

Pedro Lopes

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Curriculum Vitae

Research: interactive systems that overlap with the user's body

In my research, I **engineer interactive devices that overlap with the user's body**. These devices are the natural succession to wearable interfaces and investigate how our future interfaces will connect to our body in a more direct and personal way.

During my PhD I explored a subset of this concept: interactive devices that **interface with the user's muscles**. These devices actuate the user's body by means of computer-controlled electrical muscle stimulation (EMS). My devices form two main categories: (1) Devices that **allow users eyes-free access to information** by means of their proprioceptive sense, such as a variable, a tool, or a graph. (2) Extremely small haptic devices that **increase immersion in virtual reality by simulating large forces**, such as wind, physical impact, or walls and heavy objects.

Education

- 2019 **Assistant Professor at University of Chicago**
Department of Computer Science
- 2018 PhD at Hasso Plattner Institute (Degree in Computer Science)
Thesis: "Interactive Systems based on Electrical Muscle Stimulation"
Advisor: Prof. Patrick Baudisch
- 2010 MSc at Technical University of Lisbon (#1 Computer Science Degree in Portugal)
Thesis: "Multitouch DJing" (top of year, grade A+)
Advisors: Prof. Alfredo Ferreira, Prof. João Pereira

CHI & UIST full papers

ACM CHI/UIST are the top-tier publications in Human Computer Interaction (20-25% acceptance rate).

- [11] Adding Force Feedback to Mixed Reality Experiences and Games using Electrical Muscle Stimulation.
Pedro Lopes, Sijing You, Alexandra Ion, and Patrick Baudisch.
In Proc. CHI'18, Paper 446.
- [10] Providing Haptics to Walls & Heavy Objects in Virtual Reality by Means of Electrical Muscle Stimulation.
Pedro Lopes, Sijing You, Lung-Pan Cheng, Sebastian Marwecki, and Patrick Baudisch.
In Proc. CHI'17, pg. 1471-1482.
- [9] Muscle-plotter: An Interactive System based on Electrical Muscle Stimulation that Produces Spatial Output.
Pedro Lopes, Doga Yüksel, François Guimbretière, and Patrick Baudisch.
In Proc. UIST '16, pg. 207-217.
- [8] Impacto: Simulating Physical Impact by Combining Tactile Stimulation with Electrical Muscle Stimulation. **[Best Talk Nomination]**
Pedro Lopes, Alexandra Ion, and Patrick Baudisch.
In Proc. UIST '15, pg. 11-19.
- [7] Affordance++: Allowing Objects to Communicate Dynamic Use. **[CHI Best Paper Award, top 1%]**
Pedro Lopes, Patrik Jonell, and Patrick Baudisch.
In Proc. CHI '15, pg. 2515-2524.
- [6] Proprioceptive Interaction. **[Best Talk award]**
Pedro Lopes, Alexandra Ion, Willi Mueller, Daniel Hoffmann, Patrik Jonell, and Patrick Baudisch.
In Proc. CHI '15, pg. 939-948.

Interactive Systems based on EMS (1st author)

- [5] Gesture output: eyes-free output using a force feedback touch surface. Anne Roudaut, Andreas Rau, Christoph Sterz, Max Plauth, **Pedro Lopes**, and Patrick Baudisch. *In Proc. CHI '13*, pg. 2547-2556.
 - [4] Haptic turk: a motion platform based on people. Lung-Pan Cheng, Patrick Lühne, **Pedro Lopes**, Christoph Sterz, and Patrick Baudisch. *In Proc. CHI '14*, pg. 3463-3472.
 - [3] Metamaterial Textures. Alexandra Ion, Robert Kovacs, Oliver Schnider, **Pedro Lopes**, Patrick Baudisch. *In Proc. CHI'18*. (to appear May 2018)
 - [2] Metamaterial Mechanisms. **[UIST Honourable Mention, top 5%]** Alexandra Ion, Johannes Frohnhofen, Ludwig Wall, Robert Kovacs, Mirela Alistar, Jack Lindsay, **Pedro Lopes**, Hsiang-Ting Chen, and Patrick Baudisch. *In Proc. UIST '16*, pg. 529-539.
 - [1] Interactive construction: interactive fabrication of functional mechanical devices. Stefanie Mueller, **Pedro Lopes**, and Patrick Baudisch. *In Proc. UIST '12*, pg. 599-606.
- } Haptics
 } Fabrication

CHI & UIST short papers

- [2] Muscle-propelled force feedback: bringing force feedback to mobile devices. **Pedro Lopes** and Patrick Baudisch. *In Proc. CHI '13*, pg. 2577-2580. **[IEEE World Haptics, People's Choice Nomination for Best Demo]**
- [1] Let's kick it: how to stop wasting the bottom third of your large screen display. Ricardo Jota, **Pedro Lopes**, Daniel Wigdor, and Joaquim Jorge. *In Proc. CHI '14*, pg. 1411-1414.

Magazine Publications

- [2] Interactive Systems based on Electrical Muscle Stimulation. **Pedro Lopes** and Patrick Baudisch. *In IEEE Computer*, Feature Article, Volume: 50, Issue: 10, 2017.
- [1] Immense Power in a Tiny Package: Wearables Based on Electrical Muscle Stimulation. **Pedro Lopes** and Patrick Baudisch. *In IEEE Pervasive Computing*, Feature Article, Volume: 16, Issue: 3, 2017.

Further peer-reviewed publications in HCI

- [7] Interacting with Wearable Computers by means of Functional Electrical Muscle Stimulation. **Pedro Lopes** and Patrick Baudisch. *In Proc. NAT '17 (Neuroadaptive Technology)*, pg. 118. **[NAT'17 Best Talk award]**
- [6] Ricardo Jota, **Pedro Lopes**, and Joaquim Jorge. 2012. I, the device: observing human aversion from an HCI perspective. *In Proc. CHI EA'12*, pg. 261-270.
- [5] Augmenting touch interaction through acoustic sensing, **Pedro Lopes**, Ricardo Jota, Joaquim Jorge, *In Proc. ITS'11 (Interactive Tabletops and Surfaces)*, pg. 53-56.
- [4] Hands-on interactive tabletop LEGO application, Daniel Mendes, **Pedro Lopes** and Alfredo Ferreira. *In Proc. ACE'11 (Advances in Computer Entertainment)*, Article 19, 8 pages.
- [3] Combining bimanual manipulation and pen-based input for 3D modelling. **Pedro Lopes**, Daniel Mendes, Bruno Araújo, and Joaquim Jorge. *In Proc. SBIM'11 (Sketch-Based Interfaces and Modelling)*, pg. 15-22.
- [2] Battle of the DJs: an HCI Perspective of Traditional, Virtual, Hybrid and Multitouch DJing. **Pedro Lopes**, Alfredo Ferreira, and João Pereira. *In Proc. NIME'11 (New Interfaces for Musical Expression)*.
- [1] Multitouch interactive DJing surface. **Pedro Lopes**, Alfredo Ferreira, and João Pereira. *In*

Invited Talks

2018

- [35] UCSD (ECE & Design Lab), San Diego (hosted by Scott Klemmer & William G. Griswold)
- [34] UCSB, Santa Barbara (hosted by Tim Sherwood & Matthew Turk)
- [33] UCLA, Los Angeles (hosted by Paulo Tabuada & Asad Abidi)
- [32] Cornell, Ithaca (hosted by François Guimbretière & José Martínez)
- [31] Cornell Tech, NYC (hosted by Vikram Krishnamurthy)
- [30] Princeton University (hosted by Adam Finkelstein)
- [29] University of Chicago (hosted by Blase Ur)
- [28] University College London (hosted by Nicolai Marquardt)
- [27] TU Delft (hosted by Gerd Kortuem)

2017

- [26] MIT Media Lab (hosted by Hiroshi Ishii)
- [25] Berkeley (hosted by John Chuang)
- [24] Stanford University (hosted by Sean Follmer)
- [23] Tufts University (hosted by Robert J.K. Jacob)
- [22] MIT CSAIL (hosted by Stefanie Mueller)
- [21] Columbia University, NYC (hosted by Steven K. Feiner)
- [20] University of Tokyo (hosted by Jun Rekimoto & Masahiko Inami)
- [19] Toronto University (hosted by Daniel Widgor)
- [18] McGill University, Montreal (hosted by Jeremy Cooperstock)
- [17] Tech3Lab, HEC, Montreal (hosted by Élise Labonte-LeMoyne)
- [16] SFC, KEIO University, Yokohama (hosted by Yasuaki Kakehi)
- [15] KMD, School of Media Design, KEIO University, Yokohama (hosted by Kai Kunze)
- [14] Digital Nature Group, University of Tsukuba (hosted by Yoichi Ochiai)
- [13] Electro-Communications University, Tokyo (hosted by Hiroyuki Kajimoto)
- [12] Dagstuhl Seminar (hosts Anind K. Dey, Kai Kunze, Jun Rekimoto)

2016

- [11] Neuroimaging Group, Free University, Berlin (hosted by Felix Blankenburg)
- [10] Print Screen Festival, Tel Aviv (hosted by Lior Zalmanson)
- [9] "Die, and become! Art and Science", Laznia, Gdansk (hosted by Dmitry Bulatov)
- [8] Institute of Experimental Design and Media Cultures, Basel (hosted by S. Hertrich)
- [7] ACM CHI Doctoral Consortium (led by Ivonne Rodgers, Hilary Hutchinson, Alan Borning)

2015-2013

- [6] University of Tokyo, Japan (hosted by Jun Rekimoto & Takeo Igarashi)
- [5] Sketching in Hardware conference, Berlin (hosted by Mike Kuniavsky)
- [4] NODE'15 Conference, Frankfurt
- [3] University of Stuttgart (hosted by Albrecht Schmidt)
- [2] Campus Party 2012, Berlin, Germany
- [1] Technical University, Berlin (hosted by Katrin Wolf)

Prizes and Awards

- [10] **Best Paper award**, ACM CHI'15
- [9] **Best Paper Nomination**, ACM UIST'16
- [8] **Best Talk award**, ACM CHI'15

- [7] **Best Talk award**, Neuroadaptive Technologies'17
- [6] **Best Demo Nomination**, IEEE World Haptics'13
- [5] **Best Talk Nomination**, ACM CHI'15
- [4] **Best Talk Nomination**, ACM UIST'15
- [3] **VIDA.16 Incentive Award**, for Ad Infinitum
(Art/Science Award by Telefonica Foundation)
- [2] **Scholarship** for the Teaching International Professionals (1 year long didactics course at University of Potsdam)
- [1] **ACM CHI & UIST "High Quality Reviewer Distinction"** (2014-17)

Workshops & Courses organized at Conferences

- [2] Hands-on course: "Electrical Muscle Stimulation", ACM CHI'16
(~40 participants, HCI researchers & scientists)
- [1] Hands-on course: "Electrical Muscle Stimulation as Haptics", IEEE World Haptics'15 (~20 participants, HCI researchers & scientists)

Demos at Conferences

- [8] ACM SIGGRAPH 2017
- [7] ACM CHI 2017
- [6] NeuroAdaptive Technology 2017
- [5] IEEE World Haptics 2017
- [4] ACM UIST 2015
- [3] ACM CHI 2013
- [2] IEEE World Haptics 2013 [**Best Demo People's Choice Nomination**]
- [1] ACM Augmented Human 2013

Artwork

- [7] **Ad Infinitum**, Ars Electronica'17, Linz
- [6] **Ad Infinitum**, Science Gallery Dublin
- [5] **Ad Infinitum**, World Economic Forum, San Francisco
- [4] **Ad Infinitum**, Natural History Museum, Bern
- [3] **Conductive Ensemble**, Print Screen Festival, Tel Aviv & Disruption Network Lab, Berlin
- [2] **Conducting the Amplified Body**, Pedro Lopes & Michaela Davies, ACUD Macht Neu, Berlin
- [1] **Affordance++**, Laznia Centre for Contemporary Art, Gdansk

Impact

My work has captured the interest of media outlets, such as MIT Technology Review, NBC, Discovery Channel, NewScientist and Wired. My research videos have more than 500k views on YouTube.

My research has been integrated into syllabi: Columbia University (COMS W4170), Carnegie Mellon University (SSUI, 05-431), University of Washington (HCID 520), MIT (6.S063), McGill University (ECSE 424/542), University of Tsukuba (AIST), Whitman College (CS 200A), and Aalto University (CS-C3120).

In 2016, my work was the focus of the ACM UIST Student Innovation Contest (sponsored by Google). During this contest, 18 teams utilized an open-source electrical muscle stimulation kit, which I co-authored, to create their interactive prototypes. The final prototypes were demonstrated to ~600 attendees during the conference in Tokyo, Japan. This opportunity generated a lot of visibility to my work.

Program Committee

- [10] Program Committee Member for ACM CHI'19
- [9] Program Committee Member for ACM UIST'18
- [8] Program Committee Member for ACM CHI'18
- [7] Program Committee Member for IEEE VR'18
- [6] Program Committee Member for ACM Pervasive Displays'18
- [5] Program Committee Member for ACM EICS'18
- [4] Program Committee Member for IEEE AIVR'18
- [3] Best Paper Committee for ACM UIST'17
- [2] Program Committee Member for ACM UIST'17
- [1] Program Committee Member for Desform'17

Organizing Committee

- [5] Demo Chair for ACM MobileHCI'19
- [4] Student Innovation Contest Chair for ACM UIST'17
- [3] Student Design Challenge Chair for ACM TEI'17
- [2] Student Innovation Contest Chair for ACM UIST'16
(In this contest 18 teams used my EMS hardware)
- [1] Proceedings Chair for ACM UIST'13

Publication Editor

- [2] Guest editor for ACM XRDS, Virtual Reality issue, 2016.
- [1] Digital Content Editor, ACM XRDS Magazine 2014-2017

Research Assistant and Grants

- 2011 Research Assistant at INESC-ID & Technical University of Lisbon
Project: "Large-scale Multitouch Tabletops", a **FP7 European funded (EU grant)**
Research supervisor: Joaquim Jorge

Teaching experience at University level

Graduate-level lectures (90min)

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| [13] | "Microphones as Input", Hasso Plattner Institute | 2018 |
| [12] | "Muscle and Brain Computer Interfaces", Hasso Plattner Institute. | 2018 |
| [11] | "Muscle and Brain Computer Interfaces", Hasso Plattner Institute. | 2017 |
| [10] | "Muscle I/O and Brain I/O", guest-lecture, McGill University (host: J. Cooperstock) | 2017 |
| [9] | In-class "EMS demonstration", MIT CSAIL (host: Stefanie Mueller) | 2017 |
| [8] | "Muscle and Brain Computer Interfaces", Hasso Plattner Institute | 2016 |
| [7] | "Microphones as Input", Hasso Plattner Institute | 2016 |
| [6] | "Muscle and Brain Computer Interfaces", Hasso Plattner Institute | 2015 |
| [5] | "Microphones as Input", Hasso Plattner Institute | 2015 |
| [4] | "Muscle-computer Interfaces", Hasso Plattner Institute | 2014 |
| [3] | "Audio as Input", Hasso Plattner Institute | 2014 |
| [2] | "Muscle-computer Interfaces", Hasso Plattner Institute | 2013 |
| [1] | "Audio Interaction", Hasso Plattner Institute | 2013 |

Undergraduate-level lectures (3h, in-class programming & assignments)

- [4] "Dataflow programming & signal processing", Hasso Plattner Institute 2015
- [3] "Dataflow programming & signal processing", Hasso Plattner Institute 2014
- [2] "Dataflow programming & signal processing", Hasso Plattner Institute 2013
- [1] "Dataflow programming & signal processing", Lusófona University (2 day workshop) 2013

Education in Pedagogy

- 2014 Teaching International Professionals at University of Potsdam
(1-year long, workshop-based course, including peer-evaluation of lectures)

Teaching Assistant

- 2012-2017 Prof. Patrick Baudisch's "Building Interactive Devices" at Hasso Plattner Institute

Advising

Co-advised Master students (with Patrick Baudisch, 6 months, full time)

- [3] Sijing You, Master Thesis (published CHI'17)
Student finished with A+, Hasso Plattner Institute, 2017
- [2] Doga Yüksel, Master Thesis (published UIST'16)
Student finished with A+, Technical University Berlin, 2016
- [1] Patrik Jonell, Master Thesis (published at CHI'15 with Best Paper Award)
Student finished with A+, Technical University Berlin, 2015

Co-advised Project Seminar students (one teaching term, ~2 days a week)

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| [18] Sijing You | 2015 | [9] Alex Teibrich | 2013 |
| [17] Friedrich Horschig | 2015 | [8] Stefanie Müller | 2013 |
| [16] Martin Fritzsche | 2014 | [7] Marius Knaust | 2013 |
| [15] Maximilian Schneider | 2014 | [6] Markus Dreseler | 2013 |
| [14] Willi Müller | 2014 | [5] Patrick Lühne | 2013 |
| [13] Daniel Hoffmann | 2014 | [4] Fabian Bornhofen | 2012 |
| [12] Lars Butzmann | 2013 | [3] Anton Gulenko | 2012 |
| [11] Dustin Beyer | 2013 | [2] Lars Wassermann | 2012 |
| [10] Bernhard Rabe | 2013 | [1] Lena Herscheid | 2012 |

Teaching experience outside academia

- [7] "Microphones as weird but fun game controllers" (A MAZE Festival, Berlin) 2016
- [6] "Experimental turntablism" lecture & demonstration, (Brno) 2016
- [5] "Audio Spatialization" lecture & demonstration, (Knockdown Center, NYC) 2015
- [4] "EMS & Electronics" workshop for dancers (Transmediale Vorspiel, Berlin) 2015
- [3] "EMG sensors & electronics" for elders/middle-age (Hacking Health, Berlin) 2014
- [2] "EMS & Electronics" at Ig4mer (World-wide game Hackathon, Paris) 2014
- [1] "Sound-processing and programming" for visual artists (Werkstatttraum, Berlin) 2013

Reviewing

I regularly review for the following conferences: CHI, UIST, World Haptics, Haptics Symposium, EuroHaptics, TEI, DIS, ITS, MobileHCI, EICS, IUI, NIME.

Session chair & moderator

- [3] "Force Feedback in VR" paper session at CHI 2018
- [2] "Circuits" paper session at UIST 2017
- [1] "Haptic Feedback" paper session at CHI 2017

Extra-curricular education via MOOCs

- 2018 Fundamentals of Biomedical Imaging II(NMR, MRT, fMRI, BOLD)
(Biomedical Eng. Master's course, EPFL, Prof. Gruetter Rolf)
- 2017 Cellular Mechanisms of Brain Function
(Neuroscience Master's course, EPFL, Prof. Carl Petersen)
- 2017 Deep Learning in Python
(Datacamp, Dan Becker)
- 2017 Philosophy of Technology and Design
(University of Twente, Prof. Peter-Paul Verbeek)
- 2017 Fundamentals of Biomedical Imaging I (X-Ray, CT, PET, SPECT)
(Biomedical Eng. Master's course, EPFL, Prof. Gruetter Rolf)
- 2015 Fundamentals of Electrical Engineering (theory + lab assignments)
(Rice University ELEC 241, Undergraduate course, Prof. Don H. Johnson)

References

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