Matthew Millard

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Education

09/2005 - 06/2011 **Doctor of Philosophy**, *Systems Design Engineering*, Mechanics and Control of Human Balance, University of Waterloo, Canada

09/2000 - 06/2005 **Bachelor of Applied Science with Distinction**, *Systems Design Engineering with the Mechatronics Option*, University of Waterloo, Canada

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Professional Academic Appointments

Highlights
09/2005 - 09/2024

Awarded research funding in Canada ($183.5k) and Germany (218k€), *Published 25 journal papers, 5 IEEE conference papers, 2 book chapters, and 32 conference abstracts*

- Worked at 5 Universities in 3 countries: University of Waterloo, Stanford University, University of Duisburg-Essen, Heidelberg University and the University of Stuttgart
- Contributed code to *OpenSim* and *RBDL* including a *C++ muscle model* that is used by *tens of thousands* of researchers annually around the world
- Developed novel *muscle models* and *foot contact models* to predict human movement during walking, *exoskeleton-assisted lifting*, and *injury* (*LS-DYNA material*)
- Formulated the most advanced model of *3D dynamic balance* in the literature and have applied it to study walking, *cerebral palsy patients*, *older adults*, and *humanoid robots*
- Created some of the first optimal control simulations to analyze and design *low-back exoskeletons* and *ankle-foot-orthoses*
- Developed and ran experiments to study human balance during *walking* and *sit-to-stand*; to validate *foot-contact models*; to evaluate *exoskeletons*; neck *strength* and *reflexes* during simulated whiplash accelerations
- Published research on a wide variety of topics: *cryptography*, *reinforcement learning*, *expert performance in fine art*, muscle mechanics of *tuna fish swimming*, human *motor learning*, and *sports equipment analysis*

Professional Experience

05/2007 - 05/2008 **Research Assistant (part-time)**, *Aeryon Labs Inc.*, Waterloo, Ontario, Canada
- Designed and 3D printed a 46g two degree-of-freedom driven gimbal based on Ouerfelli and Kumar's *spherical fivebar parallel linkage*
- Developed and evaluate the speed, accuracy and backlash of commercially available miniature servo motors using a mirror and a laser

05/2005 - 09/2009 **Research Assistant (part-time)**, *University of Waterloo and Steinway & Sons NY*, Waterloo, Canada
- Designed and implemented a user-interface in java for a dynamic simulation of a piano mechanism

05/2004 - 08/2004 **Research Intern**, *Sun Microsystems*, Mountainview, U.S.A.
- Debugged the world's smallest secure webserver (8-bit Atmel microcontroller) using LEDs and implemented a communication protocol to the communications stack
- *Compared RSA and elliptic curve cryptography* in terms of transaction speed

01/2003 - 04/2003 **Controls Design Engineering Student**, *Husky Injection Molding*, Bolton, Canada
- Developed a Visual Basic graphical user interface to reduce the time needed to configure Husky's pick-and-place robots from 50 minutes to 2 minutes

01/2001 - 04/2001 **Engineering Student**, *Bombardier Transportation*, Millhaven, Canada
- Developed a dynamic simulation of the *Las Vegas Monorail*
- Performed product research on tire pressure sensors and heat sensors for the train

Awards and Honors

2018	o Best Paper Award. International Symposium on Wearable Robotics, Pisa, Italy.
2007-2010	o Natural Sciences and Engineering Research Council PhD (CGS-D) Scholarship ($110k CAD)
2006	o Natural Sciences and Engineering Research Council Masters (PGS-M) Scholarship ($17.5k CAD)
2005	o Ontario Graduate Scholarship ($10k CAD) o Canadian Engineering Competition Champion, Entrepreneurial Category o Ontario Engineering Competition Champion, Entrepreneurial Category o Mark Weiser Best Paper Award. IEEE PERCOM. Kauai, Hawaii.

Skills

Languages

English	Native speaker
German	B1 Certificate

Software

High-level languages	C++, Fortran, Java
Low-level languages	C, Basic, Atmel AVR assembler
Scripting languages	Matlab, Maple, Maxima, Lua
Structured data	json

Hardware

Robotics	As part of _Carl Zeiss Project HeiAge_ I adapted a Festo pick-and-place robot with 6-axis force sensing handles to study human-robotic interaction during sit-to-stand
Fluid power	Canadian pneumatic and hydraulic technican's certificate (1998)
Metal Work	Experience using manual and CNC machining equipment that I've used to make a _impact wrench_ for piano tuning, a steadicam, a tibialis-posterior training machine, and _tech-art_.
Electronics	Spent my teenage years building mobile robots. Developed and taught a high-school level robotics course between 05/2002 - 08/2002

Interests

Table tennis	Active member of the Stuttgart Kickers since 2015
Weightlifting	Since a Canadian javelin thrower cannot throw in the winter

Extra

Mobility	Driving license class AM/B/L