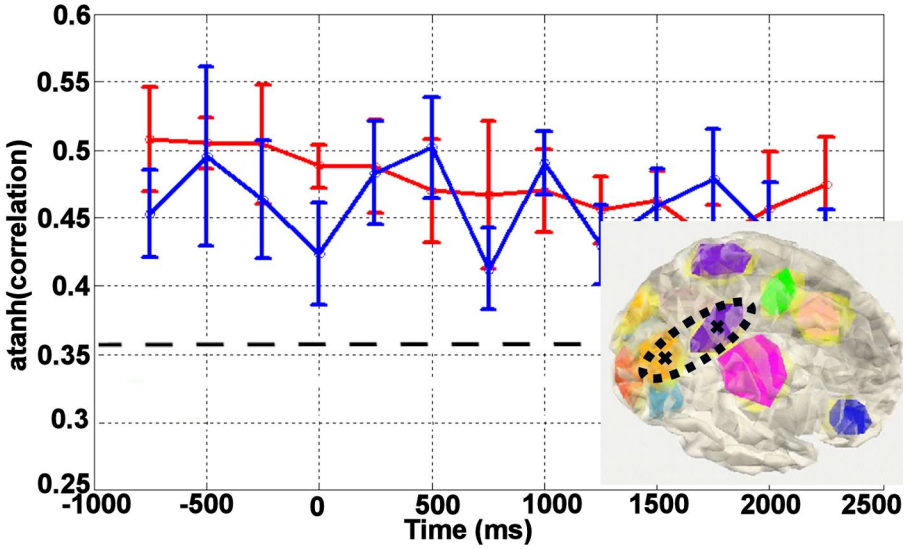
Philip Michael Zeman, B.Eng., Ph.D.
Curriculum Vitae



Revised: 26MAY2011

PERSONAL AND CONTACT INFORMATION (Philip Michael Zeman)

Born: July 5, 1976, Saskatoon, Saskatchewan
Citizenship: Canadian

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Victoria, BC, V8P-5A7
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TITLES

- Interdisciplinary Ph.D. (Engineering, Biology, Neuropsychology); Dissertation titled, "Feasibility of Multi-Component Spatio-Temporal Modeling of Cognitively Generated EEG Data and its Potential Application to Research in Functional Anatomy and Clinical Neuropathology"
- B. Eng., Bachelor of Electrical and Computer Engineering with Co-op
- Electronic Engineering Technologist's Diploma with Co-op

EXPERTISE/KEYWORDS

Interdisciplinary Aptitude, System-Level Design, Hardware/Software/Algorithm/Product Design, Computer Engineering, Digital Signal Processing, Random Signal Analysis, Data Mining, Neuroscience, Behavioral Data Analysis, Behavioral Investigations (Spatial Navigation using virtual Morris Water Task) , Research Design, EEG, GSR, Heartbeat, eye-movement, Behavioral Data Analysis, Independent Component Analysis (ICA), Spectral Shaping-ICA , Beamforming, creator of Multiple-Origin Spatio-Temporal Analysis (MOST-EEG/MEG)

FORMAL EDUCATION AND TRAINING

University of Victoria, Victoria BC -- January 2003 – June 2009
Ph.D. -- "Multi-component spatio-temporal modeling of cognitively generated EEG data and its potential application to research in functional anatomy and clinical neuropathology"

- Highlights: advanced digital signal processing, engineering optimization, wavelet analysis, neuroethology, advanced neurophysiology, history & theory of neuroscience, physiological psychology, human neuroanatomy, artificial intelligence, adaptive filters, cognitive neuroscience, clinical neurophysiology.

University of Victoria, Victoria BC -- January 1998 – May 2000
Bachelor of Electrical Engineering -- Computer Hardware Option/Digital Signal Processing

- Highlights: Digital Signal Processing, Linear/Active Circuits, Data Structures and Graph Theory, Semi-Conductor Theory, Analog/Digital Communications, Operating System Design, Power Amplifiers, Micro-controller programming, Control Theory, Digital Filters, Random Signal Analysis, Direct Sequence Spread Spectrum, Modulation Scheme Evaluation, Motorola 56303 DSP / Motorola 68332 / Motorola 6800 / Motorola HC11 programming, Real-time O/S programming & Scheduling (MQX).

Camosun College, Victoria BC -- July 1997 - January 1998
Computer Engineering Bridging Program

- Highlights: Intensive Engineering Mathematics, C++, Electromagnetic Theory, Signal Analysis.

Okanagan University College, Kelowna BC -- September 1994 - December 1996
Electronic Engineering Technology Cooperative Education Program

- Highlights: (All topics include Labs). Digital/Analog Communication/Modulation, Antenna Theory, Signal Propagation through conductors and free space, Digital Circuits - TTL, CMOS, Simplification, Analog Circuits, Circuit Design, Control Systems, Operational Amplifiers, Troubleshooting, Telephony, Networking, Introductory C Programming, Micro-Controllers, Assembly Language Programming, Control Systems, AutoCAD, PCB Etching, Soldering, PCB Assembly.

WORK EXPERIENCE

Applied Brain and Vision Sciences Inc. – November 2009 - Current
Position: Principal Owner/Developer of Analysis Technology and Applications

- Application of my Ph.D. work to analysis of EEG, GSR, eye-movement, heartbeat data in consumer/research product design (Video Game, Neuromarketing, Health, Pharmaceutical Indus.).
- Actively seeking clients/collaborators with which to continue developing biometric and behavioral data mining algorithms for understanding functional brain activity/cognition and disease modification methods.
- Creation and development of client-server system providing public EEG and ECG data mining and data cleaning services.

Clients Include: Mindmetic (Copenhagen), University of Victoria (Canada), University of Vancouver Island (Canada), Procuros (Copenhagen), Medical Analytics (Canada)

CanAssist, University of Victoria Brain-Computer Interface – January 2003 - January 2009
Position: Student Researcher to obtain PhD

- Application of signal processing and data mining methods to construct models of functional brain activity from scalp-recorded EEG data. Methods include: Fourier and wavelet analysis, random signal analysis, digital signal processing, blind source separation (PCA/ICA); Application of neuroscience principles: neuropsychology, neurophysiology, and neuroanatomy.
- Contributed to designed of eye-movement tracking system including software, hardware specs., calibration methods, signal processing.
- Training, supervision and mentoring of students/research assistants: programming, trouble shooting, signal processing, equipment design.
- Collaboration with researchers at the University of Lethbridge, Canadian Centre for Behavioural Neuroscience to create new EEG analysis methods to study brain activities of spatial navigation.

Sojourn Design, Victoria, BC – February 2002 – January 2003
Sole proprietorship called Sojourn Design offering product design and engineering services: project management, business development, client relations.

Projects with Sojourn Design:

- Designed, constructed & debugged motion control system for experimental crystal growth process.
- Spec.'d temperature controllers for 4 zone vertical furnace to be used at temperatures above 900C.
- Planned and implemented industrial installation of multiple furnace temperature controllers.
- Designed, wrote, debugged Windows 2000 enterprise caliber software to implement independent ramp/soak process control profiles using the CN3390 temperature controller.
- Designed and built high intensity rotating magnetic field generator.

MOTO Development Group, www.moto.com -- May 2000 – January 2002

MOTO Development Group is a technology design consulting firm specializing in technology strategy and focusing on technological product development.

Projects with MOTO Development Group:

Created micro-controller based system architecture proposals for sales and business development. Actively participated in developing product design solutions and selling work to clients.

Apple, Cupertino

Position: Electrical Engineer – Schematic & Board Design

Product: Prototype

- Collaborated in system architecture design and created schematic and board layout. The design included an 8051based EZ-USB micro-controller and an Altera FPGA.
- Presented completed prototype/design tool to client in an application tutorial.

Sony Design Center, San Francisco & Elias Arts, **New York**

Position: Project Technical Lead Electrical Engineer.

Product: Prototype

- Collaborated with Elias Arts (New York) and Sony Design Center (San Francisco) to create proof-of-concept prototype, confidential device. Created a system architecture that considered rigid cost and time constrains of both Sony and Elias and still met all the product requirements.
- Designed, constructed and debugged electronics in the prototype device.

Assistive Technology, Inc. www.assistivetech.com

Position: Project Electrical Engineer

Product: Gemini tablet computer

- Re-designed electronics and schematic design for reduction of audio noise and EMI.
- Re-designed PCB for reduction of audio noise and improved reliability of Universal Serial Bus.
- Worked with EMCE, Inc. and Assistive Technology, Inc. to create a design that passed EMC testing.
- Modified system design and wiring to satisfy EMC.
- Designed, wrote, and debugged CY7C63001A USB firmware compliant to USB 1.1. to read a bank of external switches and control speaker audio output.

emusicsystems.com

Position: Project Electrical Engineer.

Product: Combination MIDI & LED Guitar

- Drove evaluation of options for System Architecture.
- Analyzed digital signal processing requirements for pitch detection.

- Created System Architecture and feature matrix to subdivide product features for cost and product-line analysis.
- Worked with client and venture capitalists to pin-point the value in the product being developed.
- Analyzed the characteristics of a plucked guitar string to determine processing requirements for reliable pitch-tracking.
- Implemented and experimented with zero-crossing detection, short-time fast Fourier analysis, pattern recognition, and short-time average magnitude difference functions for the purposes of pitch detection of a plucked string.

Sportbug.com
Position: Project Electrical Engineer
Product: GPS Device

- Designed, wrote, and debugged CY7C63001A USB firmware compliant to USB1.1 to do various SetReport and GetReports as well as serial uploads and downloads.
- Developed serial upload and download software during this project for IC-design firm www.cypress.com.
- Design of complex custom LCD.

Creo/CreoScitex -- September 1999 - December 1999
Information Systems Co-op Student

- Designed and wrote power-on self-test for Master Control Electronics for the next generation of high resolution industrial computer-to-plate technology media printers.
- Designed complex I/O module to complete functionality and burn-in testing for the next generation of high resolution industrial computer-to-plate technology media printers.

Gregg River Mine -- May 1998 - September 1998
Information Systems Co-op Student

- Supported and improved operations of Windows NT 3.5/4.0 network.
- Supported DHCP TCP/IP 10BASE2 and 10BASET network infrastructure.

RFID Systems Corporation -- January 1997 - July 1997
MIS Technician & Electronics Technician

- Designed WAN layout for RFID Systems Corp., Hardwired and installed software for WindowsNT/95 network.
- Networked computers in the RFID Systems Corp. Kelowna office to their Vancouver office via the Internet using Windows NT 4.0 and PPTP.
- Installed and supported Lotus Notes 4.5 with Domino Web Server and supported 18 mobile and stationary users as an MIS Technician.
- Participated in development and prototyping of Radio Frequency Identification Reader.
- Created model of RFID Reader in AutoCAD and 3D-Studio.
- Validated equipment in the System Integration/OEM Department: Ultra-sonic fingerprint ID scanner / video capture equipment

TRIUMF (University of British Columbia) -- January 1996 - September 1996
Controls Hardware Co-op Student

- Repaired and modified CAMAC and other digital devices.

- Wrote programs in Fortran for testing CAMAC, GPIB, NIM modules in VMS operating environment.
- Documented modifications and test-software.
- Wrote 'Position Display' software in Fortran for cyclotron stripping rods.
- Introduced myself to UNIX and Cluster network configuration and created web pages/web server.
- Selected and ordered components for special applications.
- Organized TRIUMF's Summer Volleyball league.

AWARDS

- University of Victoria Interdisciplinary Fellowship 2008
- University of Victoria Interdisciplinary Fellowship 2007
- Innovation and Development Corporation Invention Competition: Best Software Category 2006
- NSERC Industrial Undergraduate Student Research Award 1999

PEER REVIEWED ARTICLES

1) Zeman PM, Till BC, Livingston NJ, Driessen PF, Tanaka, JW. Independent component and analysis and clustering improve signal-to-noise ratio for statistical analysis of event-related potentials. Journal of Clinical Neurophysiology 2007; 118(12):2591-2604.

2) Zeman PM, Mahajan SV, Sorensen PL, Livingston NJ. Biorthogonal 3.1 Wavelet Enhancement of Brain Activities. Canadian Conference on Electrical and Computer Engineering 2007.

3) Albu AB, Mahajan SV, Zeman PM. Spatio-Temporal Modeling of Neural Source Activation from EEG Data. Canadian Conference on Electrical and Computer Engineering 2007.

4) Prinz R, Zeman PM, Neville S, Livingston NJ. Emulating a Single Switch Input Device Through Wavelet De-Noising of Surface EMG Signals. Cambridge Workshop on Universal Access and Assistive Technology, Conference Proceedings 2006.

5) Prinz R, Zeman PM, Neville S, Livingston NJ. Feature extraction through wavelet de-noising of surface EMG signals for the purpose of mouse click emulation. Canadian Conference on Electrical and Computer Engineering 2006.

6) Zeman PM, Livingston NJ, Hook W, Driessen PF. Creation of a custom basis for detection of a neural physiological event in EEG. Brain Inspired Cognitive Systems Conference Proceedings 2004.

PATENT DOCUMENTATION

1) PCT US Application No. 61/325164: Automated data-driven method for transforming EEG or MEG data into a behavioral-anatomical-functional model and schematic representation of information processing

MANUSCRIPTS IN PEER-REVIEW

1) Livingstone-Lee S, Murchison SC, Zeman PM, Gandhi MM, Gerven DJ, Livingston NJ, Skelton RW. Simple Gaze Analysis and Special Design of a Virtual Morris Water Maze Provides a New Method for Differentiating Egocentric and Allocentric Navigational Strategy Choice. Behavioural Brain Research

UNPUBLISHED MANUSCRIPTS (manuscript publication is awaiting patent processing)

1) Zeman PM, Sorensen PL, Livingstone SA, Skelton RW, Livingston NJ. Understanding and Improving ICA Source Separation of EEG Data. 2008a.

2) Zeman PM, Mahajan SV, Livingstone SA, Driessen PF, Skelton RW, Livingston NJ. Volume Estimation of ICA-Derived EEG Sources. 2008b.

3) Zeman PM, Mahajan SV, Sorensen PL, Driessen PF, Skelton RW, Livingston NJ. Volume Estimation of Scalp EEG: ICA and Beamforming Identify Spatial Overlap. 2008c.

4) Zeman PM, Mahajan SV, Livingstone SA, Driessen PF, Skelton RW, Livingston NJ. Volume Domain Validation of ICA-Derived EEG Sources. 2008d.

5) Zeman PM, Mahajan SV, Livingstone SA, Driessen PF, Livingston NJ, Skelton RW. Spectral Shaping to Relax ICA Assumptions to Facilitate Decomposition of EEG. 2008e.

6) Zeman PM, Livingstone SA, Livingston NJ, Skelton RW. Building a Multi-Component Spatio-Temporal Model of Functional Brain Activity Using Scalp-EEG Data. 2008f.

7) Zeman PM, Livingstone SA, Livingston NJ, Skelton RW. Feasibility of System Analysis of Brain Activity for Spatial Navigation using Scalp-EEG. 2008g.

8) Zeman PM. Role of Sensorimotor Integration and Multiple Systems for Locomotion in Parkinson's Disease: Evidence from Freezing and Paradoxical Gait. Department of Psychology, University of Victoria, BC. 2007.

9) Zeman, PM. Brain-Computer Interface design based on voluntary finger movement-related potentials. Department of Electrical Engineering, University of Victoria, BC. 2005.

PUBLISHED ABSTRACTS

1) Zeman PM. Considerations for the Development of a Brain-Computer Interface. Cambridge Workshop on Universal Access and Assistive Technology. University of Cambridge, Cambridge England. 2004.

2) Zeman PM, Livingston NJ, Driessen PF. Using ICA and correlation to measure multi-source synchrony. Canadian Society for Brain, Behaviour and Cognitive Science. 2006.

INVITED PRESENTATIONS

1) University of Victoria Speakers Bureau: Victoria Council of Women: How the brain can talk to computers
2) University of Lethbridge: The future of the brain-computer interface
3) Kelowna General Hospital: Brain-Computer Interface Design for Motor Control

ONGOING UNIVERSITY COLLABORATIONS

University of Victoria: Dr. Ron Skelton: Eye-movement tracking and brain function analysis using EEG to understand spatial navigation cognition and deficits associated with traumatic brain injury

Vancouver Island University: Tony Robertson: Eye-movement tracking to understand where people look when they view picture stimuli

PERSONAL ACTIVITIES

yacht racing, volleyball, triathlon, guitar, Cross Canada bicycle trip Summer 2008, camping, volunteer work in developing countries, student mentorship

LEADERSHIP

Co-op supervisor of 3 students, Class project supervisor of 2 students, Mentor and supervisor for 1 research assistant, Peer Mentor Group coordinator for the Young Entrepreneur's Association: Victoria Chapter 2004-2006

REFERENCES

Available upon request