Matteo Pettenò

Venice, Italy

Profile

I am an engineer with a strong foundation in information theory from my Bachelor's at the University of Padova and a deep passion for audio, which led me to a Master's in Music and Acoustic Engineering at Politecnico di Milano. I gained expertise in deep learning, signal processing, and electronics and worked professionally as a full-stack developer, software architect, and DevOps engineer. In September 2025, I will begin a Marie Skłodowska-Curie PhD with a focus on Privacy for Smart Speech Technology, jointly hosted by EURECOM and Ruhr-Universität Bochum. During my PhD, I am actively seeking research or industrial internship opportunities in related fields.

Education

Ph.D. Candidate in PSST (Marie Curie Fellow) Starting 09/2025 - Expected 2029
Digital Security Department, EURECOM Sophia Antipolis, France
IKA, Ruhr-Universität Bochum (RUB) Bochum, Germany

- *Privacy for Smart Speech Technology* (PSST) joint doctoral training programme
- Funded by Horizon Europe Marie Skłodowska-Curie Action
- 19 months at EURECOM, 6-months secondment at Orange and 26 months at RUB
- **Research focus**: Disentangled representations for selective attribute suppression

Master's Degree in Music and Acoustic Engineering 09/2021 - 10/2024
DEIB, Politecnico di Milano (PoliMi) Milan, Italy

- **Relevant Courses**: Machine Learning, Computer Music, Sound Analysis Synthesis and Processing, Creative Programming and Computing, Musical Acoustics, Electronics and Electroacoustics, Computer Security
- **Thesis**: *Latent Space Regularization via Normalizing Attribute Transformations for Symbolic Music Generation*
- **Advisor**: Alberto Bernardini
- **Grade**: Cum Laude (110/110)

Bachelor's Degree in Information Engineering 09/2013 - 07/2021
DEI, University of Padua (UNIPD) Padua, Italy

- **Relevant Courses**: Algorithms for Engineering, Systems and Models, Control systems, Electronics, Telecommunications
- **Thesis**: *Evaluation of the performance of commercial STT and NER services applied to digitized oral sources*
- **Advisor**: Sergio Canazza Targon
- **Grade**: 93/110
- **Note**: Suspension of studies from 2016 to 2019.

High School Certificate in Information Technology 09/2007 - 07/2013
I.T.I.S. Carlo Zuccante Mestre, Italy

- **Relevant Courses**: Computer Science, Electronics, Systems, Statistics
- **Thesis**: *The MIDI Protocol & Touchscreen XY MIDI Controller*
- **Grade**: 87/100

Publications

M. Pettenò, A. I. Mezza and A. Bernardini, Conditional Diffusion as Latent Constraints for Unconditional Symbolic Music Generation Models, Under review at *26th Conference of the International Society for Music Information Retrieval (ISMIR)*, 2025

M. Pettenò, A. I. Mezza and A. Bernardini, On the Joint Minimization of Regularization Loss Functions in Deep Variational Bayesian Methods for Attribute-Controlled Symbolic Music Generation, Under review at *33rd European Signal Processing Conference (EUSIPCO)*, 2025

R. B. Luzietti et. al, FONTI 4.0: Evaluating Speech-to-Text Automatic Transcription of Digitized Historical Oral Sources. *Proceedings of the Eighth Italian Conference on Computational Linguistics CliC-it*, 2021[1]

[1] Although my name is mentioned only in the acknowledgments and not among the authors, this publication consists of much of the work done for my bachelor's degree thesis.

Research Interests

Deep Learning, Representation Learning, Speech Processing, Privacy Preservation, Speaker Anonymization, Deepfake Detection, Music Information Retrieval (MIR), Audio Generation, AI-Assisted Music Composition, Music Understanding, Hearing Aids

Research Projects

Conditional Diffusion as Latent Constraints for Unconditional Symbolic Music Generation Models 2025

Paper submitted to 26th Conference of the ISMIR github

Keywords: symbolic music, attribute-controlled generation, diffusion models, latent constraints

A plug-and-play framework using conditional denoising diffusion models as latent constraints for symbolic music generation. The approach enables fine-grained control over musical attributes such as note density, pitch range, contour, and rhythm complexity, without retraining the backbone model. Demonstrated superior controllability and quality compared to traditional attribute regularization methods.

On the Joint Minimization of Regularization Loss Functions in Deep Variational Bayesian Methods for Attribute-Controlled Symbolic Music Generation 2025

Paper submitted to 33rd EUSIPCO github

Keywords: symbolic music, attribute-controlled generation, power transforms

Supervised extension of the well-established variational information bottleneck framework by including a regularization loss aimed at encoding a specific attribute into a designated dimension of the latent space. The novelty of the approach lies in the introduction of an invertible parametric mapping whose goal is to transform the original and possibly complex distribution of the target attribute to a new one that is coherent with that of the latent space. The dataset generated to train the models is publicly available on Zenodo.

Do Unconditional Deep Generative Models Spontaneously Learn How to Encode Human-Interpretable Musical Attributes? 2023

Music and Acoustics Engineering Capstone course in MS. github

Keywords: variational autoencoders, latent space topological structure

Latent space analysis of the pre-trained recurrent variational autoencoder model MusicVAE by Google Magenta in its 2-bars melody unconditional version. The study is focused on investigating the presence of any correlations between the topological structure of the latent space and different human-interpretable musical attributes of the output.

Evaluation of the performance of commercial STT and NER services applied to digitized oral sources 2021

Thesis in Information Engineering BS github

Keywords: speech-to-text, named-entity-recognition, gcp, aws

This thesis is part of the Fonti 4.0 project and it aims to test the performances of STT commercial services on digitized historical oral sources in order to discover which one is the most accurate and find out if the quality of the digitized audio or other elements in the recording impact the accuracy of automatic transcription. in the experiment the transcription services were evaluated through some metrics obtained aligning and comparing the reference manual transcription with the automatic transcription and a web interface has been implemented that allows you to explore how they change these indices vary according to the quality of the audio, the language spoken and the presence or absence of disturbing events. Furthermore, a first step is taken to study the NER algorithms.

Professional Experience

Full Stack Developer 11/2021 - 08/2023

ccelera s.r.l (Arsenalia Group) - Via Lepetit, 8, 20124 Milan, Italy

- **Description**: full-stack development on the SAP Hybris Commerce platform.
- **Platforms**: SAP Hybris Commerce
- **Customers**: Bonfiglioli, Cellularline, PegPerego, Metal Work
- **Job type**: Part-time

DevOps Engineer 09/2019 - 02/2021

Walit s.r.l - Via Dandolo, 25/B, 31100 Treviso, Italy

- **Description**: Design and maintenance of the Google Cloud infrastructure for a deep learning project. CI/CD orchestration in Gitlab. Application security monitoring with OWASP ZAP.
- **Platforms**: Google Cloud Platform (GCP)
- **Job type**: Full-time

System Integration Engineer 01/2019 - 07/2019

Alpenite Ltd - 38 Craven Street, WC2N 5NG London, UK

- **Description**: architect/developer role in collaboration with an Indian team for analysis and development of logistics and retail integration on Mulesoft middleware. Integration strategies used: AMQP messaging protocol (RabbitMQ as message-broker), REST/SOAP API calls to ERP M3, reading/writing files on FTP.
- **Platforms**: Mulesoft
- **Customers**: Stella McCartney
- **Job type**: Full-time

Full Stack Developer 01/2017 - 01/2019

Alpenite s.r.l (Arsenalia Group) - Via delle Industrie, 27/7, 30175 Venice, Italy

- **Description**: full-stack development for B2B and CRM on the SAP Hybris Commerce platform. CRM: integration of the IFM Group phone bar, ASM (Assisted Service Module), ticketing and notification system, asynchronous integration of the RFC SAP call for prices and availability of goods on the ZK framework (event queue system). B2B: multi-login function for users linked to multiple customers, Authorization Matrix framework (functionality/site content visibility BE control), mobile channel development on PWA with Workbox library and site content management setup with CMS.
- **Platforms**: SAP Hybris Commerce

- **Customers**: Kering Eyewear
- **Job type**: Full-time

IT Help Desk Operator 09/2014 - 01/2017
Alfa Telematica s.r.l. - Via Antonio Pacinotti, 4, 30175 Venice, Italy

- **Customers**: Regione Veneto
- **Job type**: Part-time

Creative Projects

Ego 2023
Creative Programming & Computing course in MS github
Keywords: three.js, glsl, svelte, mediapipe, max4live, tone.js
Creative coding project meant to explore the idea of human perception, in particular the idea of identity and self consciousness and the way it is distorted and biased.

Pulseq - Fractal Sequencer 2022
Advanced Coding Tools and Methodologies course in MS github
Keywords: fractal sequencer, web app, svelte, tone.js, glsl
Fractal sequencer implemented in Svelte as a single-page application (SPA) and inspired by Eurorack module Bloom by Qu-Bit Electronix.

Computer Music Projects

Padder - Computer Music System 2022
Computer Music Languages and Systems course in MS github
Keywords: arduino, touchosc, supercollider, processing
Musical instrument based on a virtual pedal that, thanks to the interaction between the different blocks of its architecture, can generate chords that can be played in real time during a musical performance. This kind of approach could be seen as a handsfree way to generate chords, instead of using a piano or a keyboard.

OranJam - JUCE 2022
Computer Music Languages and Systems course in MS github
Keywords: juce, c++, cmake
Polyphonic subtractive synthesizer implemented in JUCE. Features: oscillators bank, white noise generator, ADSR envelope, filters bank and LFO.

HarMMMLonizer - Supercollider 2022
Computer Music Languages and Systems course in MS github
Keywords: supercollider, harmonizer, delay lines, crosstalk delay feedback
Real-time harmonizer implemented in Supercollider. It features a controllable number of voices and a delay line for each voice with three different feedback configurations, including a crosstalk one for stereo ping-ping effects.

Template Based Chord Recognition 2021
Computer Music Representations and Models course in MS github
Keywords: MIR, chord recognition, librosa, libfmp
Propose and implement a metric able to evaluate the performance of the template based chord recognition algorithm. The proposed metric is then used to evaluate the performance on 4 different songs. Finally, the evaluation is repeated for different values of the algorithm parameters.

Rhythmic and Harmonic Analysis 2021
Computer Music Representations and Models course in MS report
Keywords: music theory
Rhythmic analysis of the song *Pyramid Song* by Radiohead and harmonic analysis of the jazz standard *Peace* by Horace Silver in the arrangement of Norah Jones.

Sound Analysis Synthesis and Processing Projects

Wave Digital Filter Modeling 2022
Sound Synthesis and Spatial Processing course in MS report
Keywords: wdf, matlab, virtual analog
Design of a three-way crossover network in the Wave Digital (WD) domain starting from a reference analog circuit. The model is then implemented in MATLAB using the trapezoidal discretization method (bilinear transformation).

Leslie Speaker Emulation 2022
Sound Synthesis and Spatial Processing course in MS report
Keywords: leslie speaker, matlab, digital audio effect
Efficient implementation of the Leslie rotary speaker as a digital audio effect.

Acoustic Source Localization with Microphone Array 2022
Digital Audio Analysis and Processing course in MS report
Keywords: sound localization, doa estimation, matlab, microphone arrays
Acoustic source localization using the Delay-And-Sum (DAS) beamformer and the MUSIC methods to estimate the Direction Of Arrival (DOA) of two audio sources sampled by a 64 microphones array.

RIR Estimation with Wiener Filters 2022
Digital Audio Analysis and Processing course in MS report
Keywords: room impulse response, wiener filter, matlab, convolution
Estimation of the Room Impulse Response (RIR) of a small reverberant environment by means of a Wiener filter. The obtained filter is obtained using the Overlap-and-Add (OLA) algorithm.

Musical Acoustics Projects

Design of a Recorder Flute 2023
Musical Acoustics: Characterization of Musical Instruments course in MS report
Keywords: applied acoustics, matlab, flute modeling
Design of a recorder flute in MATLAB dimensioning the bore, the last two finger holes, the flue channel and the instrument mouth.

Brass Instrument Simulation 2023
Musical Acoustics: Characterization of Musical Instruments course in MS report
Keywords: applied acoustics, comsol, trumpet modeling
Implementation of a trumpet model in COMSOL in order to simulate its acoustic response.

Design of a Piano 2023
Musical Acoustics: Characterization of Musical Instruments course in MS report
Keywords: applied acoustics, comsol, matlab, piano modeling
Design and analysis of a piano soundboard and its bridge in COMSOL.

Horn Design 2022
Musical Acoustics: Modeling of Musical Instruments course in MS report
Keywords: applied acoustics, matlab, horns modeling
Design of an exponential and compound horns in MATLAB.

Musical Instruments Modeling Techniques 2022
Musical Acoustics: Modeling of Musical Instruments course in MS report
Keywords: applied acoustics, matlab, piano modeling, guitar modeling
Implementation in MATLAB of the FD model for a piano string considering the hammer interaction and of an acoustic guitar model with 20 resonances.

Helmholtz Resonator Tree 2022
Musical Acoustics: Modeling of Musical Instruments course in MS report
Keywords: applied acoustics, helmholtz resonator, matlab, simulink
Modeling of a complex resonant system through a hierarchical structure of Helmholtz resonators.

Glass Harp 2022
Musical Acoustics: Modeling of Musical Instruments course in MS report
Keywords: applied acoustics, comsol, glass harp modelling
3D and axysymmetric modeling of a wineglass for glass harp in COMSOL with eigenfrequencies analysis.

2D and 1D systems 2022
Musical Acoustics: Modeling of Musical Instruments course in MS report
Keywords: applied acoustics, matlab
Circular membrane and circular plate characterization in MATLAB. Analysis of the interaction in a system formed by a circular plate coupled with an iron string.

Helmholtz Resonator and System Impedance 2022
Musical Acoustics: Modeling of Musical Instruments course in MS report
Keywords: applied acoustics, helmholtz resonator, matlab
Analysis of the characteristics of a Helmholtz resonator in MATLAB.

Additional Experience

Volunteer at 24th ISMIR Conference November, 2023
Politecnico di Milano Milan, Italy

- Assisted with event coordination and attendee registration
- Supported speakers and managed technical equipment
- Helped ensure smooth operations during sessions and networking events

Digital Skills

Programming Languages: Python, C++, MATLAB, GLSL, JAVA, JS, CSS
ML/DL: Keras, Tensorflow, PyTorch, Google Magenta, NumPy, SciPy, scikit-learn
Big Data Tools: Apache Beam, Apache Airflow, Apache Spark
Scientific Tools: LaTeK, Jupyter Notebooks, Zotero
MIR: librosa, FMP Notebooks
DevOps: GCP, AWS, CI/CD, Docker, LXC, Proxmox
Web: Tone.js, Three.js, Svelte, Vue.js, Firebase, Flask, Spring, PWA, Workbox, Hugo
Computer Music Languages: JUCE, Supercollider, Faust, PureData
DAWs: Logic Pro, Ableton Live, Reaper, Ardour
Acoustics: COMSOL, REW
Cybersecurity: gdb, OWASP ZAP, ghidra
DBMS: Microsoft SQL Server, MySQL, SQLite, MongoDB, Redis, MariaDB
Design: Figma
Operating Systems: Linux, macOS, Windows, Hackintosh, Android

Others: Blockchain

Musical Background

As a self-taught multi-instrumentalist, I have a well-rounded skill set across guitar, piano, and drums, while not being a virtuoso in any of them. My passion for synthesizers has always been a major influence, and listening across genres has enriched my understanding of music. I have experience playing in bands, which has further developed my collaborative skills. Additionally, I have a solid background in music theory, which I have developed independently over the years through my playing and further strengthened through courses in my master's degree.

Languages

Italian: Mother tongue

English: Fluent (C1)

French: Base (A1)

References

Available upon request.