Federico Visi

Researcher in Music and Movement

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Profile and Research Interests

Researcher, composer and performer. His research interests include body movement in performances with musical instruments, music cognition, motion-sensing technologies, machine learning, artificial intelligence, human-computer interaction, and interactive music systems. He has presented his research at several international conferences and has composed music for ensembles, films, dance, theatre, and installations. His work as a performer focuses on motion and presence of the musician's body and on the concept of liveness in electronic music performance. He has worked on collaborative interdisciplinary projects with researchers in Europe (Ghent University, University of Bologna), North America (NYU, UCLA) and South America (Universidade Federal do Rio Grande do Sul).

Work Experience

Researcher (Wissenschaftlicher Mitarbeiter), Universität der Künste Berlin **Mar. 2022 – Present**

Teaching Assignment (Lehrauftrag), Universität der Künste Berlin **Oct. 2021 – Feb. 2022**
Wearing Sound – Crafting e-textiles for interacting with sound through body movement.

Postdoctoral Researcher, Luleå University of Technology, Sweden **Oct. 2019 – Sept. 2021**
GEMM))) Gesture Embodiment and Machines in Music research cluster

Postdoctoral Researcher, Goldsmiths, University of London, UK **Sept. 2019**
ERC project BioMusic, work on reinforcement learning for sonic interaction design.

Visiting Researcher, Universitet i Oslo, Norway **Nov. 2018 – Dec. 2018**
RITMO Centre for Interdisciplinary Studies in Rhythm, Time and Motion.

Postdoctoral Research Fellow, Universität Hamburg, Germany **2017 – 2018**
ERC project Slow Motion: Transformations of Musical Time in Perception and Performance (SloMo).

Research Assistant at the Music Computing Lab, Open University, UK **2016 – 2017**
Research project on the development of a haptic feedback device for improving the gait of stroke survivors.

Freelance Sound Designer, Composer, Producer **2008 – 2013**
Music and sound design for film, documentaries, installations.

Education

PhD, Computer Music Research **2013 – 2016**
Plymouth University, Interdisciplinary Centre for Computer Music Research (ICCMR), Plymouth, United Kingdom.
Thesis title: *Methods and technologies for the analysis and interactive use of body movements in instrumental music performance.*

Music Academy, Composition and Analysis **2010 – 2012**
Accademia Pianistica Internazionale, Imola, Italy (with M° Marco di Bari).

Music Academy, Music for Image and Multimedia **2009 – 2010**
Civica Scuola di Musica Claudio Abbado, Istituto di Ricerca Musicale – IRMus, Milan, Italy.

MA, Design and Multimedia **2006 – 2008**
ISIA – Istituto Superiore per le Industrie Artistiche, Faenza, Italy (110/110).

Erasmus Exchange, Media and Communication **2004 – 2005**
Universitetet i Oslo, Institutt for Medier og Kommunikasjon, Oslo, Norway.

BA, Disciplines of Communication **2002 – 2006**
Alma Mater Studiorum Università di Bologna, Dipartimento di Scienze della Comunicazione, Bologna, Italy (103/110).

Other Studies and MOOCs

- International Summer School of Systematic Musicology (ISSSM) – InfoMus/Casa Paganini, Genoa (IT), March 2014.
- Audio Signal Processing for Music Applications – Universitat Pompeu Fabra, Stanford University, Coursera (98.9% with distinction. Only 111 students obtained distinction out of 14,460 that joined the course).
- Advanced Signal Processing – School of Computing and Mathematics, Plymouth University.
- General Teaching Associates (GTA) intensive course, Teaching & Learning, Plymouth University.
- Music Moves – Universitetet i Oslo, FutureLearn.
- Machine Learning for Musicians and Artists – Goldsmiths, Kadenze (95.2%, top 10%).
- The Nature of Code – Processing Foundation, Kadenze (102% including extra-credit).
- Introduction to Programming with MATLAB – Vanderbilt University, Coursera (100% with distinction).
- Pro Tools User Certification (PT101).
- Piano, Guitar, Harmony, and Music Theory private lessons (15+ years).

Technical Skills

Programming Environments: Max (including o.dot for processing OSC bundles, 10+ years of experience), MATLAB (contributed to three new functions included in MoCap Toolbox 1.5), Python, Processing, PureData, JavaScript (proficient P5.js framework user), Arduino IDE, experiences with C++ and Swift.

Sensor Systems: design of embedded systems (Arduino), motion sensing with IMU/MARG 9DoF sensors, EMG, MMG (Myo armband, BITalino, Delsys, custom devices) for physiological and motion data collection and online analysis.

Motion Capture: OptiTrack, Qualisys, and Vicon systems. Use of dedicated software (OptiTrack Motive, Qualisys Track Manager) for capturing, offline data processing, and real-time network streaming. Real-time motion features extraction for marker-based motion capture (see 2018 papers on the *modosc* library). Design and 3D-printing of custom rigid bodies and marker configurations for real-time tracking.

Machine Learning: supervised and unsupervised learning, classification, reinforced learning, regression, clustering, feature extraction, dynamic time warping, gesture following, support vector machines, neural networks, Bayesian learning, Markov decision processes. Familiar with Machine Learning applications in Python, MATLAB, Weka. Currently studying deep learning and TensorFlow.

Music Information Retrieval: in MATLAB, Python, Max, and other environments using MIR toolbox, sms-tools, Essentia, Sonic Visualiser VAMP plugins, zsa.descriptors, and more.

Music Production and Composition: piano, guitar, analogue synthesis, music notation, Ableton Live, ProTools, Sibelius.

Experimental Design and Data Collection: design of experiments with human participants using OpenSesame/PsychoPy.

Statistical Analysis: time series analysis, Principal Component Analysis, Functional Data Analysis, inferential statistics (ANOVA, chi-squared tests, t-tests, regression, etc.), Multidimensional Scaling, and more in MATLAB, Python, SPSS, JASP.

Other Relevant Skills: data sonification and musification, interaction design, 3D modelling for rapid prototyping and 3D printing, Digital Signal Processing, Genetic Algorithms, Agent-Based Modelling, advanced LaTeX/BibTeX for typesetting and reference management, graphic design, photography, video production, sound design, web design.

Other interests: Ashtanga yoga, tai chi, meditation.

Grants and Awards

AHRC / HumPA PhD research scholarship, Plymouth University 2013 – 2016
Research proposal on Music and Body Motion (13,726 GBP per annum).

Roland Levinsky Memorial Fund Award 2016
Workshop and performance at Harvestworks during Creative Technology Week in New York City, US (500 GBP).

Santander Universities Internationalisation Mobility Support 2015
Research project on gesture control devices in collaboration with NYU Steinhardt, New York City, US (4,000 GBP).

Santander Postgraduate Internationalisation Scholarship 2014
Interdisciplinary project on the musification of ALS pathophysiology at UCLA, Los Angeles, US (2,500 GBP).

Language Skills

Italian: native language.
English: C2 proficient user (understanding, speaking, writing). IELTS Academic certification from British Council.
Norwegian: B1 independent user (understanding, speaking, writing). *Norsk for internasjonale studenter* course at UiO, Oslo.

Federico Visi – List of Publications

Links to full published papers can be found at http://www.federicovisi.com/publications/

Journal Articles

F. G. Visi, S. Östersjö, R. Ek, and U. Röijezon, "Method Development for Multimodal Data Corpus Analysis of Expressive Instrumental Music Performance," *Front. Psychol.*, vol. 11, no. 576751, Dec. 2020.

F. Visi, E. Coorevits, R. Schramm, and E. R. Miranda, "Musical Instruments, Body Movement, Space, and Motion Data: Music as an Emergent Multimodal Choreography," in *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments, Special Issue on Human–Technology Choreographies: Body, Movement, and Space,* 2017.

Book Chapters

F. G. Visi and A. Tanaka, "Interactive Machine Learning of Musical Gesture," in *Handbook of Artificial Intelligence for Music*, Cham: Springer International Publishing, 2021, pp. 771–798.

M. Zbyszyński, B. Di Donato, F. G. Visi, and A. Tanaka, "Gesture-Timbre Space: Multidimensional Feature Mapping Using Machine Learning and Concatenative Synthesis," in *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 12631 LNCS, no. 789825, 2021, pp. 600–622.

F. Visi and F. Faasch, "Motion Controllers, Sound, and Music in Video Games: State of the Art and Research Perspectives," in *Emotion in Video Game Soundtracking*, D. Williams and N. Lee, Eds. Springer International Publishing, 2018.

F. Visi, "Augmenting Instruments and Extending Cultures: on the Overtone Violin," in *A NIME Reader: Fifteen years of New Interfaces for Musical Expression*, A. R. Jensenius and M. Lyons, Eds. Springer, 2017.

F. Visi, E. Coorevits, R. Schramm, and E. R. Miranda, "Analysis of Mimed Violin Performance Movements of Neophytes," in *Music, Mind, and Embodiment*, vol. 9617 LNCS, R. Kronland-Martinet, M. Aramaki, and S. Ystad, Eds. Cham, Switzerland: Springer, 2016, pp. 88–108.

R. Schramm, H. de S. Nunes, L. de A. Nunes, F. Visi, and E. R. Miranda, "3CMS: An Interactive Decision System for Live Performance," in *Music, Mind, and Embodiment*, vol. 9617 LNCS, R. Kronland-Martinet, M. Aramaki, and S. Ystad, Eds. Cham, Switzerland: Springer, 2016, pp. 190–210.

Conference Proceedings

F. G. Visi and A. Tanaka, "Towards Assisted Interactive Machine Learning: Exploring Gesture-Sound Mappings Using Reinforcement Learning," in *ICLI 2020 - the Fifth International Conference on Live Interfaces*, 2020, pp. 10–19.

F. Visi, D. Hammerschmidt, C. Wöllner, "Using Unimanual and Bimanual Tapping to Explore Synchronisation with Musical Rhythmic Layers," in *ICMPC 15 / ESCOM 10 – 15th International Conference on Music Perception and Cognition 10th triennial conference of the European Society for the Cognitive Sciences*, 2018.

L. Dahl and F. Visi, "Modosc: A Library of Real-Time Movement Descriptors for Marker-Based Motion Capture," in *MOCO '18 Proceedings of the 4th International Conference on Movement Computing*, 2018.

F. Visi, L. Dahl, "Real-Time Motion Capture Analysis and Music Interaction with the Modosc Descriptor Library," in *NIME'18 – International Conference on New Interfaces for Musical Expression*, 2018.

F. Visi, T. Georgiou, S. Holland, O. Pinzone, G. Donaldson, and J. Tetley, "Assessing the accuracy of an algorithm for the estimation of spatial gait parameters using inertial measurement units: Application to healthy subject and hemiparetic stroke survivor," in *MOCO '17 Proceedings of the 4th International Conference on Movement Computing*, 2017.

F. Visi, B. Caramiaux, M. Mcloughlin, and E. Miranda, "A Knowledge-based, Data-driven Method for Action-sound Mapping," in *NIME'17 – International Conference on New Interfaces for Musical Expression*, 2017.

F. Visi and E. R. Miranda, "Instrumental Movements to Physical Models: Mapping Postural and Sonic Topologies through Machine Learning," in *Porto International Conference on Musical Gesture as Creative Interface*, 2016.

F. Visi, E. Coorevits, and E. R. Miranda, "A practice-based study on instrumental gestures in music composition and performance: Kineslimina," in *MuSA 2015 - Sixth International Symposium on Music/Sonic Art: Practices and Theories*, 2015.

F. Visi, E. Coorevits, R. Schramm, and E. Miranda, "Instrumental Movements of Neophytes: Analysis of Movement Periodicities, Commonalities and Individualities in Mimed Violin Performance," in *Proceedings of the 11th International Symposium on Computer Music Multidisciplinary Research (CMMR)*, 2015.

R. Schramm, H. de S. Nunes, L. de A. Nunes, F. Visi, and E. Miranda, "One Micro Song, Three Ends: an approach for musical composition and an interactive decision machine based on expressive live performance.," in *Proceedings of 11th International Symposium on Computer Music Multidisciplinary Research (CMMR)*, 2015.

F. Visi, D. Williams, G. Dothel, and E. Miranda, "Musification of ALS Pathophysiology: Notes on Timbre and Spatialisation in Unfolding | Clusters," in *Proceedings of the 9th Conference on Interdisciplinary Musicology - CIM14*, 2014.

F. Visi, E. Coorevits, E. Miranda, and M. Leman, "Effects of different bow stroke styles on body movements of a viola player: an exploratory study," in *Proceedings of the joint ICMC|SMC|2014 Conference*, 2014.

F. Visi, R. Schramm, and E. Miranda, "Use of Body Motion to Enhance Traditional Musical Instruments: A Multimodal Embodied Approach to Gesture Mapping, Composition and Performance," in *Proceedings of the International Conference on New Interfaces for Musical Expression*, 2014, pp. 601--604.

F. Visi, R. Schramm, and E. Miranda, "Gesture in performance with traditional musical instruments and electronics: Use of embodied music cognition and multimodal motion capture to design gestural mapping strategies," in *MOCO '14: Proceedings of the 2014 International Workshop on Movement and Computing*, 2014.

F. Visi, G. Dothel, D. Williams, and E. Miranda, "Unfolding | Clusters: A Music and Visual Media Model of ALS Pathophysiology," in *Proceedings of SoniHED Conference: Sonification of Health and Environmental Data*, 2014.

F. Visi, D. Williams, G. Dothel, and E. Miranda, "An Immersive Media Model of Amyotrophic Lateral Sclerosis," in *EVA London 2014: Electronic Visualisation and the Arts*, 2014.

Talks and Seminars

F. Visi, "Real-Time Motion Capture Analysis with the Modosc Descriptor Library," RITMO International Motion Capture Workshop, Universitetet i Oslo, Oslo, Norway, 2018.

F. Visi, "Methods and Technologies for the Analysis and Interactive Use of Body Movements in Instrumental Music Performance," McGill University, Montreal, Canada, 2016.

F. Visi, "Instrumental gestures in music composition and augmented music performance," in Music Seminars Series, Music Department, Plymouth University, Plymouth, UK, 2016.

F. Visi, "Gestures and Embodied Meaning in Performances with Traditional Musical Instruments," in *NYU MARL: Music and Audio Research Laboratory 2015-16 Talk Series*, New York, US, 2015.

F. Visi, "Body Movements and Embodied Meaning in Performances with Traditional Musical Instruments," in *fourMs seminars*, Department of Musicology, Universitetet I Oslo, Oslo, Norway, 2015.

F. Visi, "Gesture, Body Movement, Musical Experience," in *ICCMR Doctoral Seminar Series*, Plymouth University, Plymouth, UK, 2014.

Reviewer for

- Leonardo Music Journal – MIT Press
- Member of the organising committee and Music co-chair of the 2019 International Conference on New Interfaces for Musical Expression (NIME 2019 – https://www.ufrgs.br/nime2019/committee.html)
- Behavioral Sciences – MDPI Journal
- MOCO – International Symposium on Movement and Computing
- NIME – International Conference on New Interfaces for Musical Expression
- ICLI – International Conference on Live Interfaces
- SBCM – Brazilian Symposium on Computer Music
- Member of the organising committee of the 11th International Symposium on Computer Music Multidisciplinary Research (CMMR 2015).

Compositions, Performances, Installations (selection)

The TCP/Indeterminate Place Quartet: a Global Hyperorgan Scenario

- NIME '21, NYU Shanghai, China, 2021. (NIME 2021 Best Music Award)
- Audio Mostly 2021, University of Trento, Italy, 2021. (Audio Mostly 2021 Best Music Award)

SloMo Study #2

- NIME '18, Virginia Tech, Blacksburg, Virginia, US, 2018.
- MOCO '18, Casa Paganini, Università di Genova, Genoa, Italy, 2018.

11 Degrees of Dependence – for saxophone, electric guitar, and motion sensors

- Creative Tech Week, Harvestworks, New York, US, 2016 (with Ana García Caraballos on alto sax).
- Nonclassical Club Night curated by Gabriel Prokofiev, International Festival For Artistic Innovation -iFIMPaC 2016, Leeds College of Music, Leeds, UK, 2016 (with Dr Katherine Williams on soprano sax).

Tuned Constraint – for analogue synthesiser and motion sensors

- ICLI 2016 – International Conference on Live Interfaces, University of Sussex, 2016.
- International Metabody Forum, Brunel University / Artaud Performance Centre, London, UK, 2016.
- Practice Research Symposium, Plymouth University, Plymouth, UK, 2016.

Kineslimina – for viola, electric guitar, and motion sensors (with Esther Coorevits on viola)

- Peninsula Arts Contemporary Music Festival 2016, Plymouth, UK, 2016
- MuSA 2015 – Sixth International Symposium on Music/Sonic Art: Practices and Theories, Karlsruhe, Germany, 2015.
- Gala Concert of the 11th International Symposium on Computer Music Multidisciplinary Research (CMMR), Plymouth University, Plymouth, UK, 2015.

Unfolding | Clusters – audiovisual installation modelled from scientific data related to the pathophysiology of Amyotrophic Lateral Sclerosis (ALS)

- Immersive Vision Theatre, Peninsula Arts Contemporary Music Festival 2015, Plymouth, UK, 2015.
- Art | Sci center, UCLA, Los Angeles, US, 2014.

Workshops

- *Kinefy Workshop: movement interaction with Max and Processing*, Creative Tech Week, Harvestworks, New York, US, 2016. In collaboration with Andrew Telichan Phillips.
- *Motion and Music Workshop: processing and performing gesture motifs for computer music*, Symposium on Computer Music Multidisciplinary Research (CMMR), Plymouth, UK, 2015. In collaboration with Luiz Naveda.