Gerard Encina-Llamas

curriculum vitae

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I am a hearing science researcher specialised in human electrophysiology and computational audiology modelling. I have oriented my research towards understanding the underlying pathologies of peripheral hearing disorders beyond audiometry, and the neuronal representation of sound in the normal and the impaired systems. I am curious about the connection between neuronal representation and EEG, and how this translates into perception. For this, I have focused recently on exploring the use of machine-learning and deep-learning tools to improve the prediction of auditory evoked potentials and perception, with the goal of improved and personalised audiological diagnostics. My main motivation is to help people suffering from hearing difficulties by proposing new methods to diagnose and address their particular disorder. I really enjoy accompanying younger scientists and students in the process of learning about audiology and hearing science, either through project supervision or in the form of lectures.

Education

2014–2017 **Ph.D., Electrical Engineering**,
Technical University of Denmark (DTU), Kongens Lyngby (Denmark).
Hearing Systems group, Department of Electrical Engineering.
PhD thesis: *Characterizing hearing impairment using advanced electrophysiological methods*
Supervised by: Prof. Torsten Dau, Dr. James M. Harte and Assoc. Prof. Bastian Epp.

2011–2013 **M.Sc., Engineering Acoustics**,
Technical University of Denmark (DTU), Kongens Lyngby (Denmark).
MSc thesis: *Estimates of peripheral compression using multi-frequency auditory steady-state responses.*

2008–2009 **Master in Architectural and Environmental Acoustics** (non-official degree),
Universitat Ramon Llull - La Salle (URL), Barcelona (Catalonia - Spain).
Thesis: *Acoustical evaluation and optimization of the theater at the Popular Athenaeum in Nou Barris in Barcelona.*

2004–2008 **B.Sc., Sound and Image Telecommunication engineering**,
Universitat Politècnica de Catalunya (UPC), Terrassa (Catalonia - Spain).
BSc thesis at Høgskolen i Sør-Trøndelag (currently NTNU), Trondheim (Norway): *Optimizing sound quality and radiation patterns in an acrylic DML panel.*

Experience

Academic experience

2017– **Post-doctoral researcher**,
Technical University of Denmark (DTU), Kongens Lyngby (Denmark).
Hearing Systems section, Department of Health Technology.
Project: Uncovering Hidden Hearing Loss (UHEAL)

2016–2016 **Visiting researcher**,
Boston University (BU), Boston, Massachusetts (USA).
Center of Computational Neuroscience and Neural Technology (CompNet). Granted through the Erasmus Mundus Auditory Cognitive Neuroscience Student Exchange Network program
Supervised by: Prof. Barbara Shinn-Cunningham

2013–2014 **Research assistant**,
Technical University of Denmark (DTU), Kongens Lyngby (Denmark).
Hearing Systems group, Department of Electrical Engineering

Other professional experience

2022–2022 **Senior DSP engineer**,
Demant A/S, Smørum (Denmark).
Design, development, testing and verification of signal processing algorithms for the development of cutting-edge hearing aids.

2012 **Literature research**, *GN Store Nord A/S*, Ballerup (Denmark).
Literature research project on the *Effects and benefits in workers of reducing noise in open-plan offices*.

2009–2011 **Technical acoustic engineer**,
Applus Norcontrol S.L.U., Rubí (Catalonia - Spain).
Performance of different types of architectural and industrial acoustic measurements (e.g., sound insulation, reverberation time, vibrations, etc), analysis of the results, evaluation according to local legislation and writing of technical reports.

2006–2007 **Technical telecommunication engineer (Student job)**,
Abertis Telecom, Barcelona (Catalonia - Spain).
Administration of corporate system databases and internal error reporting tasks. Updating and reviewing of internal software tutorials.

Publications

Peer-reviewed journal articles

2022 Märcher-Rørsted, J., Encina-Llamas, G., Dau, T, Liberman, M. C., Wu, P., and Hjortkjær, J. (**2022**). "Age-related reduction in frequency-following responses as a potential marker of cochlear neural degeneration", *Hear. Res.*, DOI: 10.1016/j.heares.2021.108411.

2021 Encina-Llamas, G., Dau, T., and Epp, B. (**2021**). "On the Use of Envelope Following Responses to Estimate Peripheral Level Compression in the Auditory System", *Sci. Rep.*, DOI: 10.1038/s41598-021-85850-x.

2021 Encina-Llamas, G. and Epp, B. (**under review**). "A mouse version of a computer model of the auditory nerve", *J. Neural. Eng.*.

2020 Encina-Llamas, G., Lindahl, J. C. T., and Epp, B. (**pre-print**). "Rate and synchrony at the level of the auditory nerve are not sufficient to account for behaviorally estimated cochlear compression - a modeling study", *MedRxiv*, DOI: 10.1101/2020.04.06.20055855.

2019 Encina-Llamas, G., Harte, J. M., Dau, T., Shinn-Cunningham, B. G., and Epp, B. (**2019**). "Investigating the Effect of Cochlear Synaptopathy on Envelope Following Responses using a Model of the Auditory Nerve", *J. Assoc. Res. Otolaryngol. - JARO*, DOI: 10.1007/s10162-019-00721-7.

Peer-reviewed conference articles

2020 Lindahl, J. C. T., Encina-Llamas, G., and Epp, B. (**2020**). Analysis of a forward masking paradigm proposed to estimate cochlear compression using an AN model and signal detection theory., *Proceedings of the International Symposium on Auditory and Audiological Research - ISAAR (2019)*.

2015 Encina-Llamas, G., Harte, J. M., Epp, B., and Dau, T. (**2015**). Evaluation of peripheral compression and auditory nerve fiber intensity coding using auditory steady-state responses., *Proceedings of the International Symposium on Auditory and Audiological Research - ISAAR (2015)*.

Book chapters

2022 **Manual de audiología laboral**, (**2022**), coordinado por el Dr. Javier Mata Peñuela. Capítulo 18: Nueva evidencia sobre la hipoacusia por ruido: la hipoacusia oculta, por Gerard Encina-Llamas. *Handbook on occupational audiology, Chapter 18: New evidence of noise-induced hearing loss: hidden hearing loss*, Editorial: Lettera Publicaciones. ISBN: 978-84-121623-5-6.

Conference papers, abstracts and posters

2022 Temboury-Gutiérrez, M., Märcher-Rørsted, J., Hjortkær, J., Encina-Llamas, G., and Dau, T. (**2022**). Peripheral versus central components of the age-related reduction of the frequency following response., *Association for Research in Otolaryngology - ARO,* 45^{th} *Mid-Winter Meeting*, San José, CA (USA).

2022 Märcher-Rørsted, J., Hjortkær, J., Encina-Llamas, G., Dau, T, and Heinz, M. G. (**2022**). Interactions between peripheral and central measures of temporal coding in a chinchilla model of noise-induced cochlear synaptopathy., *Association for Research in Otolaryngology - ARO,* 45^{th} *Mid-Winter Meeting*, San José, CA (USA).

2021 Sánchez-López, R and Encina-Llamas, G. (**2021**). Exploring auditory mechanisms of loudness. A modelling study on loudness-related deficits observed in different auditory profiles., *International Symposium on Auditory and Audiological Research - ISAAR (2021)*, Nyborg, (Denmark).

2021 Märcher-Rørsted, J., Temboury-Gutiérrez, M., Encina-Llamas, G., Dau, T., and Hjortkjær, J. (**2021**). Investigating peripheral contributions to the frequency following response using electrocochleography., *International Symposium on Auditory and Audiological Research - ISAAR (2021)*, Nyborg, (Denmark).

2021 Märcher-Rørsted, J., Encina-Llamas, G., Dau, T., and Hjortkjær, J. (**2021**). Age-related reduction in frequency-following responses and its connection to peripheral neural degeneration., *Association for Research in Otolaryngology - ARO,* 44^{th} *Mid-Winter Meeting*, Virtual.

2020 Encina-Llamas, G., Lindahl, J. C. T., and Epp, B. (**2020**). A Modeling Analysis of a Forward Masking Paradigm Proposed to Estimate Cochlear Compression (EFR)., *Association for Research in Otolaryngology - ARO,* 43^{rd} *Mid-Winter Meeting*, San José, CA (USA).

2019 Encina-Llamas, G., Dau, T., Harte, J. M., and Epp, B. (**2019**). The Effect of Masking Noise on the Envelope Following Responses (EFR)., *Association for Research in Otolaryngology - ARO,* 42^{nd} *Mid-Winter Meeting*, Baltimore, MD (USA).

2018 Encina-Llamas, G., Dau, T., Harte, J. M., and Epp, B. (**2018**). A mouse model of the auditory nerve to study cochlear synaptopathy., *Association for Research in Otolaryngology - ARO,* 41^{st} *Mid-Winter Meeting*, San Diego, CA (USA).

2018 Parthasarathy, A., Encina-Llamas, G., and Kujawa, S. G. (**2018**). Exaggerated temporal processing deficits as animals age after synaptopathic noise., *Association for Research in Otolaryngology - ARO,* 41^{st} *Mid-Winter Meeting*, San Diego, CA (USA).

2017 Encina-Llamas, G., Parthasarathy, A., Harte, J. M., Dau, T., Kujawa, S. G., Shinn-Cunningham, B., and Epp, B. (**2017**). Hidden hearing loss with envelope following responses (EFRs): The off-frequency problem., *Association for Research in Otolaryngology - ARO,* 40^{th} *Mid-Winter Meeting*, Baltimore, MD (USA).

2017 Parthasarathy, A., Encina-Llamas, G., Shinn-Cunningham, B., and Kujawa, S. G. (**2017**). Temporal processing deficits due to noise-induced synaptopathy studied using envelope following responses., *Association for Research in Otolaryngology - ARO,* 40^{th} *Mid-Winter Meeting*, Baltimore, MD (USA).

2016 Encina-Llamas, G., Dau, T., Harte, J.M., and Epp, B. (**2016**). Using auditory steady-state responses to evaluate auditory nerve integrity in normal-hearing and mild hearing-impaired listeners., *Association for Research in Otolaryngology - ARO,* 39^{th} *Mid-Winter Meeting*, San Diego, CA (USA).

2015 Encina-Llamas, G., Harte, J.M., Dau, T., and Epp, B. (**2015**). Evaluation of cochlear processing and auditory nerve fiber intensity coding using auditory steady-state responses (ASSR)., *XXIV Biennial Symposium of the International Evoked Response Audiometry Group - IERASG*, Busan, (South Korea).

2014 Encina-Llamas, G., Epp, B., and Dau, T. (**2014**). Comparison of peripheral compression estimates using auditory steady-state responses (ASSR) and distortion product otoacoustic emissions (DPOAE)., *Association for Research in Otolaryngology - ARO,* 37^{th} *Mid-Winter Meeting*, San Diego, CA (USA).

Graduate advising and Teaching experience

Ph.D. supervision

2018 **Jonatan Märcher-Rørsted**, *Behavioural and electrophysiological correlates of synaptopathy*, Hearing Systems section, Technical University of Denmark (DTU).
Expected thesis completion: Mid of 2022.

2020 **Miguel Temboury Gutiérrez**, *Computational modeling of auditory evoked potentials in the hearing-impaired system*, Hearing Systems section, Technical University of Denmark (DTU).
Expected thesis completion: End of 2023.

2017 **Pernille Holtegaard**, *Perceptual consequences of noise-induced neural degeneration in humans*, Hearing Systems section, Technical University of Denmark (DTU).
Expected thesis completion: Mid of 2022.

Supervision of BSc, MSc and special projects

2022 2021 **Jens C. T. Lindahl**, *Simulating perceptual tasks with deep neural networks to improve diagnostics of hearing impairment*, Hearing Systems section, Technical University of Denmark (DTU).
MSc thesis (30 ECTS).

2021 2020 **Teresa Maria Clausen-Gallo & Mercedes Christensen Duvig**, *Connection between synaptopathy and tinnitus in humans*, Hearing Systems section, Technical University of Denmark (DTU).
MSc thesis (30 x 2 ECTS).

2020 2020 **Miguel Temboury Gutiérrez**, *Quantitative modeling of auditory brainstem responses in normal-hearing and hearing-impaired listeners*, Hearing Systems section, Technical University of Denmark (DTU).
MSc thesis (35 ECTS).

2019 2019 **Jens C. T. Lindahl**, *Interpreting psychoacoustically estimated processing mechanisms using a model of the auditory nerve and signal detection theory*, Hearing Systems section, Technical University of Denmark (DTU).
BSc thesis (15 ECTS).

2017 **Paolo A. Mesiano**, *Electrophysiological correlate of masking release using a high-density EEG system*, Hearing Systems section, Technical University of Denmark (DTU).
Special project (5 ECTS).

2015 **Tommy Hardman**, *Performance evaluation of a complex principal component analysis (cPCA) for multi-channel EEG data*, Hearing Systems section, Technical University of Denmark (DTU) in collaboration with the University of Southampton (UK).
Special project (5 ECTS).

2014

David Hülsmeier, *A measurement framework of acoustic signals emitted from the inner ear of humans*, Hearing Systems section, Technical University of Denmark (DTU).
8-weeks summer internship.

Teaching

2021
2014

Auditory signal processing and perception, *MSc course in the Engineering Acoustics program*, Planning, preparation, conducting and evaluation of the lab exercises and corresponding lectures on Neural Modelling and Basilar Membrane Modelling.
10 ECTS course

2020
2015

Technical audiology and experimental hearing science, *MSc course in the Engineering Acoustics program*, Planning and project proposal, supervision and evaluation of several projects and corresponding lectures on this 3-weeks intensive project-based course.
5 ECTS course

2018

Fundamentals of acoustics and noise control, *MSc course in the Engineering Acoustics program*, Lecture on Physiological acoustics.
10 ECTS course.

Invited talks

2022 **Estimates of cochlear compression using envelope following responses: experimental results versus computational models** (*Estimación de la compresión coclear usando respuestas de seguimiento de la envolvente: datos experimentales contra modelos computacionales*), *73rd National Congress of Spanish Society ENT (SEORL-CCC)*, Las Palmas de Gran Canaria, Canary Islands, (Spain).

2022 **Uncovering hidden hearing loss: The UHEAL project** (*Descubriendo la hipoacusia oculta: El proyecto UHEAL*), *73rd National Congress of Spanish Society ENT (SEORL-CCC)*, Las Palmas de Gran Canaria, Canary Islands, (Spain).

2022 **A mouse model of the auditory nerve**, *Workshop on Computations in the Auditory Periphery - Physiological Foundations and Comparative Modeling (Hanse-Wissenschaftskolleg | Institute for Advanced Study)*, Delmenhorst, (Germany).

2022 **Auditory pathology and occupational sound exposure: Hidden hearing** (*Patología auditiva y exposición laboral: La hipoacusia oculta*), *XII Congreso Español de Medicina y Enfermería del Trabajo (CEMET)*, Madrid, (Spain).

2022 **Cochlear synaptopathy** (*La sinaptopatia coclear*), *Seminar at the Otolaryngology department at the University Hospital Germans Trias i Pujol*, Badalona, (Catalonia - Spain).

2022 **Auditory pathology of sound exposure and loud sounds: Hidden hearing loss** (*Patología auditiva por exposición al ruido y sonidos fuertes: La hipoacusia oculta*), *World Hearing Day. Round table at the Asociación Española de Audiología (AEDA) (Día Mundial de la Audición. Mesa redonda de AEDA)*, Online meeting.

2022 **Re-interpreting experimental results with computer model simulations: the case of a peripheral compression study**, *Young investigator symposia at the Association for Research in Otolaryngology - ARO,* 45^{th} *Mid-Winter Meeting*, San José, CA (USA).

2021 **Frequency following responses as a biomarker of peripheral neural degeneration** (*Las respuestas seguidoras de la frecuencia como biomarcadores de la degeneración neuronal periférica*), *XVII Congreso Nacional de la Asociación Española de Audiología (AEDA)*, Granada (virtual), (Spain).

2019 **Investigating cochlear synaptopathy using envelope following responses**, *Frequency Following Responses (FFR) Workshop*, University College of London, (UK).

2019 **Investigating cochlear synaptopathy using envelope following responses**, *The Auditory Seminar - Invited by Prof. Dr. Pim van Dijk*, University Medical Center of Groningen, (The Netherlands).

2018 **Investigating cochlear synaptopathy using envelope following responses**, *Dansk Teknisk Audiologisk Selskab (DTAS)*, Vejlefjord, (Denmark).

Professional memberships & Editorial work

2020 **Auditio - Spanish Journal of Audiology**, Associate editor.

2021 **Trends in Hearing**, Reviewer (2 article).

2021 **Frontiers in Neuroscience**, Reviewer (1 article).

2020 **Hearing Research**, Reviewer (4 articles).

2020 **The Journal of the Acoustical Society of America**, Reviewer (1 article).

2016 **Association for Research in Otolaryngology**, Member.

Research funding & Grants

2016 **Uncovering hidden hearing loss (UHEAL)**, *NovoNordisk foundation* (15 MDKK, 2 M€), Denmark.
Participation in the project proposal and writing/editing of the project description and plan.

2016 **Erasmus Mundus - Auditory Cognitive Neuroscience**, *European Union*, Boston, MA, (USA).
Stipend for a 6 month stay at the Center of Computational Neuroscience and Neural Technology (CompNet) led by Prof. Barbara Shinn-Cunningham at Boston University.

2008 **Erasmus+ program**, *European Union*, Trondheim, (Norway).
Stipend for a 6 month stay at the Høgskolen i Sør-Trøndelag, HiST (currently belonging to Norges Teknisk-Naturvitenskapelige Universitet, NTNU).

Relevant IT skills

Programming	Matlab, Python (pandas, numpy), R, use of High-Performance Computing Clusters (HPCC)	Version Control	Git, GitHub, Bitbucket
Operating Systems	MacOS X, GNU/Linux, Windows	Office & Edition	OpenOffice, Microsoft Office, LaTeX, Gimp

Languages

Catalan	Native	*Mother Tongue*
Spanish	Native	*Mother Tongue*
English	Fluent	*Professional daily use*
Danish	Good Level	*Personal daily use*

Personal interests

Main current hobbies	Playing with my children. Playing with any dog that I may encounter anywhere (I cannot have one now).
Music	Listening to music and playing the saxophone (jazz & blues).
Sports	Hiking and scuba diving (I know I do not live in the right place for this).