CURRICULUM VITAE OF

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PROFILE

My early career has been an intersection of physics, astronomy, and computing. Throughout my undergraduate education in physics I worked on extracurricular educational and scientific software and web development projects. This evolved into seven years of full-time software development and database design work at CERN during the critical construction phase of the LHC experiment. There, I gained skills and experience with complex scientific projects and distributed computing systems, building databases to handle millions of hardware tests and a data transfer system to handle petabytes of scientific data. My transition to astrophysics went through the development of a cluster-based analysis framework for the Dark Energy Survey, and on to doctoral studies in solar physics and the long-term magnetic variability of Sun-like stars. I now seek to build a career in astrophysical research while leveraging my experience in software development and large-scale computing systems.

EDUCATION

UNIVERSITY OF MINNESOTA – TWIN CITIES

Minneapolis, Minnesota — *B.S. Physics 2003*

MONTANA STATE UNIVERSITY

Bozeman, Montana — *M.S. Physics 2013* — *Ph.D. Physics (expected May 2016)*

Ph.D. Dissertation "Long-term Variability of the Sun and Solar-Analog Stars"

EXPERIENCE

GRADUATE STUDENT IN SOLAR PHYSICS

Montana State University, Bozeman, Montana / High Altitude Observatory (NCAR)   *2011–*

In the fall of 2011 I resumed studies in physics joining the doctorate program of Montana State University with an interest in their solar physics group, whose faculty actively researches several subtopics including solar flares, magnetic reconnection, the chromosphere and coronal heating, as well as the solar dynamo. Besides a strong emphasis in astrophysics and plasma physics, my curriculum included graduate computer science courses in data mining and graphical probability networks in order to leverage my past experience in scientific computing and add new analysis tools to my skill set. In 2014 I was awarded the Newkirk Fellowship at the High Altitude Observatory, part of the National Center for Atmospheric Research (NCAR) in Boulder, Colorado. This award is funding the remainder of my thesis research on the topic of stellar magnetic activity cycle observations for solar-type stars, and their constraints on dynamo theories.

SYSTEMS ANALYST

Observatório Nacional, Rio de Janeiro, Brazil   *2011*

The DES-Brazil Science Portal is a cluster-based analysis system designed to enhance collaborative analysis in the Dark Energy Survey. It consists of a web application front-end which allows astronomers to interact with analysis pipelines that use a number of file and database resources and executes parallel workflows on a cluster. I entered the project in a consulting role when it was in an advanced prototype phase and required expert advice on database programming best practices, coding and development standards, as well as a structured versioning and release system. In my six months in the project I delivered in each of these areas, developing working examples

of database programming best-practices while simultaneously addressing performance problems in the existing code. I performed detailed code reviews for specific components as well as a broad automated analysis of the code base which indicated several systematic problems. I reorganized the code repository and wrote documentation which would for the first time would enable structured, versioned releases of separate components of the system, improving the stability of both the development and production environments. Finally, I authored the first comprehensive technical description of the system which would serve as the basis of the first publication describing the Science Portal.

INFORMATION TECHNOLOGY PROFESSIONAL

University of Minnesota; working at CERN, Geneva, Switzerland   *2006–2010*

Beginning in November of 2006 I worked on the PhEDEx (Physics Experiment Data Export) project, which is a component of the computing project for the CMS (Compact Muon Solenoid) high-energy physics experiment at CERN (The European Organization for Nuclear Research). PhEDEx is transfer management software developed by CMS to transfer millions of files encompassing petabytes of experiment data. PhEDEx is responsible for replicating experiment data across the grid to a diverse array of storage systems at over 100 computing centers worldwide. Organizationally, the project can be broken down into 3 major components: low-level interface to grid transfer tools, high-level data management workflow for handling the routing of millions of files, and the data management and monitoring website. Technically, the project exists as an set of perl daemons ("agents") which perform specific and independent functions and a central Oracle database which functions as a "blackboard" memory structure for the agents as well as a record of performance for system monitoring.

I began my work by developing the schema and web interface for the data request system, which allowed physicists and computing managers to create data "subscriptions" to data centers. The request system used X509 certificate authenticated web sessions and has been used to create thousands of transfer requests resulting in over 5 petabytes of production data transferred among the sites. Later my efforts shifted towards maintaining and improving the central workflow agents as while assuming the role of project manager and lead developer by the spring of 2007.

As the manager and lead developer for the project I organized the roadmap for future developments, balancing the large number of user and management requests into a prioritized plan. I chaired regular meetings with other developers and coordinated communications with related projects. Our development group consisted of two other full-time developers and frequent volunteer effort from within the experiment. With this group we achieved major milestones of our development roadmap, including deployment a new web-based data service for integrating with other data management software, refactoring the code base for higher code reusability and optimization, improving integration with the underlying grid technologies, and conducting numerous scale tests to prove the system. In 2007 and 2008 CMS executed a number of "computing challenges" which involved data transfers at the expected scale for experiment startup. PhEDEx was an exemplary project in each of these challenges, meeting the required benchmarks and demonstrating the we were ready for the data transfer requirements of the running experiment. In the later part of 2009 we began a new effort to replace our existing web monitoring interface with a

completely new Ajax-based interface, in order to ease operations of this complex system. This work was carried out in parallel with ongoing maintenance and performance improvements to the production system.

University of Minnesota; working in Minneapolis, Minnesota *2004–2006*

Conditions databases in CMS store detailed time-based data about the detector while it is running, such as voltages and temperatures, to use for monitoring and calibration of a large number of channels. In 2004 I developed the database schema for the Electromagnetic Calorimeter (ECAL) conditions database, which used Oracle. I collaborated with physicists to create a system requirements document, which was followed up by performance tests of three iterations of the schema to ensure efficient writing and access of parameters for the 70,000+ channels of ECAL. I then developed a C++/OCCI program for user applications to write and read from the final database schema, as well as data transformation procedures to make data available to the "offline" database as required by the CMS computing model. This system was used in production for ECAL test-beam activities as well as the important early phase of the assembled detector testing and commissioning, and continued to be used in production during experiment start-up in 2010.

University of Minnesota; working in Minneapolis, Minnesota *2002–2004*

Construction databases in CMS store results from commissioning tests for detector components while they are being assembled. In 2002 I inherited and completed work on the Avalanche Photodiode construction database (MySQL) for the ECAL subdetector. This in-production project required data management for 150,000+ devices that underwent up to 9 different quality control tests each. I designed a query program in Java to allow quality control operators to easily browse the test results. Based on this work, I created another production database for the Gigabit Optical Link Opto-Hybrids, where a simpler and more fail-safe data insertion scheme was developed. I also authored web sites for both of these projects, and designed data transformation software to output XML for consumption by other projects. For these projects I held multiple roles as software designer, developer, and database administrator – and brick layer – constructing the Avalanche Photodiode Cf-252 irradiation apparatus.

PROGRAMMING ASSISTANT

University of Minnesota; Minneapolis, Minnesota *1999–2002*

Under the advice of university professors in physics I developed educational software for undergraduate courses in physics, including a point charge electric field simulator and Java-based lab quizzes. I created a video kinematic analysis program for use in introductory physics lab courses, also in Java.

University of Minnesota; Crookston, Minnesota *1998–1999*

Under the advice of a university professor in physics I developed a web-based quiz system for an undergraduate physics course, written in Perl CGI. After co-authoring and obtaining a grant from the Undergraduate Research Opportunities Program, I worked on the "Neutrino Sky Telescope", implementing a correlation algorithm for low-zenith cosmic muons detected by the deep underground Soudan II detector and gamma-ray burst detections by the Compton Gamma Ray Observatory, using FORTRAN and C.

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SKILLS

ALGORITHMS

Association rule learning (e.g. Apriori); Bayesian network structure learning, parameter learning, and inference

PROGRAMMING LANGUAGES

Extensive experience with Perl, Python, C, C++, Java, PHP, Javascript, SQL and Oracle PL/SQL. Routine use of Bash shell scripts. Some exposure to FORTRAN and IDL.

DEVELOPMENT TOOLS

CVS, SVN and Git repositories. RPM packages. Savannah and Trac ticket management. Emacs text editor.

OPERATING SYSTEMS

Extensive experience with Linux and Mac OS X. Linux experience extends to advanced use such as kernel configuration, deploying and configuring mail, web, and database servers, creating and installing RPMs, and knowledge with many standard command-line tools for debugging a running system.

DATABASES

Experience with Oracle schema design and performance considerations, SQL and SQL performance tuning; language interfaces such as Perl DBI, Java JDBC, and C++ OCCI; performance analysis using Oracle Enterprise Manager; and scale testing large applications. Similar experience with MySQL and PostgresSQL schema, SQL, language bindings, and application development, but also including server deployment, configuration, backup, and administration of production database servers.

WEB TECHNOLOGIES

Experience with the development of dynamic web interfaces using server-side and client-side programming utilizing a database backend. Developed data-centric web services providing HTML, XML, or JSON formatted data. Experience with client-side application development in Javascript using Ajax techniques, as well as the use of the Yahoo! User Interface library for developing rich client-side applications. Experience with building and configuring Apache httpd web server for production deployment environments, including secure X509 certificate authentication.

DISTRIBUTED COMPUTING

Experience with European and US grid computing tools and technologies, including the SRM storage access interface and gLite data transfer tools. Experience with designing systems for managing data across multiple computer centers at the petabyte scale.

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PROJECT MANAGEMENT

Experience with planning a critical project within the framework of a large and novel effort in computing and as part of an international scientific collaboration; scheduling work and organizing meetings for a small team of developers; maintaining communications   with multiple related or dependent sub-projects and addressing their concerns; responding to emergencies; and presenting project plans and achievements to a larger group of collaborators.

HUMAN LANGUAGES

Intermediate spoken and written Portuguese. Basic spoken French.

PUBLICATIONS

OF PRIMARY AUTHORSHIP

R. Egeland, W. Soon, S. Baliunas, J. C. Hall, A. A. Pevtsov, L. Bertello "The Mount Wilson Observatory S-index of the Sun." The Astrophysical Journal (2016; pending)

R. Egeland, W. Soon, S. Baliunas, J. C. Hall, A. A. Pevtsov, G. W. Henry "Dynamo Sensitivity in Solar Analogs with 50 Years of Ca II H & K Activity." Proceedings of The 19th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun (CS19), Uppsala, Sweden, 6-10 June 2016, editor G. A. Felden (2016)

T. S. Metcalfe, R. Egeland, J. van Saders. "Stellar Evidence That the Solar Dynamo May Be in Transition." The Astrophysical Journal Letters 826.1 (2016)

R. Egeland, T. S. Metcalfe, J. C. Hall, G. W. Henry "Sun-like Magnetic Cycles in the Rapidly Rotating Young Solar Analog HD 30495"; The Astrophysical Journal Vol. 812, Num 1 (2015)

P. G. Judge and R. Egeland "Century-Long Monitoring of Solar Irradiance and Earth's Albedo Using a Stable Scattering Target in Space"; MNRAS Letters, Vol. 448 L90-L93 (2015)

A. Sanchez-Hernandez et al. "From toolkit to framework-the past and future evolution of PhEDEx"; Proc. CHEP12 Computing for High Energy Physics, New York City, USA; J. Phys.: Conf. Ser. (2012)

R. Egeland, C-H. Huang, P. Rossman, P. Sundarrajan, T. Wildish "The PhEDEx next-gen website"; Proc. CHEP12 Computing for High Energy Physics, New York City, USA; J. Phys. Conf: Conf. Ser. (2012)

T. Chwalek et al. "No file left behind − monitoring transfer latencies in PhEDEx"; Proc. CHEP12 Computing for High Energy Physics, New York City, USA; J. Phys.: Conf. Ser. (2012)

R. Egeland, T. Wildish, C. Huang "PhEDEx Data Service"; Proc. CHEP09 Computing for High Energy Physics, Prague, Czech Republic; J. Phys.: Conf. Ser. 219

R. Egeland, T. Wildish, S. Metson "Data transfer infrastructure for CMS data taking"; Proc. ACAT08, Advanced Computing and Analysis Techniques, Erice, Italy; Proceedings of Science PoS(ACAT08)033 (2008)

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R. Egeland et al. "DataBase requirements for the CMS ECAL"; CMS internal note IN-2005/029 (2005)

AS CONTRIBUTING AUTHOR

P. G. Beck et al. "Lithium abundance and rotation of seismic solar analogues." Astronomy & Astrophysics (2016; pending)

P. G. Beck et al. "Probing seismic solar analogues through observations with the NASA Kepler space telescope and HERMES high-resolution spectrograph." Proceedings of The 19th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun (CS19), Uppsala, Sweden, 6-10 June 2016, editor G. A. Felden (2016)

D. Salabert et al. "The solar-stellar connection: Magnetic activity of seismic solar analogs." Proceedings of The 19th Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun (CS19), Uppsala, Sweden, 6-10 June 2016, editor G. A. Felden (2016)

D. Salabert et al. "Photospheric and chromospheric magnetic activity of seismic solar analogs. Observational inputs on the solar-stellar connection from Kepler and Hermes." Astronomy & Astrophysics, Vol. 596, id.A31 (2016)

D. Salabert et al. "Magnetic variability in the young solar analog KIC 10644253. Observations from the Kepler satellite and the HERMES spectrograph" Astronomy & Astrophysics Volume 589, id.A118 (2016)

The CMS Collaboration "Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC"; Physics Letters B (2012)

S. Metson, D. Bonacorsi, M. Dias Ferreira, R Egeland "SiteDB: Marshalling people and resources available to CMS"; J. Phys.: Conf. Ser 219 (2010)

A. Fanfani et al."Distributed Analysis in CMS"; Journal of Grid Computing Vol 8, Num 2 (2010)

G. Organtini et al. "The CMS ECAL Database Services for Detector Control and Monitoring"; Proc. CHEP09 Computing for High Energy Physics, Prague, Czech Republic; J. Phys.: Conf. Ser. 219

N. Magini et al. "The CMS data transfer test environment in preparation for LHC data taking"; Proc. IEEE Dresden 2008, Dresden, Germany; Nuclear Science Symposium Conference Record, 2008. NSS'08. IEEE (2008)

L. Tuura et al. "Scaling CMS data transfer system for LHC start-up"; Proc. CHEP07 Computing for High Energy Physics, Victoria, Canada; J. Phys.: Conf. Ser. 119 072030 (2008)

S. Metson et al. "CMS offline web tools"; Proc. CHEP07 Computing for High Energy Physics, Victoria Canada; J. Phys.: Conf. Ser. 119 082007 (2008)

A. Delgado Peris et al. "Data Location, Transfer and Bookkeeping in CMS"; Proc. of the Hadron Collider Physics Symposium 2007; Nuclear Physics B - Proceedings Supplements Vols 177-178, March 2008, p. 279-280 (2008)

The CMS Collaboration "The CMS experiment at the CERN LHC"; Journal of Instrumentation vol. 3 no.08 (2008)

F. Cavallari et al. "CMS ECAL intercalibration of ECAL crystals using laboratory measurements"; CMS Note (2006)

E. Auffray et al. "CMS ECAL Barrel channel numbering"; CMS internal note IN-2005/021 (2005)

D. Bailleux et al. "Hamamatsu APD for CMS ECAL: Quality Insurance"; Nuclear Instruments and Methods in Physics Research Section A, Vol. 518 No. 1 (2004)

A. Kuznetsov et al. "Radiation hard avalanche photodiodes for CMS ECAL"; Nucl. Instrum. Methods Phys. Res., A, Vol. 504 (2003)

PRESENTATIONS

"Evolution of Chromospheric Activity in Solar Analogs" IAU Symposium 328: Living around Active Stars, Maresias, Brazil (Invited; Oct 2016)

"Dynamo Sensitivity in Solar Analogs with 50 Years of Ca II H & K Activity" Cool Stars 19, Uppsala, Sweden (Jun 2016)

"The Solar Dynamo Zoo" Poster at Cool Stars 19, Uppsala, Sweden (Jun 2016)

"Dynamo Sensitivity in Solar Analogs with 50 Years of Ca II H & K Activity" American Astronomical Society Solar Physics Division meeting #47, Boulder, CO (Jun 2016)

"The Solar Dynamo Zoo" Poster at the American Astronomical Society Solar Physics Division meeting #47, Boulder, CO (Jun 2016)

"Variability of Sun-like Stars in 50 Years of Synoptic Observations" Boulder Solar Day, Boulder, CO (Invited; Mar 2016)

"Century-Long Monitoring of Solar Irradiance and Earth's Albedo Using a Stable Scattering Target in Space" 2015 Sun-Climate Symposium, Savannah, GA (Nov 2015)

"Sun-like Magnetic Cycles in the Fast-Rotating Young Solar Analog HD 30495" ; IAU General Assembly, Meeting #29, Honolulu, HI (Aug 2015)

"GeoSphere"; HAO Colloquium, High Altitude Observatory (NCAR), Boulder, CO (Mar 2015)

"Insights on the solar dynamo from stellar observations"; 224th meeting of the American Astronomical Society, Boston, MA (2014)

"PhEDEx Data Service"; CHEP09 Computing for High Energy Physics, Prague, Czech Republic (Mar 2009)

"Data transfer infrastructure for CMS data taking"; ACAT08, Advanced Computing and Analysis Techniques, Erice, Italy (Nov 2008)

"Neutrino Sky Telescope"; UROP project presentations, University of North Dakota, Grand Forks, ND (Aug 2000)

EDU. & OUTREACH

"Super Science Saturday: Eclipse Demonstration." Demonstration for the general public, NCAR Mesa Lab, Boulder, CO (Nov 5, 2016)

"Total Solar Eclipse 2017 – Don't Miss It." Demonstration for grade-school students, Hygiene Elementary, Hygiene, CO (Nov 3, 2016)

"A Física e o Grande Acelerador do CERN." Presentation to middle-school students, Colegio Fenix, Petrópolis, Brazil http://egeland.us/ricky/physics/fenix (Sep 14, 2010)

GRANTS & AWARDS

AAS Solar Physics Division Thomas Metcalfe Travel Award; $1750 (Oct 2016)

Newkirk Fellowship; High Altitude Observatory/NCAR, Boulder, CO; $35k/year (Mar 2014)

Excellent Teaching Assistant; Montana State University, Bozeman, MT; $150 (May 2014)

AAS Solar Physics Division Studentship Travel Award; $750 (Apr 2014)

Undergraduate Research Opportunity Program (UROP), University of Minnesota, Crookston, MN/University of North Dakota, Grand Forks, ND; $5k/year (Jul–Sep 1999)

NEWS & PRESS

Leah Crane, New Scientist "Fresh look at old data shows the sun is surprisingly sluggish" (Dec 9, 2016) https://www.newscientist.com/article/2115667-fresh-look-at-old-data-shows-the-sun-is-surprisingly-sluggish/

Leonardo dos Santos, Astrobites/AAS Nova "It Turns Out the Sun Is More Chill Than We Previously Thought" (Nov 29, 2016) http://aasnova.org/2016/11/29/it-turns-out-the-sun-is-more-chill-than-we-previously-thought/

Evelyn Boswell, MSU News "MSU grad student receives Newkirk Fellowship to study solar cycles" (Apr 17, 2014) http://www.montana.edu/news/12581/msu-grad-student-receives-newkirk-fellowship-to-study-solar-cycles