

SAMUEL A. INVERSO

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EDUCATION AND TRAINING

Institut Pasteur, Paris, France

Postdoctoral Fellow, Department of Neuroscience with Uwe Maskos, March 2011 to March 2013

The Australian National University, Canberra, ACT, AU

Doctor of Philosophy in *Neuroscience* with Andrew C. James, February 2011

Dissertation: *Evoked Currents in Human Visual Cortex*

Rochester Institute of Technology, Rochester, NY, USA

Master of Science in *Computer Science* with Jessica D. Bayliss, November 2004

GPA 4.0/4.0

Thesis: *Automatic Error Recovery Using P3 Response Verification for a Brain Computer Interface*

Rochester Institute of Technology, Rochester, NY, USA

Bachelor of Science in *Computer Science*, February 2001

Cumulative GPA 3.36/4.0; Professional GPA 3.3/4.0; Dean's List

Minor: Psychology. Concentrations: Artificial Intelligence and General Business Administration.

PROFESSIONAL EXPERIENCE

Harvard University, Wyss Institute, Boston, MA, USA

4/2013 to Present

Staff Software Engineer, Synthetic Biology with Richard Terry and George Church,

- ♦ On the Advanced Technology Team at the Wyss, I worked both as a Software Engineer and Scientist.
- ♦ Managed and Lead many projects including IARPA MICrONS a multi-institute consortium to map 1mm cube of a mouse brain at the synaptic level with Fluorescent in-situ sequencing (FISSEQ).
- ♦ Coordinated 10+ academic collaborations for FISSEQ including writing grants with them, sample tracking from arrival through data return, and bioinformatics of the results.
- ♦ Developed and maintained image analysis pipeline for processing multi-TB data sets from the in house built ARC-GT FISSEQ sequencer (C++/Python).
- ♦ Bioinformatics of transcriptome from many FISSEQ samples, including human cancer and normal tissue, mouse, cell culture, and *C. elegans*.
- ♦ Aided scientists, postdocs, and graduate students in data analysis, experimental planning, and produced software with their input to help them in daily tasks, e.g. image analysis GUI to determine if colonies are clonal (MATLAB), R scripts to analyze data, and python bioinformatics.
- ♦ Daily laboratory coordination including: sample management, vendors/suppliers, laboratory orders, data sharing of large data sets, and data analysis.
- ♦ Wet bench work optimizing FISSEQ protocol for the mouse brain.
- ♦ Encoded a movie in DNA, "A trip to the Moon" (700MB) with Technicolor, George Church, and Brian Turczyk. Performed the bioinformatics for library construction and trouble shooting. Credited.

Massachusetts Institute of Technology Media Lab Europe, Dublin, Ireland

9/2003 to 1/2005

Research Associate

- ♦ Designed a brain-computer interface (BCI) spelling application to reduce the user selections required to "type" messages. A context-sensitive text prediction algorithm, developed by Hawes and Kelleher at the MLE, and an ambiguous keyboard were utilized (see publications Inverso 2004).
- ♦ Investigated electromyogram (EMG: electrical activity from a muscle contraction) as a subtle socially acceptable interface for mobile devices. Designed and performed experiments and user trials to validate this interface (see publications Costanza 2004 and 2005). Participated in many Open House sessions, where demonstrations of the research projects were presented to lab sponsors and the general public.

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Rochester Institute of Technology, Rochester, NY

9/2001 to 8/2003

Research Assistant

- ◆ Developed and experimented with a method to generate halftone masks using genetic algorithms in MATLAB with Peter Anderson, PhD. and Jon Arney, PhD (see publications Anderson October 2003 and November 2003).

Teaching Assistant

- ◆ Instructed Computer Science 1, 2, 3, and Accelerated Computer Science 1 laboratory courses, which teach students engineering problem solving and object-oriented programming using Java.
- ◆ Coordinated and taught weekly student help sessions.

Kaloke Technologies, Inc., Chadds Ford, PA

3/2001 to 8/2001

Software Engineer

- ◆ Designed and implemented a notification subsystem which dynamically generated and sent emails to customers and administrators. JMS messages sent to the subsystem determined the XML email template to process. The templates contained tags associated with Java classes that pulled information from an Oracle database via JDBC then processed and rendered the data.
- ◆ Developed a Java DataLoader that loaded class member variables from files to facilitate large dataset testing.
- ◆ Wrote, tested, and debugged my and other's Java code which accessed stored procedures in an Oracle Database.

Bristol-Myers Squibb, Co., Syracuse, NY

3/2000 to 8/2000

Co-op Software Developer

- ◆ Technical lead on a project to select an application server for enterprise wide deployment. Created criteria and implemented tests to determine the suitability of the application server candidates. Prepared and delivered recommendation document and presentation to supervisor.
- ◆ Investigated approaches to integrate COM/DCOM with Java, especially Enterprise JavaBeans (EJB).
- ◆ Developed a security component to authenticate users with an LDAP server using Stateful Session EJBs.

Kenneth Crosby, Inc., Rochester, NY

8/1999 to 12/1999

MIS Assistant

- ◆ Constructed MS-Access database to manage and track all hardware and software assets.
- ◆ Analyzed Year 2000 compliance then created and implemented a Year 2000 compliance plan.

FirstUSA Bank, Wilmington, DE

6/1998 to 2/1999

Co-op Research and Development

- ◆ Participated in a code review of a mission critical application created for FirstUSA by an out of house consulting firm. Identified design and coding issues, and introduced optimizations into the application.
- ◆ Designed and prototyped a distributed application for marketing personnel to easily manipulate web page content using business rules. The application was implemented with Java, Java Servlets, Swing, and XML.
- ◆ Developed an approach to integrate Common Gateway Interface (CGI) programs with CORBA clients using Java Servlets and C++.
- ◆ Created an application allowing non-technical personnel to alter the content and presentation of web pages using templates. Templates were created with Dream Weaver; JHTML, Java Servlets, and JDBC rendered the web pages.
- ◆ Created a Java realm, for BEA WebLogic, to authenticate users against an LDAP server.
- ◆ Presented and demonstrated proof-of-concepts to varying levels of management.
- ◆ Interviewed several interns and trained two that were hired.

SKILLS AND COMPUTER EXPERIENCE

Languages: C++, C, Python, MATLAB, R, Java, Perl, XML, HTML, SQL
Specifications: Enterprise JavaBeans, JSP, Java Servlets, JDBC, JMS, SAX, DOM, LDAP, CORBA
Operating Systems: Windows 10/8/7/Vista/XP/2000/NT/9x, Unix, Linux, Mac OS X, DOS
Software: Bioinformatics: Bowtie, BWA, samtools, NCBI, Galaxy, etc.; Psychophysics Toolbox, BCI2000, Cogent, Presentation, FreeSurfer, MNE Toolbox
Equipment: 2-photon microscope (Prairie Technologies), confocals (Leica and Zyss) BIOSEMI, g.tec g.BSamp, Polhemus 3Space FASTRAK, Cambridge Systems OptiCAL, Mauna Kea Technologies CellVizio.
Lab: Cryosectioning, Animal Handling, Stereotaxic injection of Lentivirus, AAV, Sindbis,

and Amyloid β . RNA/DNA extraction, PCR, immunohistochemistry, immunofluorescence. FISSEQ Sequencer, Basic Lab techniques hazardous/carcinogenic chemical handling, sample tracking and management.

PUBLICATIONS (SELECTED)

- ◆ Blawat M., Gaedke K., Huetter I., Chen XM., Turczyk B., **Inverso S.**, Pruitt B., Church G. Forward Error Correction for DNA Data Storage. (full paper) International Conference on Computational Science, San Diego, CA, USA, June 6-8, 2016.
- ◆ **Inverso S. A.**, Xin-Lin G., Henriksson L., Vanni S., James A. C. From Evoked Potentials to Cortical Currents: Resolving V1 and V2 Components Using Retinotopy Constrained Source Estimation without fMRI. (full paper) Human Brain Mapping, 2016, 37(5):1696-1709
- ◆ Lee J. H., Daugharthy E. R., Scheiman J., Kalhor R., Yang J. L., Ferrante T. C., Terry R., Jeanty S. S. F., Li C., Amamoto R., Peters D. T., Turczyk B. M., Marblestone A. H., **Inverso S. A.**, Bernard A., Mali P., Rios X., Aach J., Church G. M., Highly Multiplexed Subcellular RNA Sequencing in Situ. *Science*, 3/21/2014, 343(6177):1360-1363.
- ◆ Valley M. T., Henderson L. G., **Inverso S. A.**, and Lledo PM., "Adult Neurogenesis Produces Neurons with Unique GABAergic Synapses in the Olfactory Bulb", *J. of Neuroscience*, Sept. 11, 2013, 33(37):14660-14665.
- ◆ **Inverso S. A.**, Goh X. L., James A. J., Slowing Vision: Pattern Pulse MultiFocal Visual Evoked Potential (PPmfVEP) timing dilation under Isoluminant and Luminance Contrast Conditions (poster) *Vision Science Society 2009*.
- ◆ Costanza E., **Inverso S. A.**, Allen R., Maes P., "EMG For Subtle, Intimate Interfaces", in Lumsden J. (Ed.), *Handbook of Research on User Interface Design and Evaluation for Mobile Technology* (book chapter), pp. 524-542, Information Science Reference, 2008
- ◆ **Inverso S. A.**, Doolan B., James A. J., Real-time Influence of Interocular Transfer During Binocular Rivalry (poster) *Vision Down Under 2007*, Palm Cove, QLD, Australia, July 19-22, 2007.
- ◆ Costanza E., **Inverso S. A.**, Allen R., Maes P., "Intimate Interfaces in Action: Assessing Usability and Subtlety of EMG-based Motionless Gestures." (full paper) *Proc. CHI2007*, April 2007, San Jose, CA, USA.
- ◆ Costanza E., **Inverso S. A.**, Pavlov E., Allen R., Maes P. "eye-q: Eyeglass Peripheral Display for Subtle Intimate Notifications." (full paper) *Proc. of MobileHCI 2006*, September 2006, Espoo, Finland.
- ◆ Bayliss, J. D. and **Inverso, S. A.** "Automatic Error Correction Using P3 Response Verification for a Brain-Computer Interface." (full paper) *Proc. 11th International Conference on Human-Computer Interaction* July 22-27, 2005, Las Vegas, NV. Mahwah: Lawrence Erlbaum Associates. 2005.
- ◆ Costanza, E., **Inverso, S. A.**, and Allen, R. "Toward Subtle Intimate Interfaces for Mobile Devices Using an EMG Controller." (full paper) *Proc. of CHI2005*, Portland, Oregon, USA. 2005.
- ◆ Bayliss, J. D., **Inverso, S. A.**, and Tentler, A. "Changing the P300 Brain-Computer Interface." *Journal of CyberPsychology & Behavior* 7.6:694-704, 2004.
- ◆ **Inverso, S. A.**, Hawes, N., Kelleher, J., Allen, R., and Haase, K. "Think and Spell: Context-Sensitive Predictive Text for an Ambiguous Keyboard Brain-Computer Interface Speller." *J. Biomedizinische Technik* 49 S. 1: 53-54, 2004.

GRANTS AND AWARDS

W. M. Keck Foundation, Medical Research Grant Program	\$1.2 million UVA, WI, 2016-2017
Co-authored proposal, PI Eyleen O'Rourke, University of Virginia	
Predicative Modeling of Animal Metabolism: The C. elegans MetaboFlux Project	
NIH S10, Shared Instrumentation Grant for FISSEQ sequencing (S10OD021692).	\$598,000, WI, 2016-2017
Co-authored proposal, PI George Church	
Machine Intelligence from Cortical Networks (MICrONS), IARPA (D16PC00008)	\$21 million, WI, 2016-2020
Co-investigator and co-author of proposal, lead of the Wyss Institute team under PI George Church.	
MICrONS is a consortia effort with Harvard, MIT, Cold Spring Harbor Labs, and Columbia University. The goal is to reverse-engineer a mouse brain's algorithms from neurocircuits at the synaptic level and calcium imaging of behavior. Then develop novel machine learning algorithms.	
Harvard Medical School Tool's and Technology	\$200,000, WI, 2014
Co-authored proposal, PI George Church	
Fondation Lagrue Postdoctoral Fellowship	Postdoc, IP, 2012
Philippe Foundation Visiting Scientist Grant	Postdoc, IP, 2011-2012
Neuropôle de Recherche Francilien (NeRF) Postdoctoral Fellowship	Postdoc, IP, 2011-2012
Burgmann College Medal (Academics, Leadership, and Service)	PhD, ANU, 2010
Young Visionaries Contribution Award	PhD, ANU, 2010

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National Computational Infrastructure Supercomputer Grant	\$8,000 ANU, 2010
ARC Centre of Excellence PhD Stipend Scholarship	PhD, ANU, 2009–2010
Vice Chancellor's Travel Grant	\$1,500, VSS, ANU, 2009
Endeavour International Postgraduate Research Scholarship	PhD, ANU, 2006–2010
ARC Centre for Excellence RSBS Top-Up Scholarship	PhD, ANU, 2006–2009
Australian National University PhD Stipend Scholarship	PhD, ANU, 2006–2009
Summer Research Scholarship in the Research School of Biological Sciences (RSBS)	ANU, 2005–2006
Computer Science Graduate Scholarship	MS, RIT, 2001–2003
Undergraduate Tuition Grants for Academic Achievement	BS, RIT, 1998–2000

PROJECTS

- ◆ *Software Engineering*: Lead a five student team in an eight-week software development project where we designed, programmed, and tested a graphical money management system in C++ and XForms on Solaris.
- ◆ *Computer Vision*: Programmed an ellipse detection algorithm using the Randomized Hough Transform in MATLAB. Developed edge density and Hough Transform methods to extract barcodes from distorted images.
- ◆ *Neural Networks*: Trained and experimented with binary and bipolar back-propagation neural networks to detect faces in a variety of scenes. Implemented a back-propagation neural network in Java.
- ◆ *Algorithms*: Implemented Dijkstra all-pairs shortest path algorithm in C++ using a minimum binary heap for the min priority queue. Compared its running time against teammate's implementation of Matrix Multiplication and Floyd Warshall in a variety of experiments.
- ◆ *Computer Architecture*: Implemented the DLX instruction set and M. Morris Mano's microprogrammed machine using the C++ Arch library.
- ◆ *Genetic Algorithms*: Programmed and experimented with a variety of GAs in C and MATLAB, including a permutation solution to the N-SuperQueens problems and solutions to density classification, synchronization, and surface minimization of two dimensional cellular automata.
- ◆ *Distributed Artificial Intelligence*: Implemented, in Java, the Clark Tax algorithm to solve the Multiple Traveling Salesperson problem, the filtering algorithm to solve the Graph Coloring problem, Q-learning for a multi-agent foraging task, and a SARSA-lambda agent for a multi-agent RoboCode tournament.

EDITORIAL BOARD

International Journal of Mobile Human Computer Interaction (IJMHCI), Intl. Editorial Rev. Board 2008–2010

MEMBERSHIPS

Vision Sciences Society, 2008
Australian Neuroscience Society, 2008
IEEE, 2002
Association for Computing Machinery, 1998

OTHER EXPERIENCE

Burgmann College, Canberra, Australia 2/2006 to 1/2010
Dean of Postgraduates, 7/2008 to 1/2010, *Senior Fellow*, from 3/2007, *Fellow*, from 2/2006

- ◆ Head of academic and pastoral care for 120 residents. Managed five Fellows and event funds. Organized College events. Served on the Finance Subcommittee, Audit and Risk Subcommittee, and Board of Management. Weekly on call emergency contact, including fire alarm panel operation and coordination with Emergency Services.

REFERENCES

Available upon request.