

# Carlos Eduardo Cancino-Chacón

## PERSONAL DETAILS

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*Birth* June 6, 1986  
*Citizenship* Mexican  
*Address* Austrian Research Institute for  
Artificial Intelligence (OFAI)  
Freyung 6 / 6  
A-1010, Vienna, Austria  
*E-Mail* carlos.cancino@ofai.at  
*Website* <http://www.carloscancinochacon.com>



## MAIN AREAS OF RESEARCH

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- Musical machine listening
- Computational models of expressive music performance and music expectation
- Human–Computer interaction in music performance (automatic accompaniment systems, interfaces for musical expression)
- Cognitively-plausible computational models of music analysis
- Machine learning (deep learning, probabilistic models)

## ACADEMIC QUALIFICATIONS

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**PhD in Computer Science** 10/2014–12/2018

*Johannes Kepler University of Linz, Austria*

Supervisor: Gerhard Widmer

Co-supervisor: Maarten Grachten

Thesis: Computational Modeling of Expressive Music Performance Through Linear and Non-linear Basis Function Models

**Master's degree in Electrical Engineering and Audio Engineering** 10/2011–07/2014

*Graz University of Technology/University of Music and Performing Arts Graz, Austria*

Supervisor: Franz Pernkopf

Thesis: Tarkus Belief Propagation: On Message Passing Algorithms and Computational Commutative Algebra

**Bachelor's degree in Physics** 08/2005–03/2011

*National Autonomous University of Mexico, Mexico City, Mexico*

Supervisor: Marcos Ley Koo

Thesis: Análisis teórico experimental de transductores de ultrasonido tipo Langevin  
(*Theoretical–experimental analysis of ultrasonic Langevin transducers*)

**Bachelor's degree in Piano Performance** 09/1999–02/2011

*National Conservatory of Music, Mexico City, Mexico*

Supervisor: Héctor Alfonso Rojas Ramírez

## RESEARCH EXPERIENCE

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### Guest Researcher

01/2020-present

*RITMO Centre for Interdisciplinary Studies in Rhythm, Time and Motion*  
*University of Oslo, Norway*  
Project: MIRAGE

### Postdoctoral Researcher

12/2018-present

*Austrian Research Institute for Artificial Intelligence, Vienna, Austria*  
*Intelligent Music Processing and Machine Learning Group*  
Project: Con Espressione  
Supervisor: Gerhard Widmer

### Doctoral Researcher

01/2014-11/2018

*Austrian Research Institute for Artificial Intelligence, Vienna, Austria*  
*Intelligent Music Processing and Machine Learning Group*  
Projects:

- Lrn2Cre8 (01/2014 – 09/2016)  
Supervisors: Maarten Grachten and Gerhard Widmer
- Con Espressione (10/2016 – 11/2018)  
Supervisor: Gerhard Widmer

## TEACHING AND SUPERVISION

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### Course Lecturer Level B

01/2011-07/2011

*National Conservatory of Music, Mexico City, Mexico*  
Courses: Elementary Music Theory I and Harmony (Levels I-III)

### Supervision

*Austrian Research Institute for Artificial Intelligence, Vienna, Austria*

- **Federico Simonetta** (Summer 2018). Main melody line identification from symbolic scores using convolutional neural networks.
- **Martin Bonev** (2017-2019). Development of a polyphonic score follower for an expressive accompaniment system.

## ACADEMIC ACTIVITIES

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### REVIEWING

#### 1. International Scientific Journals

- Journal of New Music Research, Neural Computing and Applications, Applied Sciences

#### 2. International Conferences

- ISMIR – International Society for Music Information Retrieval Conference
- IJCAI – International Joint Conference on Artificial Intelligence
- SMC – Sound & Music Computing Conference
- MCM – Biennial International Conference on Mathematics and Computation in Music
- DLM17 – International Workshop on Deep Learning for Music

## TALKS

1. Cancino-Chacón C. (March 2020) “Machine Listening of Orchestral Music”, invited talk at the Workshop on Musical Listening, University of Oslo, Norway.
2. Cancino-Chacón, C., Kosta, K. and Grachten, M. (November 2019) “Computational Models of Expressive Performance”, tutorial session at the 20th International Society for Music Information Retrieval Conference, Delft, The Netherlands.
3. Cancino-Chacón, C. (March 2019) “Modeling Expressive Music Performance with Non-linear Basis Function Models”, invited talk at the Deep Learning Seminar, University of Vienna, Austria.
4. Cancino-Chacón, C. (January 2019) “Computational Modeling of Expressive Music Performance with Linear and Non-linear Basis Function Models”, invited talk at the Austrian Research Institute for Artificial Intelligence, Vienna, Austria.
5. Cancino-Chacón, C. (November 2016) “¿Escuchan los androides música electrónica?”, invited talk at the Pláticas DeMentes talk series. Faculty of Psychology, National Autonomous University of Mexico.
6. Cancino-Chacón, C. (November 2016) “En busca del factor Mozart”, invited talk at the National Conservatory of Music, Mexico City, Mexico.

## AWARDS AND GRANTS

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### Award for Creative Achievement

06/2017

*AccompaniX Competition, 2017 Turing Tests in the Creative Arts.*

*\$500 team award for development of an expressive computer accompaniment system.*

### Fundación INBA – CONACYT Scholarship

Mexican National Council for Science and Technology

10/2012-02/2014

## PUBLICATIONS

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### PEER REVIEWED JOURNAL ARTICLES

1. Bishop, L., Cancino-Chacón, C., and Goebel, W. (2019b). Moving to communicate, moving to interact: Patterns of body motion in musical duo performance. *Music Perception*, 37(1):1–25
2. Bishop, L., Cancino-Chacón, C., and Goebel, W. (2019a). Eye gaze as a means of giving and seeking information during musical interaction. *Consciousness & Cognition*, 68:73–96
3. Cancino-Chacón, C., Grachten, M., Goebel, W., and Widmer, G. (2018). Computational Models of Expressive Music Performance: A Comprehensive and Critical Review. *Frontiers in Digital Humanities*, 5:25. <https://www.frontiersin.org/article/10.3389/fdigh.2018.00025>
4. Velarde, G., Cancino-Chacón, C., Meredith, D., Weyde, T., and Grachten, M. (2018). Convolution-based classification of audio and symbolic representations of music. *Journal of New Music Research*, 47(3):191–205. doi: 10.1080/09298215.2018.1458885
5. Cancino-Chacón, C. E., Gadermaier, T., Widmer, G., and Grachten, M. (2017d). An Evaluation of Linear and Non-linear Models of Expressive Dynamics in Classical Piano and Symphonic Music. *Machine Learning*, 106(6):887–909

6. Grachten, M., Cancino-Chacón, C. E., Gadermaier, T., and Widmer, G. (2017). Towards computer-assisted understanding of dynamics in symphonic music. *IEEE Multimedia*, 24(1):36–46

## BOOK CHAPTERS

1. Grachten, M. and Cancino-Chacón, C. E. (2017). Temporal dependencies in the expressive timing of classical piano performances. In Lessafre, M., Maes, P.-J., and Leman, M., editors, *The Routledge Companion to Embodied Music Interaction*, pages 360–369. Routledge

## PEER REVIEWED CONFERENCE PROCEEDINGS

1. Simonetta, F., Cancino-Chacón, C., Ntalampiras, S., and Widmer, G. (2019). A Convolutional Approach to Melody Line Identification in Symbolic Scores. In *Proceedings of the 20th International Society for Music Information Retrieval Conference (ISMIR 2019)*, Delft, The Netherlands
2. Cancino-Chacón, C., Grachten, M., Sears, D. R. W., and Widmer, G. (2017c). What Were You Expecting? Using Expectancy Features to Predict Expressive Performances of Classical Piano Music. In *Proceedings of the 10th International Workshop on Machine Learning and Music (MML 2017)*, Barcelona, Spain
3. Cancino-Chacón, C., Grachten, M., and Agres, K. (2017b). From Bach to The Beatles: The Simulation of Human Tonal Expectation Using Ecologically-Trained Predictive Models. In *Proceedings of the 18th International Society for Music Information Retrieval Conference (ISMIR 2017)*, Suzhou, China
4. Velarde, Gissel and Weyde, Tillman and Cancino Chacón, Carlos and Meredith, David and Grachten, Maarten (2016). Composer Recognition Based On 2D-Filtered Piano Rolls. In *Proceedings of the 17th International Society for Music Information Retrieval Conference (ISMIR 2016)*, pages 116–121, New York, NY, USA
5. Gadermaier, T., Grachten, M., and Cancino-Chacón, C. E. (2016). Basis-Function Modeling of Loudness Variations in Ensemble Performance. In *Proceedings of the 2nd International Conference on New Music Concepts (ICNMC 2016)*, Treviso, Italy
6. Cancino Chacón, C. E. and Grachten, M. (2015). An Evaluation of Score Descriptors Combined with Non-linear Models of Expressive Dynamics in Music. In *Proceedings of the 18th International Conference on Discovery Science (DS 2015)*, pages 48–62, Banff, AB, Canada
7. Agres, K., Cancino, C., Grachten, M., and Lattner, S. (2015). Harmonics co-occurrences bootstrap pitch and tonality perception in music: Evidence from a statistical unsupervised learning model. In *Proceedings of the Annual Meeting of the Cognitive Science Society (CogSci 2015)*, Pasadena, CA, USA
8. Lattner, S., Grachten, M., Agres, K., and Cancino Chacón, C. E. (2015b). Probabilistic Segmentation of Musical Sequences using Restricted Boltzmann Machines. In *Fifth International Conference on Mathematics and Computation in Music (MCM 2015)*, London, UK
9. Lattner, S., Cancino Chacón, C. E., and Grachten, M. (2015a). Pseudo-Supervised Training Improves Unsupervised Melody Segmentation. In *In Proceedings of the Twenty-Fourth International Joint Conference on Artificial Intelligence (IJCAI 2015)*, pages 2459–2465, Buenos Aires, Argentina
10. Cancino Chacón, C. E. and Mowlae, P. (2014). Least Squares Phase Estimation of Mixed Signals. In *15th Annual Conference of the International Speech Communication Association (INTERSPEECH 2014)*, Singapore

11. Cancino Chacón, C., Lattner, S., and Grachten, M. (2014a). Developing Tonal Perception Through Unsupervised Learning. In *Proceedings of the 15th International Society for Music Information Retrieval Conference (ISMIR 2014)*, pages 195–200
12. Grachten, M., Cancino Chacón, C. E., and Widmer, G. (2014). Analysis and Prediction of Expressive Dynamics Using Bayesian Linear Models. In *Proceedings of the 1st International Workshop on Computer and Robotic Systems for Automatic Music Performance (SAMP 14)*, pages 545–552, Venice, Italy
13. Tschitschek, S., Cancino Chacón, C. E., and Pernkopf, F. (2013). Bounds for Bayesian network classifiers with reduced precision parameters. In *Proceedings of the 2013 International Conference on Acoustics, Speech and Signal Processing (ICASSP 2013)*, pages 3357–3361, Vancouver, Canada. IEEE

## EXTENDED ABSTRACTS

1. Cancino-Chacón, C. E., Balke, S., Henkel, F., Stussak, C., and Widmer, G. (2019). The *Con Espressione!* Exhibit: Exploring Human–Machine Collaboration in Expressive Performance. In *Late Breaking/ Demo, 20th International Society for Music Information Retrieval Conference (ISMIR 2019)*, Delft, The Netherlands
2. Grachten, M., Cancino-Chacón, C., and Gadermaier, T. (2019). *partitura*: A Python Package for Handling Symbolic Musical Data. In *Late Breaking/ Demo, 20th International Society for Music Information Retrieval Conference (ISMIR 2019)*, Delft, The Netherlands
3. Weigl, D., Cancino-Chacón, C., Bonev, M., and Goebel, W. (2019). Linking and Visualising Performance Data and Semantic Music Encodings in Real-Time. In *Late Breaking/ Demo, 20th International Society for Music Information Retrieval Conference (ISMIR 2019)*, Delft, The Netherlands
4. Shi, Z., Cancino-Chacón, C., and Widmer, G. (2019). User Curated Shaping of Expressive Performances. In *Invited Paper at the ICML 2019 Workshop on Machine Learning for Music Discovery, 36th International Conference on Machine Learning (ICML 2019)*, Long Beach, CA, USA
5. Cancino-Chacón, C. and Grachten, M. (2018). A Computational Study of the Role of Tonal Tension in Expressive Piano Performance. In *Proceedings of the 15th International Conference on Music Perception and Cognition (ICMPC15 ESCOM10)*, Graz, Austria
6. Bishop, L., Cancino-Chacón, C. E., and Goebel, W. (2018). Visual Signals between Improvisers Indicate Attention rather than Intentions. In *Proceedings of the 15th International Conference on Music Perception and Cognition (ICMPC15 ESCOM10)*, Graz, Austria
7. Cancino-Chacón, C., Bonev, M., Durand, A., Grachten, M., Arzt, A., Bishop, L., Goebel, W., and Widmer, G. (2017a). The ACCompanion v0.1: An Expressive Accompaniment System. In *Late Breaking/ Demo, 18th International Society for Music Information Retrieval Conference (ISMIR 2017)*, Suzhou, China
8. Bishop, L., Cancino-Chacón, C., and Goebel, W. (2017). Mapping Visual Attention of Duo Musicians During Rehearsal of Temporally-Ambiguous Music. In *Proceedings of the International Symposium on Performance Science (ISPS 2017)*, Reykjavik, Iceland
9. Cancino Chacón, C. E. and Grachten, M. (2016). The Basis Mixer: A Computational Romantic Pianist. In *Late Breaking/ Demo, 17th International Society for Music Information Retrieval Conference (ISMIR 2016)*, New York, NY, USA

## TECHNICAL REPORTS

1. Cancino-Chacón, C. E. and Grachten, M. (2016). Rendering Expressive Performances of Musical Pieces Through Sampling From Generative Probabilistic Models. Technical Report OFAI-TR-2014-01, Austrian Research Institute for Artificial Intelligence, Vienna, Austria
2. Grachten, M. and Cancino Chacón, C. E. (2015). Strategies for Conceptual Change in Convolutional Neural Networks. Technical Report OFAI-TR-2015-04, Austrian Research Institute for Artificial Intelligence, Vienna, Austria
3. Cancino Chacón, C. E., Grachten, M., and Widmer, G. (2014b). Bayesian Linear Basis Models with Gaussian Priors for Musical Expression. Technical Report OFAI-TR-2014-12, Austrian Research Institute for Artificial Intelligence, Vienna, Austria