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# Zoltán Derzsi

## Electronic Engineer and Neuroscientist

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I am a postdoc at NYU Abu Dhabi, working in the lab of Robert Volcic. I am using my skills in engineering and neuroscience to understand how humans interact with the world. I can program in many languages ranging from Assembly to JavaScript, and have experience with embedded systems, displays, computer vision and graphics.

As a scientist, I design my experiments and design my own experimental hardware. For scientific purposes, I use Matlab to develop my experiment, R to process my data, and Python/C to interact with hardware as required. I use many techniques to collect data, ranging from electrophysiology to psychophysics.

## EDUCATION

### **Institute of Neuroscience, Medical School, Newcastle University, UK**

*Wellcome Trust MRes/PhD Neuroscience*

September 2012 - November 2016

I improved the signal processing in EEG frequency tagging to find the spatio-temporal limits of human stereopsis, using a display device I built.

### **School of Electrical and Electronic Engineering, Newcastle University, UK**

*BEng Electronic Engineering*

September 2009 - June 2012

I studied analogue electronics, power electronics, RF engineering and embedded systems. My final-year project was a test rig for free-space optical communications.

## EMPLOYMENT

### Postdoctoral Associate, New York University Abu Dhabi, United Arab Emirates

January 2017 to date

I study the biomechanics of reaching and grasping. So far, this involved developing virtual reality, computer vision, machine learning and robotics applications that interact with humans.

## LIST OF PUBLICATIONS

### Peer-reviewed journal articles:

Derzsi, Z., & Volcic, R. (2023). Not only perception but also grasping actions can obey Weber's law. *Cognition*, 237, 105465

Derzsi, Z. (2022). EEG Response in Humans for Frequency-Tagged Anticorrelated Random-Dot Stereograms: Increased Coherency and Alpha Oscillations. *Frontiers in Neuroscience*, 1164

Derzsi, Z. (2021). Optimal Approach for Signal Detection in Steady-State Visual Evoked Potentials in Humans Using Single-Channel EEG and Stereoscopic Stimuli. *Frontiers in neuroscience*, 15, 91.

Derzsi, Z., & Volcic, R. (2018). MOTOM toolbox: MOtion Tracking via Optotrak and Matlab. *Journal of Neuroscience Methods*, 308, 129-134.

### Conferences:

Derzsi, Z., & Volcic, R. (2022). Grasping complies with Weber's law, when biomechanical factors are not in the way. *ECVP 2022 Nijmegen*

Derzsi, Z., & Volcic, R. (2020). Is grasping always immune to Weber's law?. *Journal of Vision*, 20(11), 991-991.

Derzsi, Z., & Volcic, R. (2019). Grasping complex 3D shapes. *Journal of Vision*, 19(10), 109d-109d.

Derzsi, Z., & Volcic, R. (2018). Getting started with the MOTOM toolbox—an Optotrak-Matlab interface: From the first beeps to fingertip tracking in virtual reality. *Journal of Vision*, 18(10), 58-58.

Derzsi, Z., Tarawneh, G., Alter, K., & Read, J. (2016). Event-related potentials (ERPs) at the onset of disparity gratings. *Journal of Vision*, 16(12), 845-845.

Derzsi, Z., Tarawneh, G., Alter, K., & Read, J. (2015). A stereoscopic look at frequency tagging: Is a single frequency enough?. In 38th European Conference on Visual Perception (ECVP). Newcastle University.

Derzsi, Z., Henriksen, S., & Read, J. (2013, October). Your Eyes Don't do the Math: Effect of Temporal Display Protocols on Perceived Brightness. In SMPTE 2013 Annual Technical Conference & Exhibition (pp. 1-15). SMPTE.

## **HARDWARE AND SOFTWARE**

### **General:**

3D design with CAD software (Autodesk Inventor, Blender), for 3D printing

Machining skills: Lathe, CNC mill, welding, brazing, soldering

Electronic and Printed Circuit Board design (Ultiboard, EAGLE)

Electrical grid design for domestic and entertainment applications

Stage lighting and rig design (DMX512, Martin intelligent lights, Futurelight consoles) RF and antenna design (VLF to about 2 GHz)

### **Self-developed systems used in research:**

*Motion trackers* - required electrical network and software (Oculus CV1, NDI Optotrak and NaturalPoint OptiTrack)

*Robotics* - Matlab interface for Universal Robots UR3e with instruction buffering server written in Python

*Microcontrollers* - closed-loop precision stimulus object rotator

*Analogue electronics* - low-latency optical coupling for CRT monitors with flicker rejection *High voltage, high EM field, safety applications* - Precision flash-gun for diffusion MRI imaging *Optics* - 3D-printed Wheatstone stereoscope with CRT monitors

*High-performance computing* - GPU acceleration, distributed computing for data analysis

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### **Programming languages:**

C, Python, C#, JavaScript, Matlab, R, Assembly (Z80, 8086, Iverson, PDP-7, Motorola 68000), PHP, MySQL, Pascal, UNIX Shell Script, Perl

### **Fluency with the following libraries and software packages:**

Matlab, Unity, TensorFlow, Plotly, DirectFB, OGRE, CST, RStudio, Visual Studio, MPLAB, PlatformIO, Tina, EWB, Ultiboard, Cadence, CUDA

### **Embedded linux:**

Custom kernel modules for Imagination Technologies' Meta processor

Kernel development on X86, ARMHF, ARM64, MIPSEL (PIC32), META architectures

Buildroot, system-on-chip hardware, design interface

LAMP, Cron, systemd, iptables

### **Notable GitHub repositories:**

MOTOM toolbox: MOTion Tracking with Optotrak and Matlab

<https://github.com/ha5dzs/motom-toolbox>

MacGyvering in vision science: Interfacing systems that are not supposed to work together

<https://github.com/ha5dzs/InvisibleMacGyver>

## **COMPETENCY IN DATA ACQUISITION TECHNIQUES**

Extracellular electrophysiology, Electromyography, Electrocardiography, Electroencephalography, Transcranial Magnetic Stimulation, Motion trackers, Psychophysics, Magnetic Resonance Imaging, Data collection (measurement) automation and scheduling, data scraping

## **INVITED TALKS, WORKSHOPS, CONSULTING**

2022:

Touching the boundary of human & machine -

NYUAD Psychology Seminars, New York University Abu Dhabi, UAE

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Grasping and Weber's law: why their relationship is complicated and what can we do about it -  
Sensorimotor Research Group, Institute of Biosciences, Newcastle University, UK

2020:

Measuring light from fluorescence - Project consultant for the NYUAD iGEM team

2019:

Hybrid vehicle and electromobility power systems - Project consultant for the NYUAD GHECC Hybrid Car Race team

MacGyvering in vision science: interfacing systems that are not supposed to work together - Workshop on the Vision Sciences Society annual meeting

2018:

Software-defined radios and direction finding - Lab for Instrumentation, Servos and Actuators teaching module

## **COURSES TAKEN**

Google - TensorFlow Development

CITI - Social and Behavioural Research

Jaheziya - Fire safety and First Aid

Dar Al Ber Society - The Key to Jannah (introduction to Islam)

UK Home Office ASPA - Modules 1-3: Animal Research

UK NVQ Level 2&3 Spectator Safety and Physical Intervention

UK NHS: Magnetic resonance safety and equipment operation

UK RSGB: Teaching Children and Vulnerable Adults

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## **TEACHING, MENTORING AND OUTREACH**

### **Invited guest lectures**

2019:

CSTS-UH 1010 Astronomy and Cosmology: From Big Bang to Multiverse: Software-Defined Radio Applications and Signal Processing (with Mallory Roberts)

PSYCH-UH 1004Q Statistics for Psychology: Reaching and Grasping: What We Can Measure and How (with Giulia Rossi)

2018:

ENGR-UH 3110 Instrumentation, Sensors Actuators: Electromagnetic Waves and Propagation (with Philip Panicker)

ENGR-UH 3110 Instrumentation, Sensors Actuators: Modulation and Signal Processing (with Philip Panicker)

### **Mentoring, supervision**

2022:

NYUAD engineering undergraduate: Lightning sensor project. This student has been accepted for a PhD position in Princeton. (with Mallory Roberts)

2019:

NYUAD engineering undergraduate: Building a low-cost turbodiostat. This student just finished a Masters in power systems in Southampton, UK. (with Andras Gyorgy)

2017:

Newcastle University Wellcome Trust PhD student: Auditory neuroscience: This student is now a Postdoc in Glasgow, in the same field.

2016:

Newcastle University undergraduate medical student: Human EEG acquisition and signal processing. This student is now a practicing MD.

Outreach talks and events

2020:

Math and Applications made easy for kids: Money. Have it? Don't have it? Now What? / Data interpretation and Statistics: Making the Sense Out of the World in the Era of Fake News - SITE Research Center for Stability, Instability and Turbulence, NYUAD

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2018:

Emirates Amateur Radio Society: NYUAD Radio Direction Finding event: Invited distinguished members from around the UAE, and found hidden radio transmitters on campus

**PROFESSIONAL AFFILIATIONS AND MEMBERSHIPS** New York Academy of Sciences - member

TensorFlow Developer network - member

Telecommunications and Digital Regulatory Authority, UAE - named academic contact

Vision Sciences Society - member

### **GRANTS AND AWARDS**

2022 - Grant for becoming a certified TensorFlow developer

2021 - Awarded with the UAE Golden Visa for cross-disciplinary activities and impact

2020 - Publication support grant, New York University Abu Dhabi

2018 - Emirates Amateur Radio Society: Appreciation Award

2018 - Overseas travel grant for a conference  
2017 - Hardware grant from Facebook: Oculus CV1 Virtual Reality System  
2016 - NVIDIA grant: Tesla K40 GPU so I can process signals faster in CUDA  
2014 - Three minute thesis competition (local) - Won  
2013 - Biotech YES (regional) - 2nd  
2012 - IEEE Student Branch, Newcastle - Presentation award

## **OTHER SKILLS**

Amateur radio operator, wireless communication specialist. QRZ: A65FH/M0MBA/HA5DZS Bus and coach driver

Registered first aider; health and safety officer

Spoken languages: Hungarian (native), English (fluent), German (beginner), Arabic (beginner), Russian (elementary), Mandarin (elementary)

HVAC and Refrigeration specialist, up to 50kW thermal capacity