in different scientific areas; however, solving them numerically in an efficient way is hard. This talk demonstrates how the DifferentialEquations ecosystem allows to solve even complicated DDEs with a variety of different numerical algorithms.

I’m a PhD student at the IT department and the Center for Interdisciplinary Mathematics (CIM) at Uppsala University, Sweden. For my master thesis at TU Munich, Germany, I studied a delay differential equation model from biology and, since Julia is my preferred scientific programming language, I started to contribute to the development of [DelayDiffEq.jl](https://github.com/JuliaDiffEq/DelayDiffEq.jl). My research interests are uncertainty quantification in machine learning and differential equations.

Tue, 23 Jul 2019 15:45|BOF

Julia and NumFocus, a discussion of how money works

Viral B. Shah

Discussion on how Julia as a community handles money, sponsorship and grants.

Tue, 23 Jul 2019 15:45|Elm A

Cleaning messy data with Julia and Gen

Alex Lew

Julia is home to a growing ecosystem of probabilistic programming languages—but how can we put them to use for practical, everyday tasks? In this talk, we’ll discuss our ongoing effort to automate common-sense data cleaning by building a declarative modeling language for messy datasets on top of [Gen](https://github.com/probcomp/Gen).

Alex is a first-year PhD student at MIT’s [Probabilistic Computing Project](http://probcomp.csail.mit.edu). He’s interested in building tools that automate the tedious calculations associated with approximate Bayesian inference, and making probabilistic inference algorithms accessible to software engineers solving practical, everyday problems.

Tue, 23 Jul 2019 16:15|Room 349

XLA.jl: Julia on TPUs

Elliot Saba

The intersection of Machine Learning and High Performance Computing: Running Julia code on Google Cloud Tensor Processing Units.

Elliot Saba is a Senior Research Engineer at Julia Computing, where he develops new tools to bolster the Julia community’s collective productivity. From machine learning algorithms to web services, build environments to debugging tools, his greatest weapon against the impossible is patience.

Tue, 23 Jul 2019 16:15|Elm B

Open Source Power System Production Cost Modeling in Julia

Dheepak

Operating a power system on a day to day basis involves optimizing the operation of the given energy system. Modeling these operations requires solving a Mixed Integer Linear Programming problem. In this talk, we will present methods for solving a production cost model in Julia and JuMP using PowerSimulations.jl

I am an energy researcher and analyst at the National Renewable Energy Laboratory. My interests are power system operation, optimization, high-performance computing, and programming language theory.

Tue, 23 Jul 2019 16:15|Elm A

LightQuery.jl

Brandon Taylor

Introducting LightQuery.jl, a new querying package which combines performance with flexibility.

PhD student in heterodox economics at UMass Amherst, hobbyist programmer.

Tue, 23 Jul 2019 16:45|Room 349

Targeting Accelerators with MLIR.jl

James Bradbury

MLIR is a flexible compiler infrastructure with an open ecosystem of dialects, built for a world of increasingly heterogeneous hardware. With its support for metaprogramming and extensible JIT compiler, Julia is well-positioned as a frontend language for the MLIR stack.

James Bradbury is a research software engineer on the Google Brain team, where he works on software and languages for machine learning.

Tue, 23 Jul 2019 16:45|Elm B

Model-Enhanced Machine Learning for Accelerated Scientific Computing

Chris Rackauckas

Modeling practice seems to be partitioned into scientific models defined by mechanistic differential equations and machine learning models defined by parameterizations of neural networks. While the ability for interpretable mechanistic models to extrapolate from little information is seemingly at odds with the big data “model-free” approach of neural networks, the next step in scientific progress is to utilize these methodologies together in order to emphasize their strengths while mitigating weaknesses. In this talk we will describe four separate ways that we are merging differential equations and deep learning through the power of the DifferentialEquations.jl and Flux.jl libraries. Data-driven hypothesis generation of model structure, automated real-time control of dynamical systems, accelerated of PDE solving, and memory-efficient deep learning workflows will all shown to be derived from this common computational structure of differential equations mixed with neural networks. The audience will leave with a new appreciation of how these two disciplines can benefit from one another, and how neural networks can be used for more than just data analysis.

Scientists build large computational models via differential equations. It’s easy to take that model and ask: if my drone is currently in this state, how should I adjust the propulsion to fix the flight? Here we demonstrate a method that is able to give those kinds of answers in real-time, using the connections between differential equations and machine learning that have developed in the Julia ecosystem.

Chris' research and software combines AI with differential equation models of human organs to give patients accurate and personalized drug doses: reducing pain and complications for patients while reducing treatment costs for hospitals.

Biography

Tue, 23 Jul 2019 16:45|Elm A

State of the Data: JuliaData

Jacob Quinn

With the release of Julia 1.0, packages have raced to update and stabilize APIs. Come learn about all things current and planned for JuliaData packages, including:

- DataFrames.jl
- CSV.jl
- Tables.jl
- CategoricalArrays.jl
- and others

Long-time Julia fanatic; munger of data. Working on fun, automatic insight detection of data at Domo.

Tue, 23 Jul 2019 16:55|Room 349

SIMD and cache-aware sorting with ChipSort.jl

Nicolau Leal Werneck

ChipSort.jl is a sorting package that exploits instruction-level parallelism and cache memory seeking the best performance in any system.

Electrical Engineer specialized in Computer Vision and Pattern Recognition

Tue, 23 Jul 2019 16:55|Elm A

Prototyping Visualizations for the Web with Vega and Julia

Mary McGrath

The internet is a powerful medium for story telling in data science, but creating compelling, interactive graphics can be difficult. This talk will show how Vega (VegaLite.jl) and Julia can be used to prototype interactive visualizations, and then how those visualizations can be deployed to the web.

Mary is a data scientist with Brown’s Center for Computation and Visualization and the Brown Center for Biomedical Informatics. Her background is in health analytics and biomedical engineering.

Tue, 23 Jul 2019 17:05|Room 349

Generic Sparse Data Structures on GPUs

Sungwoo Jeong
Ranjan Anantharaman
Sparse linear operators that arise from structured grids often tend to have rich structure. We present a feature rich yet simple DIAgonal format (DIA), which also supports blocked and GPU arrays, as well as Algebraic Multigrid (AMG) preconditioners. We present this rich framework of tools to solve large oil reservoir simulations.

Doctoral student in Department of Mathematics at MIT.

PhD Student at MIT

Tue, 23 Jul 2019 17:05|Elm A

A Showcase for Makie

Simon Danisch
Makie is a new plotting library written a 100% in Julia.

It offers a GPU accelerated drawing backend that can draw huge amounts of data at interactive speeds.

Other backends for SVG, PDF and the Web are available as well, so Makie can be used in a many different scenarios.

This talk will give an overview of how Makie works and will present the most outstanding plotting examples from the areas of Interactivity, Data Science, Geology and Simulations.

I've been passionate about graphics, machine learning, scientific computing and computer graphics from an early age!

After graduating from Cognitive Science, I was able to follow that passion by directly working for the Julia MIT team! As part of my work, I've created [Makie.jl](https://github.com/JuliaPlots/Makie.jl/), [GPUArrays.jl](https://github.com/JuliaGPU/GPUArrays.jl), [PackageCompiler](https://github.com/JuliaLang/PackageCompiler.jl) and many other packages in the area of graphics, file-io and gpu acceleration.

Nowadays, I work for [Nextjournal](http://nextjournal.com/), where I'm in charge of the Julia integration, outreach and interactive plotting.

Tue, 23 Jul 2019 17:15|Room 349

Array Data Distribution with ArrayChannels.jl

Rohan McLure
We introduce the ArrayChannels.jl library, which allows communication between distributed nodes to occur between fixed buffers in memory. We explore the effects of in-place serialisation on cache usage and communication performance, and consider its suitability for high performance scientific computing.

My name is Rohan, and I am an undergraduate at the Australian National University in Canberra, ACT, studying two degrees in Mathematics and Computer Science. I am part of the undergraduate research stream, where at three occaisions of my degree I undertake individual, semester-long research projects, followed by a final year-long 'Honours' project.

The first time I really applied my programming knowledge was in the context of physical simulation. With an interest in Applied Mathematics, the procedure and evolution of computational models for natural phenomena greatly interests me. The requirement for parallelism introduces a challenging but fascinating new field of problems to the research community, and I remain optimistic that Julia will be readily adopted for this task.

Aside from study, I enjoy playing music, soccer, and helping lead a youth group at my church.

Tue, 23 Jul 2019 17:15|Elm B

HydroPowerModels.jl: A Julia/JuMP Package for Hydrothermal economic dispatch Optimization

Andrew Rosemberg
[HydroPowerModels.jl](https://github.com/andrewrosemberg/HydroPowerModels.jl) is a Julia/JuMP package for Hydrothermal Multistage Steady-State Power Network Optimization solved by Stochastic Dual Dynamic Programming (SDDP).

The objective of this work is to build an open source tool for hydro-thermal dispatch that is flexible enough for the electrical sector to test new ideas in an agile and high-level way, but at the same time using the state-of-the-art implementations of both the SDDP and the dispatch model formulations. For this, we will take advantage of the julia language and the packages, also open-source, which implement the power flow of the electrical dispatch and the Stochastic Dual Dynamic Programming (SDDP), called respectively [PowerModels.jl](https://github.com/lanl-ansi/PowerModels.jl) and [SDDP.jl](https://github.com/odow/SDDP.jl).

Degree in Control Engineering at Pontifical Catholic University of Rio de Janeiro (PUC-RIO), Brazil.

Double Degree General Engineering at École centrale de Marseille, France.

Currently enrolled in the Operations Research Masters at PUC-RIO (Electrical Department).

Researcher at Laboratory of Applied Mathematical Programming and Statistics (LAMPS), Brazil.

Tue, 23 Jul 2019 17:25|Room 349

High-Performance Portfolio Risk Aggregation

Tom Kwong
We will talk about how a risk management use case got sped up ~150x using multi-core parallel computing techniques in a Docker environment.

Tom Kwong (github: tk3369) specializes in the financial services domain and currently works at Western Asset Management Company as a Software Engineering Manager

Tue, 23 Jul 2019 17:25|Elm B

Modeling in Julia at Exascale for Power Grids

Michel Schanen
The ExaSGD (Optimizing Stochastic Grid Dynamics at Exascale) application is part of the Department of Energy's Exascale project (ECP). The dawn of renewable energies poses a great challenge to long-term planning with higher uncertainties, not only in the grid load, but also in the energy generation. The goal of this project is to provide policy planners and grid operators with cost effective long term planning solutions that are protected against uncertainties in the grid operation. This talk gives an overview of our implementation and where we leverage Julia's unique capabilities to make efficient use of the upcoming exascale hardware, while giving engineers a flexible modeling language.

> Michel Schanen is an assistant computational engineer at the mathematics and computer science division (MCS) at the Argonne National Laboratory. He received his PhD in adjoints by automatic differentiation of the message passing interface. At a postdoctoral researcher he worked on large-scale adjoint checkpointing on the supercomputers at Argonne. He now works on large-scale mathematical optimization frameworks with applications in power systems.

Tue, 23 Jul 2019 19:00|Other

Conference Dinner and Inner Habour Cruise

JuliaCon Committee
Details TBA.

Wed, 24 Jul 2019 07:30|Other

Breakfast

Breakfast will be held in the SMC 2nd Floor Lobby

Wednesday 24

Wed, 24 Jul 2019 08:40|NS Room 130

Keynote: Professor Steven G Johnson

Professor Steven G Johnson
Steven G. Johnson is a Professor of Applied Mathematics and Physics at MIT, where he joined the faculty in 2004 and previously received a PhD in physics (2001) and BS degrees in physics, mathematics, and computer science (1995). He has a long history of contributions to scientific computation and software, including the [FFTW](http://www.fftw.org) fast Fourier transform library (for which he co-received the 1999 J. H. Wilkinson Prize) and many other software packages.

He has been using, contributing to, and teaching with Julia since 2012. He created and maintains blockbuster Julia packages that you may have heard of: [PyCall](https://github.com/JuliaPy/PyCall.jl) and [IJulia](https://github.com/JuliaLang/IJulia.jl) (and Julia's [FFTW bindings](https://github.com/JuliaMath/FFTW.jl), of course).

Professor Johnson's professional research concerns wave-matter interactions and electromagnetism in media structured on the wavelength scale ("nanophotonics"), especially in the infrared and optical regimes. He works on many aspects of the theory, design, and computational modeling of nanophotonic devices, both classical and quantum.

He is also a coauthor on over 200 papers and over 30 patents in this area, including the textbook *Photonic Crystals: Molding the Flow of Light*.

Wed, 24 Jul 2019 09:30|NS Room 130

Sponsor Address: J P Morgan Chase & Co.

Jiahao Chen
An address from our sponsor.

Wed, 24 Jul 2019 09:45|NS Room 130

Sponsor Address: Julia Computing

Stefan Karpinski
An address from one of our sponsors.

> Stefan is one of the co-creators of Julia and a co-founder of Julia Computing. Before Julia, he was a software engineer and data scientist at [Akamai](https://www.akamai.com), [Citrix Online](https://www.gotomeeting.com), and [Etsy](https://etsy.com). In addition to running Julia Computing, he holds a part-time appointment as a Research Engineer at New York University as part of the Moore-Sloan Data Science Environment.

Wed, 24 Jul 2019 09:50|NS Room 130

Using Julia in Secure Environments

Seth Bromberger

As a product of the academic community, Julia has been developed with certain assumptions relating to source code availability and access. In secure environments, however, access to public (and even private) package repositories can be deliberately limited. It is still possible to use Julia in these environments: this talk will provide an overview of the challenges in deploying Julia in secure/controlled environments and discuss lessons learned from a real-world deployment on a secure system.

Seth Bromberger has been involved in network and systems security for over twenty years. His work history spans multiple industries and sectors including government, finance, and energy.

At Lawrence Livermore National Laboratory, Seth is exploring practical methods to improve the security of next-generation critical infrastructure. Previously, he was Principal at NCI Security, a consulting firm dedicated to the protection of domestic and international critical infrastructure, and was the Executive Vice President of Classified and Government Programs at Energy Sector Security Consortium, a registered 501(c)(3) non-profit organization he co-founded in 2008.

Seth's research interests include critical infrastructure protection, industrial control system and network security, and the security of emerging energy technologies such as Advanced Metering Infrastructure and Smart Grid systems. He is an active participant in several industry working groups and has been recognized in multiple sectors as a security thought leader and leading security practitioner.

Seth's work on large scale data analysis and multi-source correlation techniques resulted in his being the listed inventor on patent application 13/339,509, "System And Method For Monitoring a Utility Meter Network", which describes the TopSight system he developed to detect anomalous behavior in a multi-million node Smart Meter network while at Pacific Gas and Electric Company. He is also co-developer of the system described in patent application PCT/ US2013/026504, "Method and System for Packet Acquisition, Analysis and Intrusion Detection in Field Area Networks" which is being used by utilities to analyze the complex interactions among devices participating in large-scale mesh networks. Most recently, Seth conceived and developed the NetCanary system which is designed to detect reconnaissance attempts against critical infrastructure and other systems.

Seth received his B.A. in International Relations from the College of William and Mary and an M.S. in Computer Engineering from the University of Pennsylvania.

A list of presentations and publications may be found on [Seth's personal site](https://www.bromberger.com).

Wed, 24 Jul 2019 10:10|Other

Poster Session

The poster session will be held in room 349

Wed, 24 Jul 2019 11:00|Room 349

Yao.jl: Extensible, Efficient Quantum Algorithm Design for Humans.

Roger Luo

Quantum computation is the future of computing. However, writing quantum program can be hard for developers living in a classical world. We developed Yao.jl to help scientists test and explore their quantum ideas in a simple way.

First year grad student from University of Waterloo. Core member of JuliaCN, the Julia localization org in China.

Core member of QuantumBFS, an open source organization for developing software for quantum physics.

Wed, 24 Jul 2019 11:00|Elm B

Probabilistic Biostatistics: Adventures with Julia from Code to Clinic

Jeff Mills

Physician scientists conducting clinical trials are typically not statisticians or computer scientists. Perhaps, in a perfect world, they would be, or more realistically could have statisticians and computer scientists on their research team, but that is often not the case. This leads to what we refer to as the "two-field problem." Physician-researchers require sophisticated and powerful statistical tools to address complex inferential problems, yet these tools must be intuitive and user-friendly enough not to require advanced statistical knowledge and programming skills. Using Julia, we illustrate the application of Bayesian probabilistic biostatistics to meta-analyses of treatment effects and clinical trials. This combination of Julia and Bayesian methods provides a solution to the "two-field problem."

Associate Professor

Lindner College of Business

University of Cincinnati

Research interests: Bayesian inference, statistical hypothesis testing, meta-analyses, Bayesian adaptive randomized controlled trials, time series analysis.

Wed, 24 Jul 2019 11:00|BOF

Sustainable Development and Open Source Monetization

Clark Evans

As the Julia community grows and becomes core tooling to many scientists and businesses, sustainably keeping members of the community as developers of free software developers is vital to the health of the ecosystem. In this discussion we will talk about the various ways we ourselves are funding or have been funded for Julia-based open source software development, and hypothesize alternative methods such as crowdfunding.

Wed, 24 Jul 2019 11:00|Elm A

Why writing C interfaces in Julia is so easy*

Dheepak

Julia allows interfacing with shared libraries using `ccall`. This allows calling into compiled binaries that could be written in any language that exposes the C ABI. In this talk, I'll describe best practices to follow for

interfacing with C libraries.

I am an energy researcher and analyst at the National Renewable Energy Laboratory. My interests are power system operation, optimization, high-performance computing, and programming language theory.

Wed, 24 Jul 2019 11:30|Room 349

Guaranteed constrained and unconstrained global optimisation in Julia

David P. Sanders

Set computations with interval arithmetic allow us to write surprisingly efficient software for guaranteed unconstrained and constrained global optimisation in pure Julia.

Professor at the National University of Mexico.

Has been using Julia since early 2014.

Main co-author of the JuliaIntervals suite of packages.

Has given Julia tutorials all over the world, some of which are available on YouTube and have over 100,000 views.

Wed, 24 Jul 2019 11:30|Elm B

Slow images, fast numbers: Using Julia in biomedical imaging and beyond

Virginia Spanoudaki

At MIT's preclinical setting (Preclinical Modeling, Imaging and Testing, PMIT), the available shared biomedical imaging instrumentation, such as magnetic resonance imaging (MRI) or x-ray micro-computed tomography (microCT) scanners, produces diverse and large data sets on a daily basis. The acquisition of an image can be fast or slow depending on the acquisition protocols and whether we are interested in a 2D slice, a 3D volume or a 4D dataset over time. The time from acquisition to visualization of the image heavily depends on the size of the dataset, the image reconstruction algorithm and the computing power available. Although image acquisition and visualization are typically tied to the manufacturer of each specific platform, image quantification is more user dependent and can suffer a significant computational burden when performing non-linear mathematical operations on a pixel-by-pixel basis over millions of high-resolution images. The quantification of an image, namely the extraction of precise numerical information from the image that is representative of a biological process tied to disease and therapy, can take days to derive for users that choose high-level, easy-to-use numerical analysis software. We will present a case study of vast improvements in quantitative image processing of large preclinical MRI datasets using Julia libraries and expand on PMIT's efforts to develop a Julia-based platform for intelligent preclinical evaluation of therapeutics from their development at bench to their visualization in a living subject.

Wed, 24 Jul 2019 11:30|Elm A

Backticks and the Glorious Command Literal

Aaron Christianson

Julia command literals are one of the most compelling abstractions for dealing with processes in any programming language. This talk will show what these command literals offer that similar constructs in other languages do not and how they can be used to write safer, more robust shell scripts.

Aaron was born in rural Wisconsin, but has also lived in Copenhagen, Brussels, Jerusalem and currently resides in Frankfurt, doing Hebrew-related string mangling for the Goethe University library, despite his degrees in Bible and Theology. He likes small, beautiful programs and programming languages and dislikes unnecessary complexity. He also likes fancy keyboards.

Wed, 24 Jul 2019 11:40|Room 349

Pyodide: The scientific Python stack compiled to WebAssembly

Michael Droettboom

Pyodide is a project from Mozilla to build a performant scientific Python stack running entirely in the web browser using WebAssembly.

Michael Droettboom is a Staff Data Engineer at Mozilla, where he builds tools to support lean and ethical data science. He is a former lead developer of matplotlib and airspeed velocity.

Wed, 24 Jul 2019 11:40|Elm B

Brain Tumour Classification with Julia

Amita Varma

I will be talking about my work on brain tumour classification using gene expression data, and how Julia as a tool aided this process.

I am a to-be graduate student, and am interested in the field of health data science.

Wed, 24 Jul 2019 11:40|Elm A

Re-designing Optim

Patrick Kofod Mogensen

With Julia v1.0 released, It is time to reflect on what a Julian Julia package is, and why some popular packages such as Optim is not necessarily as Julian as they can be! Based on requests from the community and own experiences, I explain some guiding principles on a complete re-write of the packages in the JuliaNLSolvers organization.

Patrick Kofod Mogensen, or pkofod, has used Julia since v0.2, and contributed to various packages as well as JuliaLang itself. He is a PhD student in Economics at University of Copenhagen.

Wed, 24 Jul 2019 11:50|Room 349

Julia for Battery Model Parameter Estimation

Venkat Viswanathan
Shashank Sripad
William L Fredericks
Matthew Guttenberg

High-fidelity battery modeling requires the estimation of numerous physical parameters in order to properly capture the physics of the electrochemical, thermodynamic and chemical processes that underlie the system. Using Julia, the parameters for this model were able to be estimated by speeding up the code such that a Markov Chain Monte Carlo approach (Hamiltonian Monte Carlo) could be used, combined with a high-performance computing cluster, to sample the vast search domain and reach the global error minima.

I am a researcher in the Viswanathan group at Carnegie Mellon University.

Matt is a second year Ph.D. student under Venkat Viswanathan studying the dynamics of batteries as they relate to systems. He has been involved with numerous projects including how platooning, convoying of trucks, affects the energy requirements of electric semi-trucks, creating a charger placement algorithm called INCEPTS that hinges on the coupling of battery dynamics and vehicle dynamics as well as the locality of the simulation including weather, traffic flow, etc. Matt got his undergraduate degrees in Mechanical Engineering and Energy Engineering from the University of California at Berkeley and has had numerous internships in industry with companies such as SunPower.

Wed, 24 Jul 2019 11:50|Elm B

Mining Imbalanced Big Data with Julia

Swakkhar Shatabda
Dewan Md. Farid

Machine learning for data Mining applications in imbalanced big data classification is very challenging task. In this talk, we have proposed a new cluster-based under-sampling approach with ensemble learning for mining real-life imbalanced big data in Julia.

Dr. Shatabda is Associate Professor and Undergraduate Program Co-ordinator of Computer Science and Engineering Department.

He achieved his Ph. D degree from the Institute for Integrated and Intelligent Systems (IIIS), Griffith University in 2014. His thesis is titled "Local Search Heuristics for Protein Structure Prediction". He completed his BSc. in Computer Science and Engineering from Bangladesh University of Engineering and Technology (BUET) in 2007.

Research interest of Dr. Shatabda includes bioinformatics, optimization, search and meta-heuristics, data Mining, constraint programming, approximation Algorithms and graph theory. He has a number of quality publications in both national and international conferences and journals.

He has worked as Graduate Researcher in Queensland Research Laboratory, NICTA, Australia. Prior entering the teaching line he worked as a Software Engineer in Vonair Inc, Bangladesh.

Dr. Dewan Md. Farid is an Associate Professor, Department of Computer Science and Engineering, United International University, Bangladesh. He worked as a Postdoctoral Fellow at the following research groups: (1) Computational Modeling Lab (CoMo), Department of Computer Science, Vrije Universiteit Brussel, Belgium in 2015-2016, and (2) Computational Intelligence Group (CIG), Department of Computer Science and Digital Technology, University of Northumbria at Newcastle, UK in 2013. Dr. Farid was a Visiting Faculty at the Faculty of Engineering, University of Porto, Portugal in June 2016. He holds a PhD in Computer Science and Engineering from Jahangirnagar University, Bangladesh in 2012. Part of his PhD research has been done at ERIC Laboratory, University Lumière Lyon 2, France by Erasmus-Mundus ECW eLink PhD Exchange Program. He has published 73 peer-reviewed scientific articles, including 26 journal papers in the field of machine learning and data mining. Dr.

Farid received United Group Research Award 2016 in the field of Science and Engineering. He received following Erasmus Mundus scholarships: (1) LEADERS (Leading mobility between Europe and Asia in Developing Engineering Education and Research) in 2015, (2) cLink (Centre of excellence for Learning, Innovation, Networking and Knowledge) in 2013, and (3) eLink (east west Link for Innovation, Networking and Knowledge exchange) in 2009. Dr. Farid also received Senior Fellowship I, and II award by National Science & Information and Communication Technology (NSICT), Ministry of Science & Information and Communication Technology, Government of Bangladesh respectively in 2008 and 2011. He is a member of IEEE.

Wed, 24 Jul 2019 11:50|Elm A

Towards Faster Sorting and Group-by operations

Dai ZJ

Julia is increasingly being recognized as one of the big three data science programming languages alongside R and Python. However, Julia's data ecosystem has had less time to mature when compared to R's or Python's. Hence it's not surprising that some data operations in Julia are slower than their counterparts in R and Python, e.g. group-by.

This talk discusses how under-utilized fast sorting methods, such radix sorts, can be used to speed up group-by operations in Julia so that Julia's group-by operations can match (or even surpass) the speed of optimized C-based group-by implementations in R and Python.

ZJ has more than 10 years of experience in Credit Risk modelling/data science/machine learning in Australia and Singapore.

Wed, 24 Jul 2019 12:00|Other

Lunch

Lunch will be held in the SMC 2nd Floor Lobby

Wed, 24 Jul 2019 13:30|NS Room 130

Keynote: Arch D. Robison

Arch D. Robison

Arch D. Robison is a Principal Systems Software Engineer at NVIDIA, where he works on [TensorRT](https://developer.nvidia.com/tensorrt), NVIDIA's platform for high-performance deep-learning inference. He was the lead developer for KAI C++, the original architect of Intel Threading Building Blocks, and one of the authors of the book *Structured Parallel Programming: Patterns for Efficient Computation*. Arch contributed type-based alias analysis and vectorization support to Julia, including the original implementation of [SIMD in Julia 0.3](https://software.intel.com/en-us/articles/vectorization-in-julia). He's used Julia to generate [x86 assembly language](https://software.intel.com/en-us/articles/vectorization-in-julia) for a Go implementation of his video game *Frequon Invaders*. He also took 2nd place in AI Zimmermann's contest "Delacorte Numbers" [using Julia exclusively](https://software.intel.com/en-us/articles/computing-delacorte-numbers-with-julia). He has 21 patents and an Erdős number of 3.

Wed, 24 Jul 2019 14:30|Room 349

Heterogeneous Agent Dynamic Stochastic General Equilibrium (DSGE) Models in Julia at the Federal Reserve Bank of New York

Rebecca Sarfati

This talk will provide an overview of the Federal Reserve Bank of New York's heterogeneous agent dynamic stochastic general equilibrium (DSGE) model development process in Julia, walking through our navigation of Julia-specific functionality in the process. Comparisons of performance relative to MATLAB and FORTRAN will be provided.

> Rebecca is a Senior Research Analyst at the Federal Reserve Bank of New York, employing dynamic stochastic general equilibrium (DSGE) models for macroeconomic forecasting and policy analysis. She holds a dual degree in mathematics and computer science from Brown University.

Wed, 24 Jul 2019 14:30|Elm B

DataKnots.jl - an extensible, practical and coherent algebra of query combinators

Clark C. Evans

DataKnots is a Julia library for querying data with an extensible, practical and coherent algebra of query combinators. DataKnots is designed to let data analysts and other accidental programmers query and analyze complex structured data.

> Clark is a co-creator of YAML and has worked in the field of medical informatics for a dozen years working on query languages such as HTSQL.py and DataKnots.jl

Wed, 24 Jul 2019 14:30|BOF

Diversity and Inclusion in Julia Community

Kelly Shen

We'll have a birds of a feather session to discuss and brainstorm diversity and inclusion in the Julia community. All are welcome!

> Kelly Shen is a data engineer at Etsy, where she works on improving the e-commerce company's in-house A/B testing platform. She has been using Julia since her undergraduate days at MIT. In her free time, Kelly enjoys reading, painting and listening to music.

Wed, 24 Jul 2019 14:30|Elm A

SemanticModels.jl: not just another modeling framework

Christine R Herlihy
James Fairbanks

SemanticModels.jl is a library for analyzing scientific and mathematical models written in julia. We apply techniques from program analysis to understand and manipulate scientific modeling code. This allows you to

write programs that write novel models.

> James has been developing graph theory and numerical software in julia since v0.2. He works in the JuliaGraphs ecosystem and is a research engineer at the Georgia Tech Research Institute, where he leads projects in both fundamental and applied research in computational science and engineering.

Wed, 24 Jul 2019 15:00|Room 349

"Online" Estimation of Macroeconomic Models

Ethan Matlin

Medium-large Dynamic Stochastic General Equilibrium models such as those used for forecasting and policy analysis by central banks take a substantial amount of time to estimate using standard approaches such as Random Walk Metropolis Hastings. Our new Sequential Monte Carlo sampler in DSGE.jl makes it possible to estimate DSGE models in parallel, reducing computational time, and "online," that is efficiently including new data in the estimation as they become available.

> I'm a Senior Research Analyst at the Federal Reserve Bank of New York using Julia to estimate and forecast macroeconomic models. I'm interested in applying advances in efficient scientific computing to answer questions about the economy and improve societal well-being.

Wed, 24 Jul 2019 15:00|Elm B

Queryverse - Under the Hood

David Anthoff

This talk will give a brief overview of the [Queryverse](https://www.queryverse.org/) functionality and some new features that were added over the last year, and then dive deep into the internal design of [Query.jl](https://github.com/queryverse/Query.jl), [TableTraits.jl](https://github.com/queryverse/TableTraits.jl) and many other packages from the [Queryverse](https://www.queryverse.org/).

> David Anthoff is an environmental economist who studies climate change and environmental policy. He co-develops the integrated assessment model FUND that is used widely in academic research and in policy analysis. His research has appeared in Science, the Journal of Environmental Economics and Management, Environmental and Resource Economics, the Oxford Review of Economic Policy and other academic journals. He contributed a background research paper to the Stern Review and has advised numerous organizations (including US EPA and the Canadian National Round Table on the Environment and the Economy) on the economics of climate change.
>
> He is an assistant professor in the Energy and Resources Group at the University of California, Berkeley. Previously he was an assistant professor in the School of Natural Resources and the Environment of the University of Michigan, a postdoc at the University of California, Berkeley and a postdoc at the Economic and Social Research Institute in Ireland. He also was a visiting research fellow at the Smith School of Enterprise and the Environment, University of Oxford.
>
> He holds a PhD (Dr. rer. pol.) in economics from the University of Hamburg (Germany) and the International Max Planck Research School on Earth System Modelling, a MSc in Environmental Change and Management from the University of Oxford (UK) and a M.Phil. in philosophy, logic and philosophy of science from Ludwig-Maximilians-Universität München (Munich, Germany).

Wed, 24 Jul 2019 15:00|Elm A

OmniSci.jl: Bringing the open-source, GPU-accelerated relational database to Julia

Randy Zwitch

OmniSci (formerly MapD) is an open-source relational database built from the ground-up to run on GPUs, providing millisecond query speed on multi-billion row datasets. This talk presents OmniSci.jl, the database client for OmniSci written completely in Julia and a basic demonstration of using OmniSci and Julia together, with the aim of encouraging community collaboration on GPU accelerated analytics.

Randy Zwitch is Senior Director of Developer Advocacy at OmniSci and a long-time Julia user (somewhere between 0.2 and 0.3 of julia). Randy is a committed open-source developer and maintainer, contributing to packages in the Julia, Python and R communities, mostly around data visualization, data engineering and database technologies.

Wed, 24 Jul 2019 15:30|Other

Short break

A short break between sessions

Wed, 24 Jul 2019 15:45|Room 349

Differentiate All The Things!

Mike Innes

Explore Flux's brand-new compiler integration, and how this lets us turn anything in the Julia ecosystem into a machine learning model.

I work at Julia Computing on all kinds of Julia things – mainly on turning Julia into a language for differentiable programming, via the Flux machine learning stack.

Wed, 24 Jul 2019 15:45|Elm B

Raising Diversity & Inclusion among Julia users

Elwin van 't Wout

Kevin S Bonham

This session aims at discussing/showcasing our experience promoting diversity and inclusion in the US, Brazil, Chile and online, with the help of the Julia Computing Diversity & Inclusion Award, funded by the Sloan Foundation.

Kevin received a BS in Biochemistry and Cell Biology from the University of California, San Diego, and a PhD in Immunology from Harvard University. He is currently a Research Scientist at Wellesley College, a women's college in Eastern Massachusetts, where he studies the relationship between the gut microbiome and childhood cognitive development, and is the author of the `Microbiome.jl` and `GenderInference.jl` packages. He was awarded a grant from the Sloan Foundation through Julia Computing to develop course materials for Biology majors at Wellesley to learn to program in julia.

Wed, 24 Jul 2019 15:45|Elm A

Polynomial and Moment Optimization in Julia and JuMP

Benoît Legat

Juan Pablo Vielma

Tillmann Weisser

Chris Coey

Lea Kapelevich

Polynomial and moment optimization problems are infinite dimensional optimization problems that can model a wide range of problems in engineering and statistics. In this minisymposium we show how the Julia and JuMP ecosystems are particularly well suited for the effortless construction of these problems and the development of state-of-the-art solvers for them.

Juan Pablo Vielma is an associate professor at MIT's Sloan School of Management and is also associated to MIT's Operations Research Center. Juan Pablo's research interests include the development of theory and technology for mathematical optimization and their application to problems in marketing, statistics and sustainable management of energy and natural resources. Juan Pablo is the Ph.D. advisor of two of the creators of JuMP and continues to be closely involved in JuMP's development. Some projects he is currently associated with are the Pajarito, Hypatia and Aspasia Solver, JuMP's extension for piecewise linear optimization and the Cassette and Capstan tools.

Doctoral student at MIT Operations Research Center, advised by Juan Pablo Vielma

PhD student at the Operations Research Center at MIT.

Wed, 24 Jul 2019 16:15|Room 349

Differentiable Rendering and its Applications in Deep Learning

Avik Pal

RayTracer.jl is a package designed for differentiable rendering. In this talk, I shall discuss the inverse graphics problem and how differentiable rendering can help solve it. Apart from this we will see how differentiable rendering can be used in differentiable programming pipelines along with neural networks to solve classical deep learning problems.

Sophomore Undergraduate Student majoring in Computer Science and Technology at Indian Institute of Technology Kanpur.

Wed, 24 Jul 2019 16:25|Room 349

Neural Ordinary Differential Equations with DiffEqFlux

Jesse Bettencourt

This talk will demonstrate the models described in [Neural Ordinary Differential Equations](https://arxiv.org/pdf/1806.07366.pdf) implemented in DiffEqFlux.jl, using DifferentialEquations.jl to solve ODEs with dynamics specified and trained with Flux.jl.

Jesse Bettencourt is a graduate student in the Machine Learning group at the University of Toronto and the Vector Institute. He is supervised by David Duvenaud and Roger Grosse and teaches the senior undergraduate/graduate course on probabilistic models and machine learning.

Wed, 24 Jul 2019 16:35|Room 349

Fitting Neural Ordinary Differential Equations with DiffeqFlux.jl

Elisabeth Roesch

Neural Ordinary Differential Equations (neural ODEs) are a brand new and exciting method to model nonlinear transformations as they combine the two fields of machine learning and differential equations. In this talk we discuss DiffEqFlux.jl, a package for designing and training neural ODEs, and we introduce new methodologies to improve the efficiency and robustness of neural ODEs fitting.

Elisabeth Rösch did her undergraduate studies in Munich, Germany, (B.Sc. Bioinformatics - Technical University Munich and Ludwig-Maximilans-Univerisity Munich) and postgraduate studies in London, UK, (M.Sc. Bioinformatics and Theoretical Systems Biology- Imperial College London). Currently she is doing her PhD in the Maths and Stats department of the University of Melbourne, Australia. She focuses her research on the combination of machine learning and mechanistic modelling applied to Theoretical Systems Biology.

Wed, 24 Jul 2019 17:05|Room 349

Randomized Sketching for Approximate Gradients : Applications to PDE Constrained Optimization and Backpropagation.

Ramchandran Muthukumar

Randomized sketching algorithms are a powerful tool for on-the-fly compression of matrices. In this talk we show how sketching can be used for approximate gradient and hessian-times-vector computations that are storage optimal.

This approach gives cutting-edge low memory algorithms to address the challenge of expensive storage in optimization problems with PDE constraints.

We also discuss implications for efficient adjoint computation/back-propagation.

I am currently a Research Assistant for Prof. Madeleine Udell at Cornell University. I will be a CS PhD student at Johns Hopkins from Fall 2019. I was a 2016 Google Summer of Code Fellow under NumFocus/Julia-Opt organization where I worked on pre-solve routines for LP.

I'm interested in optimization, numerical analysis and leveraging the powerful expressiveness of the Julia language in scientific research.

Wed, 24 Jul 2019 17:15|Room 349

Neural Network states and unsupervised learning for Open Quantum Systems

Filippo Vicentini

We recently investigated how Neural Networks can be used to approximate the density matrix encoding mixed quantum states, and how traditional numerical techniques in physics can be reinterpreted in terms of unsupervised learning. I will talk about how Julia allowed us to rapidly iterate in our research while also producing an efficient yet flexible package.

Filippo Vicentini is a Ph.D. Candidate in Theoretical Quantum Optics at the Laboratoire MPQ in Paris. His research revolves around the numerical simulation of critical phenomena in Driven-Dissipative Quantum Systems. More recently, he started to investigate how to use neural networks as function approximations for quantum systems.

Wed, 24 Jul 2019 17:25|Room 349

Machine Learning for Social Good

Dhairya Gandhi

Using Julia and Flux.jl, we want to show how we have applied modern neural architectures like Mask RCNN and Inception to identify diseases and slums in metropolitan cities.

Dhairya Gandhi received his Bachelors in Electrical and Electronics Engineering from Birla Institute of Technology and Science, Pilani (2018) and is currently a Data Scientist at Julia Computing. He is a regular contributor to the machine learning stack in Julia.

Thursday 25

Thu, 25 Jul 2019 07:30|Other

Breakfast

Breakfast will be held in the SMC 2nd Floor Lobby

Thu, 25 Jul 2019 08:40|NS Room 130

Keynote: Professor Heather Miller

Professor Heather Miller
Heather Miller is an Assistant Professor in the School of Computer Science at Carnegie Mellon, where she is affiliated with the Institute for Software Research. Prior to joining the faculty at CMU, Professor Miller not only worked as a research scientist at [EPFL](https://www.epfl.ch/research/), but also co-founded and served as the Executive Director for the [Scala Center](https://scala.epfl.ch/), a nonprofit focused on software development, education, and research surrounding the open source Scala programming language. She continues to work on and around Scala, while pursuing research on various flavors of distributed and concurrent computation. Some of her projects underway include programming models and type systems to facilitate the design of new, functional distributed systems.

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Thu, 25 Jul 2019 09:30|NS Room 130

What's Bad About Julia

Jeff Bezanson
I'll describe some of the more fundamental issues in Julia today, as I see it, and how we can potentially solve them to get a better language.

Jeff is one of the creators of Julia, co-founding the project at MIT in 2009 and eventually receiving a Ph.D. related to the language in 2015. He continues to work on the compiler and system internals, while also working to expand Julia's commercial reach as a co-founder of Julia Computing, Inc.

Thu, 25 Jul 2019 10:00|NS Room 130

Sponsor Address: University of Maryland

Vijay Ivaturi
An address from one of our sponsors.

Thu, 25 Jul 2019 10:10|Other

Poster Session

The poster session will be held in room 349

Thu, 25 Jul 2019 11:00|Room 349

The Unreasonable Effectiveness of Multiple Dispatch

Stefan Karpinski
If you're familiar with Julia and its ecosystem, you may have noticed something lovely but a bit puzzling: there seems to be an unusually large amount of code reuse between packages compared to other seemingly similar languages. This sharing of code comes in two forms:

1. Sharing basic types among a wide variety of packages providing disparate functionality;

2. Sharing generic algorithms that work on various implementations of common abstractions.

Why does generic code in Julia "just work"? Why do Julia packages seem to share types with so little friction? Both kinds of reuse are supposed to be natural benefits of class-based object-oriented languages. After all, inheritance and encapsulation are two of the four pillars of OOP. Even more puzzling is that Julia has no encapsulation and doesn't allow inheriting from concrete types at all. Yet both kinds of code reuse are rampant. What is going on? In this talk, I make the case that both of kinds sharing stem directly from Julia's multiple dispatch programming paradigm.

Stefan is one of the co-creators of Julia and a co-founder of Julia Computing. Before Julia, he was a software engineer and data scientist at [Akamai](https://www.akamai.com), [Citrix Online](https://www.gotomeeting.com), and [Etsy](https://etsy.com). In addition to running Julia Computing, he holds a part-time appointment as a Research Engineer at New York University as part of the Moore-Sloan Data Science Environment.

Thu, 25 Jul 2019 11:00|Elm B

Interval methods for scientific computing in Julia

David P. Sanders
We will survey the use of numerical methods built on interval arithmetic and their use for solving nonlinear equations, minimizing nonlinear functions, approximating functions, and solving ordinary differential equations.

Professor at the National University of Mexico.

Has been using Julia since early 2014.

Main co-author of the JuliaIntervals suite of packages.

Has given Julia tutorials all over the world, some of which are available on YouTube and have over 100,000 views.

Thu, 25 Jul 2019 11:00|BOF

Performant parallelism with productivity and portability.

Alan Edelman Andreas Noack Chris Hill Lucas Wilcox

This BoF will be a forum to discuss the state of the state around performant parallelism for distributed memory programming in Julia. Performance, parallelism, productivity and portability are four P's of distributed memory parallelism that over the last 30 years have proved hard to satisfy simultaneously in a general solution. The goal of this BoF is discussion and exploration of approaches for providing performant distributed memory parallelism in Julia in ways that are portable and that reflect the productivity vision of Julia. The format will consist of a series of presentations and a discussion/Q&A section. It will look both within Julia and across other languages at the last 30 years of efforts in this space. The motivation for the BoF is that meeting the four P's well remains an unsolved problem. For now projects that seek all of performance, parallelism at scale, portability and productivity typically have to make compromises in one or more of these areas. The hoped for outcome is some shared momentum and sharing of ideas for developing Julian approaches that lessen (or eliminate) the need to compromise in any of the four P's in the future.

Working on science projects at Julia Computing. Formerly post.doc. in the JuliaLab at MIT-CSAIL.

Chris Hill is a principal researcher at MIT who works on computational science applied to large-scale ocean and Earth system modeling. He has worked in this area for nearly 30 years and has contributed to several widely used open source efforts. In collaboration with many others he is helping to develop a next generation climate model in Julia and is intrigues that for now the core distributed memory parallelism abstractions for the project will be programmed directly in MPI, despite 30 years of innovation and research exploration of parallelism paradigms.

Thu, 25 Jul 2019 11:00|Elm A

Julia + JavaScript = ‹3

Shashi Gowda

Julia and JavaScript come together like peanut butter and chocolate

This talk is an overview of the JuliaGizmos ecosystem. It starts with the basics of creating a simple page, showing it in various forms, to Interact.jl and beyond. I will present work done by many people that have been aggregated in this github niche, mainly that of Mike Innes, Pietro Vertechi, Joel Mason, Travis DePrato, Sebastian Pfitzner and myself.

I'm a first year grad student at MIT. Formerly programmer at Julia Computing.

Thu, 25 Jul 2019 11:30|Room 349

Julia's Killer App(s): Implementing State Machines Simply using Multiple Dispatch

Joshua Ballanco

Julia's embrace of multiple dispatch as a key organizing concept provides developers with all the tools they need to simply implement state machine based solutions to a wide range of problems. This presentation will explore a series of increasingly complex tasks that can all be addressed

using a clever combination of types and multiple dispatch.

Thu, 25 Jul 2019 11:30|Elm B

Implicit Geometry with Multi-Dimensional Bisection Method

Daniel Bachrathy

In the proposed talk an efficient root finding algorithm is presented through engineering applications, which are formed as implicit non-linear equation systems.

Workplace

- 2014- Assistant professor at Budapest University of Technology and Economics, Department of Applied Mechanics

Education

- 2006 – 2013 PhD Programme

Budapest University of Technology and Economics, Department of Applied Mechanics

Research topic: Cutting dynamics and surface quality

- 2001 – 2006 Mechanical Engineer

Interests

- Professional: Stability, Time-Delay, Machining, Dynamics, Vibration

- Hobbies: American Football player, 3D computer graphics, Arduino Project, 3D printing, travelling, photography

Thu, 25 Jul 2019 11:30|Elm A

Julia web servers deployment

Mohammed El-Beltagy Amgad Naiem

We present our experience in deploying Julia web servers in production systems. We developed a custom buildpack that facilitates deploying web servers on Heroku. It is built so that any application requires almost no special code to be deployed.

I'm a Phd Student at Cairo University and chief technical lead at [Optomatica](https://www.optomatica.com) I have been working with Julia since 2013 and have developed many applications on it throughout these years. I also have some contributions on Julia Ecosytem.

Thu, 25 Jul 2019 11:40|Room 349

What I learned from developing ExponentialUtilities.jl

Xingjian Guo

I will share some tips on writing Julia packages for newcomers using my experience with ExponentialUtilities.jl as an example.

I'm a Master's student in scientific computing at New York University and I'll be graduating this summer. I have participated in GSoC 2018 under the JuliaDiffEq organization and have contributed to various Julia packages.

Thu, 25 Jul 2019 11:40|Elm B

Computational topology and Boolean operations with Julia sparse arrays

Alberto Paoluzzi

This talk introduces computational topology algorithms to generate the 2D/3D space partition induced by a collection of 1D/2D/3D geometric objects. Methods and language are those of basic geometric and algebraic topology. Only sparse arrays are used to compute spaces and maps (the chain complex) from dimension zero to three.

Alberto Paoluzzi is professor of Computer Science with the Department of Mathematics and Physics of Roma Tre University. Currently teaches Parallel and Distributed Computing, and Computational Algebraic Topology, and leads the CVD (Computational Visual Design) Lab, previously CAD-PLM Lab. He was associate professor of Computer Science with La Sapienza University of Rome from 1983 to 1993, and professor of Computer Aided Design with the Department of Informatics and Automation of Roma Tre from 2000 to 2012. He was working on graphics, geometric and solid modeling in Italy since the last seventies, and leaded the design and development of several geometrical systems, including the first solid modeler on a personal computer in 1985, and the geometric language PlaSM in more recent years.

He is a member of SIAM, ACM, the IEEE Computer Society. He was editor of Computer-aided Design journal and Computer-Aided Design and Applications. Authored 3 books, and more than 120 peer-reviewed papers on international journals and conferences. In 2017 was awarded from SMA (Solid Modeling Association) the honorific title of Pioneer of Solid Modeling.

Thu, 25 Jul 2019 11:40|Elm A

A case study of migrating Timelineapp.co to the Julia language

Bogumił Kamiński

[Timelineapp.co](https://timelineapp.co) is an on-line platform for financial planners. Recently its core compute engine has been migrated to the Julia language. In this talk we discuss the reasons and benefits of this decision.

I am a researcher in the fields of operations research and computational social science.

For development work I mostly use Julia language.

You can find more information about me on [my personal website](http://bogumilkaminski.pl/about/) or [GitHub](https://github.com/bkamins).

Thu, 25 Jul 2019 11:50|Room 349

JuliaCN: A community driven localization group for Julia in China

Roger Luo

JuliaCN was founded by early Chinese Julia developers for Julia localization in Chinese. We started it by providing Chinese translation on Julia documentation known as

[JuliaZH.jl](https://github.com/JuliaCN/JuliaZH.jl)/[julia_zh_cn](https://github.com/JuliaCN/julia_zh_cn).

First year grad student from University of Waterloo. Core member of JuliaCN, the Julia localization org in China. Core member of QuantumBFS, an open source organization for developing software for quantum physics.

Thu, 25 Jul 2019 11:50|Elm B

Geometric algebra in Julia with Grassmann.jl

Michael Reed

The [Grassmann.jl](https://github.com/chakravala/Grassmann.jl) package provides tools for doing computations based on multi-linear algebra, differential geometry, and spin groups using the extended tensor algebra known as Grassmann-Clifford-Hestenes-Taylor geometric algebra. The primary operations are `∧, ∨, ∗, ×, ⋅, ', ~` (which are the outer, regressive, inner, geometric, and cross products along with the Hodge star, adjoint, and multivector reversal operations). Any operations are truly extensible with high dimensional support for up to 62 indices and staged caching / precompilation, where the code generation enables the fairly automated task of making more definitions. The [DirectSum.jl](https://github.com/chakravala/DirectSum.jl) multivector parametric type polymorphism is based on tangent bundle vector spaces and conformal projective geometry to make the dispatch highly extensible for many applications. Additionally, interoperability between different sub-algebras is enabled by [AbstractTensors.jl](https://github.com/chakravala/AbstractTensors.jl), on which the type system is built.

computational meta-linguist working on conformal geometric algebra

Thu, 25 Jul 2019 11:50|Elm A

The Julia Language 1.0 Ephemeris and Physical Constants Reader for Solar System Bodies

Renee Spear

The Julia Language 1.0 Ephemeris and Physical Constants Reader for Solar System Bodies is an ephemeris reader, written in the programming language of Julia, is a new tool intended for use in astrodynamic applications.

Renee Spear is a senior at Embry-Riddle Aeronautical University - Prescott, AZ majoring in Aerospace Engineering, Astronautical track, and minoring in Computer Science. Renee has been involved in the Julia Language 1.0 Ephemeris and Physical Constants Reader for Solar System bodies with her peer, Julia Mihaylov, and mentors, Dr. Kaela Martin of Embry-Riddle Aeronautical University and Dr. Damon Landau of the Jet Propulsion Laboratory, for over two years and has published two papers on the subject. Her career goals include pursuing an advanced degree in astrodynamics and working for an aerospace company where she can make an impact on spacecraft and mission design through the optimization of existing procedures and exploration of new avenues in technology and design. Outside of academia, Renee loves to enjoy the outdoors through hiking, photography, kayaking, and backpacking.

Thu, 25 Jul 2019 12:00|Other

Lunch

Lunch will be held in the SMC 2nd Floor Lobby

Thu, 25 Jul 2019 13:30|NS Room 130

Keynote: Dr Steven Lee

Dr Steven Lee
TBA

Thu, 25 Jul 2019 14:30|Room 349

Writing maintainable Julia code

Scott Haney
How to use abstractions to write code that will be easy to follow and change while also not significantly impacting performance

I Received a doctorate degree in electrical and computer engineering from Drexel University in 2011. I started out doing scientific programming in R while working on my doctoral thesis and recently found out about and got excited about the Julia programming language. My main interest areas in programming are software architecture and numerical analysis.

Thu, 25 Jul 2019 14:30|Elm B

Mimi.jl - Next Generation Climate Economics Modeling

Lisa Rennels
David Anthoff
Cora Kingdon
We will present Mimi.jl, a next generation platform for Integrated Assessment Modelling widely used in climate economics research. The talk will outline technical aspects of the platform, as well as its adoption and impact both on research at universities and in the US federal climate regulation process.

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David Anthoff is an environmental economist who studies climate change and environmental policy. He co-develops the integrated assessment model FUND that is used widely in academic research and in policy analysis. His research has appeared in Science, the Journal of Environmental Economics and Management, Environmental and Resource Economics, the Oxford Review of Economic Policy and other academic journals. He contributed a background research paper to the Stern Review and has advised numerous organizations (including US EPA and the Canadian National Round Table on the Environment and the Economy) on the economics of climate change.

He is an assistant professor in the Energy and Resources Group at the University of California, Berkeley. Previously he was an assistant professor in the School of Natural Resources and the Environment of the University of Michigan, a postdoc at the University of California, Berkeley and a postdoc at the Economic and Social Research Institute in Ireland. He also was a visiting research fellow at the Smith School of Enterprise and the Environment, University of Oxford.

He holds a PhD (Dr. rer. pol.) in economics from the University of Hamburg (Germany) and the International Max Planck Research School on Earth System Modelling, a MSc in Environmental Change and Management from the University of Oxford (UK) and a M.Phil. in philosophy, logic and philosophy of science from Ludwig-Maximilians-

Universität München (Munich, Germany).

Cora is a Research Assistant at Resources for the Future where she uses the Julia software package, Mimi.jl, for Integrated Assessment Modeling of climate damages and the social cost of carbon. She is a recent graduate of UC Berkeley where she contributed to research in the Energy and Resources Group and was a co-developer of Mimi.jl.

Thu, 25 Jul 2019 14:30|BOF

Julia in Healthcare

Vijay Ivaturi
This session is for gathering the various groups interested in Julia for healthcare purposes. Pharmacometrics, healthcare-focused biological research, and the translation of software to practice will be discussed.

Thu, 25 Jul 2019 14:30|Elm A

If Runtime isn't Funtime: Controlling Compile-time Execution

Nathan Daly
"This block will compile away," the comments say. _But will it?_ In this talk we'll see some scenarios where controlling compile-time vs runtime execution is crucial for performance, and we'll discuss some ideas that might make this control easier in Julia.

Nathan Daly is a Software Engineer at [RelationalAI](http://relational.ai). He was first introduced to the idea of contributing to JuliaLang as one small way to help fight climate change by making scientific computing a little bit easier: http://worrydream.com/ClimateChange

Thu, 25 Jul 2019 15:00|Room 349

How We Wrote a Textbook using Julia

Tim Wheeler
The speaker's experience writing a full-length optimization textbook with Julia-generated figures and typeset julia code, how to all works.

Tim Wheeler is a software engineer working on flying autonomous cars at Kitty Hawk. He recently got his Ph.D. in Aeronautics and Astronautics from Stanford for research in automotive artificial intelligence and methods for validating the safety of autonomous vehicles. Tim has sent weather balloons to the edge of space, hit Space X rockets with a big hammer, and written a college-level textbook on optimization. He loves Julia and has contributed to several METADATA packages, including PGFPlots.jl, Discretizers.jl, and CrossfilterCharts.jl.

Thu, 25 Jul 2019 15:00|Elm B

The Climate Machine: A New Earth System Model in Julia

Simon Byrne
Charlie Kawczynski
We are using Julia to develop the first Earth System Model that automatically learns from diverse data sources.

I started using Julia in 2012, first as a researcher in computational statistics, then as a developer at Julia Computing. I recently joined the [CliMA](https://clima.caltech.edu/) project as the lead software engineer.

Thu, 25 Jul 2019 15:00|Elm A

Transducers: data-oriented abstraction for sequential and parallel algorithms on containers

Takafumi Arakaki

Transducers are composable algorithms that operate on collections of inputs. This concept is first introduced in Clojure language by Rich Hickey for a fully reusable code for mapping, filtering, concatenation, and similar operations that can be modeled a succession of steps. By this nature, transducers superficially look like iterators that are used by the majority of programming languages for a similar purpose. However, the protocol used by transducers is quite different from iterators and results in different characteristics:

(1) Transducers are driven by a "generalized" [`foldl`](https://docs.julialang.org/en/v1.1/base/collections/#Base.foldl-Tuple{Any,Any}) function. It can implement a specialized looping strategy that is most friendly to the way the data is laid out in memory for a given collection (e.g., two nested loops for vector-of-vectors).

(2) Some transducers like `Map`, `Filter`, `Cat` and `Scan` can support parallel execution. Importantly, this is done without re-writing any of the code for those transducers.

(3) The code composed by transducers is close to the way code is written manually using raw loops. It seems to result in a good machine code generation. This also means that enabling SIMD using the `@simd` macro is straight forward.

In this talk, I explain the formalism of the transducers and discuss the pros and cons for Julia ecosystem based on my experience in implementing [Transducers.jl](https://github.com/tkf/Transducers.jl).

I'm a postdoc in theoretical neuroscience. I'm a member of JuliaPy and JuliaDiffEq organizations and the active maintainer of PyJulia.

Thu, 25 Jul 2019 15:30|Other

Short break

A short break between sessions.

Thu, 25 Jul 2019 15:45|Room 349

Turing: Probabalistic Programming in Julia

Cameron Pfiffer

Turing is a probabilistic programming language written in Julia. This talk will introduce Turing and its tooling ecosystem, as well as go over some introductory tutorials.

I am a developer for Turing, as well as a finance PhD student at the University of Oregon.

Thu, 25 Jul 2019 15:45|Elm B

Symbolic Manipulation in Julia

Harrison Grodin

Symbolic terms are fundamental to a variety of fields in computer science, including computer algebra, automated reasoning, and scientific modeling. In this talk, we discuss a family of Julia packages for symbolic computation, including Rewrite.jl for term rewriting and ModelingToolkit.jl for symbolic differential equations.

Student at Carnegie Mellon University School of Computer Science, with an interest in programming language theory and computational symbolic mathematics. Author of Rewrite.jl and related symbolic packages. Developer of ModelingToolkit.jl and its integration into the PuMaS.jl project for pharmaceutical modeling and simulation, through the University of Maryland, School of Pharmacy, Center for Translational Medicine.

Thu, 25 Jul 2019 15:45|Elm A

Efficient Stiff Ordinary Differential Equation Solvers for Quantitative Systems Pharmacology (QsP)

Yingbo Ma

QsP is a sophisticated and effective way to predict the interaction between drugs and the human body, however, simulating QsP models can take a long time because of the intrinsic stiffness in transient chemical reactions. Here we take a deep look at the efficiency of various stiff ordinary differential equation solvers in the JuliaDiffEq ecosystem applied to QsP models, and utilize benchmarks to summarize how the ecosystem is progressing and what kinds of advances we can expect in the near future.

Yingbo Ma was a math major in the University of California, Irvine, and he is currently taking a gap year. He is a scientific computing intern in predictive healthcare analytics at Julia Computing, Inc. and the Center for Translational Medicine at the University of Maryland Baltimore. He is very interested in numerical treatments for differential equations and implemented a number of integrators and interfaces in the JuliaDiffEq organization. His future goal is to develop new efficient algorithms for solving differential equations and to apply them in real practice.

Thu, 25 Jul 2019 16:15|Room 349

Gaussian Process Probabilistic Programming with Stheno.jl

Will Tebbutt
Stheno.jl is a probabilistic programming framework specifically designed for constructing probabilistic models based around Gaussian processes. Come to this talk to find out what that means, why you should care, and how you can use it with Flux.jl and Turing.jl to do cool things.

Will is a PhD student in the Machine Learning Group at the University of Cambridge, supervised by Rich Turner. He's generally interested in probabilistic modelling and (approximate) inference, and is particularly fond of Gaussian processes (GPs). His work on GPs includes approximate inference for scaling to large problems, their use in both multi-output regression and the ensembling of climate models, and most recently on how best to exploit their unique properties in a probabilistic programming framework.

Thu, 25 Jul 2019 16:15|Elm B

Building a Debugger with Cassette

Lyndon White (@oxinabox)
As the saying goes: _"You can solve that with Cassette"_.

This is a tuitoral on how to use Cassette for building a debugger.

It explains the core of MagneticReadHead.jl, and how you can build similar tools,
to instrument julia code for your purposes.

Hopefully by the time of juliacon, offically a PhD gradute, NLP & ML.

A reseach software engineer at Invenia Labs.

Been using julia since 0.3.

Broadly speaking: a useful human.

Thu, 25 Jul 2019 16:15|Elm A

Simulation and estimation of Nonlinear Mixed Effects Models with PuMaS.jl

Vaibhav Dixit
The talk will introduce the use of PuMaS.jl for simulation and estimation of Nonlinear Mixed Effects Models used in systems pharmacology.

Vaibhav is an Undergraduate in Mathematics and Computing at the Indian Institute of Technology (B.H.U.), Varanasi, India. His interests lie in scientific computing and leveraging it to solve modern problems especially in the field of healthcare. He is a contributor to analysis tooling of JuliaDiffEq, specifically the DiffEqParamEstim.jl, DiffEqBayes.jl and DiffEqSensitivity.jl. For the past year he has been involved in the development of PuMaS.jl a Julia based software for simulating and estimating PKPD, PBPK, QSP, etc. models used in pharmacology.

Thu, 25 Jul 2019 16:45|Room 349

Soss.jl: Probabilistic Metaprogramming in Julia

Chad Scherrer
This talk will explore the basic ideas in Soss, a new probabilistic programming library for Julia. Soss allows a high-level representation of the kinds of models often written in PyMC3 or Stan, and offers a way to programmatically specify and apply model transformations like approximations or reparameterizations.

Chad Scherrer has been actively developing and using probabilistic programming systems since 2010, and served as technical lead for the language evaluation team in DARPA's Probabilistic Programming for Advancing Machine Learning ("PPAML") program. Much of his blog is devoted to describing Bayesian concepts using PyMC3, while his Soss.jl project aims to improve execution performance by directly manipulating source code for models expressed in the Julia Programming Language .

Chad is a Senior Data Scientist at Metis Seattle, where he teaches the Data Science Bootcamp.

Thu, 25 Jul 2019 16:45|Elm B

Static walks through dynamic programs – a conversation with type-inference.

Valentin Churavy
Efficient performance engineering for Julia programs heavily relies on understanding the result of type-inference on your program, this talk will introduce a tool to have a conversation with type-inference.

PhD student at the MIT JuliaLab, HPC enthusiast.

Thu, 25 Jul 2019 16:45|Elm A

An advanced electrodialysis process model in the Julia ecosystem

Bram De Jaegher
Electrodialysis, a prominent technology in the production of drinking water from seawater is modelled using the Julia ecosystem. A framework of partial differential equations and neural networks is solved to model the fouling of this process and to optimise its design and operation.

A PhD student at Ghent University and VITO currently working on developing models for electrochemical processes. As a bio-science engineer that loves mathematical modelling, I transform real-life systems into virtual systems and have experience in computational fluid dynamics, machine learning and bioprocess technology.

Thu, 25 Jul 2019 16:55|Elm B

Concolic Fuzzing – Or how to run a theorem prover on your Julia code

Valentin Churavy
Concolic testing is a technique that uses concrete execution to create a symbolic representation of a program, which can be used to prove properties of programs or do provable exhaustive fuzzing.

PhD student at the MIT JuliaLab, HPC enthusiast.

Thu, 25 Jul 2019 16:55|Elm A

IVIVC.jl: In vitro – in vivo correlation module as part of an integrated pharmaceutical modeling and simulation platform

Shubham Maddhashiya

IVIVC.jl is a state of the art package for predictive mathematical modelling which correlates in vitro property (rate of drug dissolution) and in vivo response (plasma drug concentration profile). An IVIVC is meant to serve as a surrogate for in vivo bioavailability. This relationship can guide product development and support biowaivers. IVIVC.jl pipelines input bio-data to an IVIVC model with validations and it involves mathematical modelling, optimization and data visualisation accelerated with Julia.

Shubham Maddhashiya is a third-year undergraduate student majoring in Ocean Engineering and Naval Architecture at the Indian Institute of Technology, Kharagpur, India. Shubham is interested in scientific computing and artificial intelligence in robotics.

Thu, 25 Jul 2019 17:05|Elm B

Analyzing and updating code with JuliaInterpreter and Revise

Tim Holy

Revise.jl allows you to modify code in your running Julia session. Revise was recently rewritten around JuliaInterpreter.jl and a new query interface, CodeTracking.jl, resulting in many improvements and easier access to Revise's internal data.

Neuroscientist and developer of the Julia language and its packages.

Thu, 25 Jul 2019 17:05|Elm A

GigaSOM.jl: Huge-scale, high-performance flow cytometry clustering in Julia

Vasco Verissimo

Laurent Heirendt

Flow cytometry clustering for several hundred million cells has long been hampered by software implementations. Julia allows us to go beyond these limits. Through the high-performance GigaSOM.jl package, we gear up for huge-scale flow cytometry analysis.

Laurent Heirendt was born in 1987 in Luxembourg City, Luxembourg (Europe). He received his BSc in Mechanical Engineering from the Ecole Polytechnique Fédérale de Lausanne, Switzerland in 2009. A year later, he received his MSc in Advanced Mechanical Engineering from Imperial College London in the UK, where his research and thesis focused on developing a general dynamic model for shimmy analysis of aircraft landing gear that is still in use today. He received his PhD in 2014 in Aerospace Science from the University of Toronto, Canada. He developed a thermo-tribomechanical model of an aircraft landing gear, which led to a patent pending design of a critical aircraft landing gear component. He then worked in industry and oversaw the structural analysis of large aircraft docking structures.

Laurent currently works as a Research Associate at the Luxembourg Centre for Systems Biomedicine. His work focuses on responsible and reproducible research science and scientific computing applications using Julia. Besides his mother tongue Luxembourgish, he is fluent in English, French and German, and he is actively learning Brazilian Portuguese.

Thu, 25 Jul 2019 17:15|Room 349

Gen: a general-purpose probabilistic programming system with programmable inference built on Julia

Marco Cusumano-Towner

This talk introduces a new flexible and extensible probabilistic programming system called Gen, that is built on top of Julia. Gen's extensible set of modeling DSLs can express probabilistic models that combine Bayesian networks, black box simulators, deep learning, structure learning, and Bayesian nonparametrics; and Gen's inference library supports custom algorithms that combine Markov chain Monte Carlo, particle filtering, variational inference, and numerical optimization.

Marco is a fourth-year Ph.D. student in electrical engineering and computer science at MIT, working with Vikash Mansinghka in the MIT Probabilistic Computing Project, and Josh Tenenbaum in the MIT Department of Brain and Cognitive Sciences.

Previously, Marco completed his Master's degree at Stanford University, where his research focused applied machine learning for computational biology. Marco has spent time in industry developing computational infrastructure and algorithms for genetic testing from high-throughput DNA sequencing data. During his undergraduate studies in at UC Berkeley, Marco worked with Professor Pieter Abbeel on probabilistic and optimization techniques for household robotics.

Marco is interested in developing programming languages, software systems, user interfaces, algorithms, and theory that make it easier to construct, reason about, and use probabilistic modeling and inference.

Thu, 25 Jul 2019 17:15|Elm B

TimerOutputs.jl - a cheap and cheerful instrumenting profiler

Kristoffer Carlsson

TimerOutputs.jl is a tool that lets you annotate sections in your code so that after execution, a nicely formatted table with information about how much time and allocations were spent in each section can be shown.

I used to be a PhD student at Chalmers University of Technology doing research in material science. Now I work for JuliaComputing, doing all kinds of different Julia stuff.

Thu, 25 Jul 2019 17:15|Elm A

MendelIHT.jl: How to fit Generalized Linear Models for High Dimensional Genetics (GWAS) Data

benjamin chu

GWAS data are extremely high dimensional, large (>100GB), dense, and typically contains rare and correlated predictors. In this talk we discuss its unique data structures, how to efficiently represent it with Julia, how `MendelIHT.jl` in conjunction with `Distributions.jl` and `GLM.jl` fits generalized linear models for GWAS data, and the role of parallel computing.

Hi there.

I am a 3rd year graduate student from the department of Biomathematics at University of California, Los Angeles. I love [speedcubing](https://www.worldcubeassociation.org/persons/2012CHUB01), [coding](https://github.com/biona001), swimming, [anime](https://myanimelist.net/animelist/biona001), [piano](https://www.youtube.com/watch?v=VZS6yb8rXX8), and brewing milk tea. I also used to love jigsaw puzzles, yoyo, go, calligraphy.... but my interest comes and goes. Last year I participate in google summer of code with Julia!

Thu, 25 Jul 2019 17:25|Room 349

A probabilistic programming language for switching Kalman filters

Cédric St-Jean-Leblanc

I will present a probabilistic programming language that implements switching Kalman filters, and its applications to industrial time series processing.

AI researcher focused on decision making under uncertainty, and data scientist.

Thu, 25 Jul 2019 17:25|Elm B

PackageCompiler

Simon Danisch

With PackageCompiler, one can ahead of time compile binaries for Julia packages. This includes the ability to create an executable for a Julia script.

In this talk, I will give a short overview of how PackageCompiler works and how it can be used to ship your Julia package or eliminate JIT overhead.

I've been passionate about graphics, machine learning, scientific computing and computer graphics from an early age!

After graduating from Cognitive Science, I was able to follow that passion by directly working for the Julia MIT team! As part of my work, I've created [Makie.jl](https://github.com/JuliaPlots/Makie.jl/), [GPUArrays.jl](https://github.com/JuliaGPU/GPUArrays.jl), [PackageCompiler](https://github.com/JuliaLang/PackageCompiler.jl) and many other packages in the area of graphics, file-io and gpu acceleration.

Nowadays, I work for [Nextjournal](http://nextjournal.com/), where I'm in charge of the Julia integration, outreach and interactive plotting.

Thu, 25 Jul 2019 17:25|Elm A

Electrifying Transportation with Julia

Alec Bills

In this talk, we will discuss implementation of various models relevant for electrochemical energy systems in order to more rapidly optimize component design and use-case specific optimization.We will show massive performance improvements gained through Julia for a variety of popularpseudo-2D porous electrode models describing Li-ion batteries. In addition, we will illustrate an example of an integrated design workflow of an aircraft power dynamics model along with a battery model, implemented within Julia.

Alec is a PhD Student at Carnegie Mellon University. He is interested in batteries and electric transportation, particularly in electric and hybrid electric aircraft.

Friday 26

Fri, 26 Jul 2019 08:30|Elm A

Hackathon

JuliaCon Committee
The hackathon. Come work on projects, have discussions about converging ecosystems, and generally hang out.

Note: both Elm A and Elm B will be used.

Fri, 26 Jul 2019 12:00|Other

Lunch

Lunch will be held in the SMC 2nd Floor Lobby

JuliaCon 2019

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