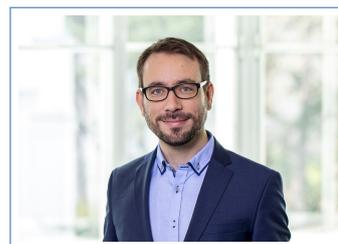# Philipp Aichinger

Curriculum Vitae

Medical University of Vienna
Department of Otorhinolaryngology
Division of Phoniatrics-Logopedics
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Personal information

Born	on January 23, 1983 in Vienna, Austria
Citizenship	Austria
Permanent contact	Zentagasse 37/25, 1050 Vienna, Austria
Marital status	Married, 1 daughter (born 2021).

Education

2015 **Doctoral Degree**, Graz University of Technology, Medical Voice Assessment/Signal Processing and Speech Communication.
With distinction

2009 **Master's Degree**, Graz University of Technology & University of Music and Dramatic Arts Graz, Electrical Engineering/Sound Engineering.
With distinction

2002 **High School Degree**, HTL Wien Donaustadt, Electrical Engineering/Telecommunications, Vienna.

Positions

since 2023 **Ap.Professor**, Medical University of Vienna, Department of Otorhinolaryngology, Division of Phoniatrics-Logopedics.

06-11/2022 **Visiting Researcher**, Friedrich-Alexander University Erlangen-Nürnberg / University Hospital Erlangen, Germany, Department of Otorhinolaryngology-Head & Neck Surgery, Division of Phoniatrics and Pediatric Audiology.

since 2018 **Principal investigator**, *Lead of the Speech and Hearing Science Lab*, Medical University of Vienna, Department of Otorhinolaryngology, Division of Phoniatrics-Logopedics.

since 2015 **Research Associate**, Medical University of Vienna, Department of Otorhinolaryngology, Division of Phoniatrics-Logopedics.

2010–2015 **PhD student**, Medical University of Vienna, Department of Otorhinolaryngology, Division of Phoniatrics-Logopedics.

Coordinator / PI in clinical investigations (incl. medical devices)

2022 (ongoing) Medical application of voice conversion: Improvement of speech in voice, speech, and language disorders (IRB 2005/2022)

2016 (ongoing) Objective differentiation of dysphonic voice quality types (IRB 1473/2016, National grant: FWF KLI722-B30, medical device)

2013 Development of an objective method for the detection of diplophonia (IRB 1700/2013, medical device)

2012 Pilot study: Development of an objective method for the detection of diplophonia (IRB 1810/2012, medical device)

Keywords / interests

Artificial intelligence, Deep learning, (Computational) Medical imaging, Clinical/diagnostic studies, Signal processing, Speech and voice disorders, Medical acoustics, Psychoacoustics, Hearing research, Hearing impairment

Journal papers

16 Devaraj V, Roesner I, Wendt F, Schoentgen J, **Aichinger P.** Auditory perception of impulsiveness and tonality in vocal fry. *Applied Sciences*, 2023;13(7):4186. doi:*10.3390/app13074186*.

15 **Aichinger P**, Kumar PS, Lehoux H, Švec JG. Simulated laryngeal high-speed videos for the study of normal and dysphonic vocal fold vibration. *Journal of Speech, Language, and Hearing Research*, 2022;65(7):2431-2445. doi:*10.1044/2022_JSLHR-21-00673*.

14 **Aichinger P.** A modelling study on the comparison of predicted auditory nerve firing rates for the personalized indication of cochlear implantation. *Applied Sciences Basel*, 2022;12:5168. doi:*10.3390/app12105168*.

13 Devaraj V, **Aichinger P.** Modelling of Amplitude Modulated Vocal Fry Glottal Area Waveforms Using an Analysis-by-Synthesis Approach. *Applied Sciences Basel*, 2021;11(5):1990. doi:*10.3390/app11051990*.

12 **Aichinger P**, Pernkopf F. Synthesis and Analysis-by-Synthesis of Modulated Diplophonic Glottal Area Waveforms. *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, 2021;29:914-926. doi:*10.1109/TASLP.2021.3053387*.

11 Driolo C, **Aichinger P.** Modelling sagittal and vertical phase differences in a lumped and distributed elements vocal fold model. *Biomedical Signal Processing and Control*, 2021;64:102309. doi:*10.1016/j.bspc.2020.102309*.

10 Bulusu S, Kumar PS, Švec JG, **Aichinger P.** Fitting synthetic to clinical kymographic images for deriving kinematic vocal fold parameters: Application to left-right vibratory phase differences. *Biomedical Signal Processing and Control*, 2021;63:102253. doi:*10.1016/j.bspc.2020.102253*.

9 **Aichinger P**, Schoentgen J, Pernkopf F. Detection of extra pulses in synthesized glottal area waveforms of dysphonic voices. *Biomedical Signal Processing and Control*, 2019;50:158-167. doi:*10.1016/j.bspc.2019.01.007*.

8   **Aichinger P**, Schoentgen J. Detection of diplophonation in audio recordings of German standard text readings. *Journal of Voice*, doi:*10.1016/j.jvoice.2018.06.009*.

7   **Aichinger P**, Hagmüller M, Roesner I, Schneider-Stickler B, Schoentgen J, Pernkopf F. Tracking of Multiple Fundamental Frequencies in Diplophonic Voices. *IEEE Transactions on Audio, Speech, and Language Processing*, 2018;26(2):330-341. doi:*10.1109/TASLP.2017.2761233*.

6   **Aichinger P**, Roesner I, Schneider-Stickler B, Leonhard M, Denk-Linnert DM, Bigenzahn W, Fuchs AK, Hagmüller M, Kubin G. Towards Objective Voice Assessment: The Diplophonia Diagram. *Journal of Voice*, 2017;31(2):253.e17-253.e26.

5   **Aichinger P**, Roesner I, Leonhard M, Schneider-Stickler B, Denk-Linnert DM, Bigenzahn W, Fuchs AK, Hagmüller M, Kubin G. Comparison of an audio-based and a video-based approach for detecting diplophonia. *Biomedical Signal Processing and Control*, 2017;31:576-585.

4   **Aichinger P**, Hagmüller M, Roesner I, Schneider-Stickler B, Schoentgen J, Pernkopf F. Fundamental frequency tracking in diplophonic voices. *Biomedical Signal Processing and Control*, 2017;37:69-81. doi:*10.1016/j.bspc.2016.10.002*.

3   **Aichinger P**, Hagmüller M, Roesner I, Bigenzahn W, Schneider-Stickler B, Schoentgen J. Diplophonia disturbs jitter and shimmer measurement. *Folia Phoniatrica et Logopaedica*, 2016;68:22-28. doi:*10.1159/000447589*.

2   Schenk F, **Aichinger P**, Roesner I, Urschler M. Automatic high-speed video glottis segmentation using salient regions and 3D geodesic active contours. *Annals of the British Machine Vision Association*, 2015;2015(1):1-15.

1   **Aichinger P**, Feichter F, Aichstill B, Bigenzahn W, Schneider-Stickler B. Inter-device reliability of DSI measurement. *Logopedics Phoniatrics Vocology*, 2012;37(4):167-173.

Letters to the editor

1   **Aichinger P**, Kubin G. Re: Gaskill CS, Awan JA, Watts CR, Awan SN. Acoustic and perceptual classification of within-sample normal, intermittently dysphonic, and consistently dysphonic voice types. J Voice. 2016;31:218-228. *Journal of Voice*, 2018;32(3):381-382, doi:*10.1016/j.jvoice.2017.05.023*.

Editorial boards

since 2022   *Biomedical Signal Processing and Control*, guest editor.

Leadership and management

2018-2024   **Aichinger P**. Objective differentiation of dysphonic voice quality types. *Austrian Science Fund (FWF) - Programme Clinical Research*, KLI722-B30, ~403k € granted.

2021   **Aichinger P**, Van Hirtum A. Diplophonia in vocal fold replica experiments. *Austrian Science Fund (FWF) - Joint project with ANR France*, ~400k €, submitted.

2021   **Aichinger P**. Computer models and perception of pathological voice - PATHOVOX *European Research Council (ERC) - Starting / FWF Start*, ~1.5 mio. €, submitted.

2022   Completion of the Leadership Curriculum. *HR Dept., Medical University of Vienna.*

2023   XBIO - Building a Biomedical Enterprise. *Course hosted by ISTA, ISTcube, Univ. of Vienna, MUV, CeMM, aws, INITS, and KHAN-I.*

Patents

2017   **Aichinger P**. Medical detector and method for extra pulse detection. *European patent*, application filed, Nr. EP17207133.4.

2019   **Aichinger P**. Medizinischer Detektor und Verfahren zur Extrapulserkennung. *Austrian patent*, granted, AT 522636 A1 2020-12-15.

Theses

2015   **Aichinger P**. Diplophonic Voice - Definitions, models, and detection. PhD dissertation. *Graz University of Technology, Austria.*

2009   **Aichinger P**. Investigation of psychoacoustic principles for automatic mixdown algorithms. Master's thesis. *University of Music and Performing Arts Graz, Austria.*

Conference papers (peer-reviewed)

24   Devaraj V, Roesner I, Wendt F, Schoentgen J, **Aichinger P.** Auditory perception of impulsiveness and tonality in vocal fry. *Proceedings of the 10th Convention of the European Acoustics Association - Forum Acusticum 2023*, 6 pages.

23   **Aichinger P**, Kumar PS, Lehoux H, Švec JG. Artificial high-speed videos of normal and dysphonic vocal fold vibration. *Proceedings of the 12th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2021, 4 pages.

22   Driolo C, **Aichinger P**. Fitting a biomechanical model of the folds to oscillatory patterns with AP and LR asymmetries observed in high speed video data. *Proceedings of the 12th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2021, 4 pages.

21   Devaraj V, **Aichinger P**. Objective detection of amplitude modulation in glottal area waveforms. *Proceedings of the 12th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2021, 4 pages.

20   Driolo C, **Aichinger P**. Modelling longitudinal phase differences in a lumped and distributed elements vocal fold model. *Proceedings of the 11th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2019, 4 pages.

19   Bulusu S, Kumar PS, Švec JG, **Aichinger P**. Extracting kinematic vocal fold parameters from videokymograms via simulation of clinical data. *Proceedings of the 11th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2019, 4 pages.

18   Devaraj V, **Aichinger P**. A glottal area waveform model for multi-pulsed vocal fry. *Proceedings of the 11th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2019, 4 pages.

17 **Aichinger P**. Perturbation of times and magnitudes of cycle maxima observed in diplophonic voices. *Proceedings of the 11th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2019, 4 pages.

16 **Aichinger P**. Tracking of multiple fundamental frequencies in standard text readings of diplophonic speakers. *Proceedings of the 11th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2019, 4 pages.

15 Schoentgen J, **Aichinger P**. Analysis and Synthesis of Vocal Flutter and Vocal Jitter. *ISCA Interspeech conference*, 2019;2518-2522.

14 Drioli C, **Aichinger P**. Aerodynamics and Lumped-Masses Combined with Delay Lines for Modeling Vertical and Anterior-Posterior Phase Differences in Pathological Vocal Fold Vibration. *ISCA Interspeech conference*, 2019;2503-2507.

13 **Aichinger P**. Characterization of turbulence noise in breathy human phonation. *Proceedings of the ICA 2019 and EAA Euroregio*, 2019;23:3139-3146.

12 **Aichinger P**, Roesner I, Schoentgen J, Pernkopf F. Modelling and detection of random extra glottal pulses during quasi-closed phases. *Proceedings of the 10th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2017, 5 pages.

11 **Aichinger P**, Fuchs AK, Schneider-Stickler B, Schoentgen J, Hagmüller M. Acoustic waveform model based detection of diplophonia for clinical application. *Proceedings of the 7th Congress on Sound and Vibration*, 2016, 8 pages.

10 **Aichinger P**, Roesner I, Leonhard M, Denk-Linnert DM, Bigenzahn W, Schneider-Stickler B. A database of laryngeal high-speed videos with simultaneous high-quality audio recordings of pathological and non-pathological voices. *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC)*, 2016;10:767-770.

9 **Aichinger P**, Fuchs AK. Diplophonie - Definitionen, Modelle und Detektion. *Fortschritte der Akustik 2016 (42. Jahrestagung für Akustik DAGA)*, 2016;42:1-4.

8 **Aichinger P**, Hagmüller M, Roesner I, Bigenzahn W, Schneider-Stickler B, Schoentgen J, Pernkopf F. Measurement of fundamental frequencies in diplophonic voices. *Proceedings of the 9th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2015;9:21-24.

7 **Aichinger P**, Schneider-Stickler B, Bigenzahn W, Hagmüller M, Sontacchi A, Schoentgen J. Assessment and psychoacoustic modeling of auditory streams in diplophonic voice. *Proceedings of the 9th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2015;9:135-138.

6 Schoentgen J, **Aichinger P**. Synthetic kymograms and glottal area waveforms in simulated non-neutral phonation. *Proceedings of the 9th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2015;9:75-78.

5 Schoentgen J, **Aichinger P**. Glottal area patterns in numerically simulated diplophonia. *Proceedings of the 18th International Congress of Phonetic Sciences*, 2015, 4 pages.

4 Schenk F, Urschler M, Aigner C, Roesner I, **Aichinger P**, Bischof H. Automatic glottis segmentation from laryngeal high-speed videos using 3D active contours. *Medical Image Understanding and Analysis*, 2014;18:111-116.

3 **Aichinger P**, Roesner I, Schneider-Stickler B, Bigenzahn W, Feichter F, Fuchs AK, Hagmüller M, Kubin G. Spectral Analysis of Laryngeal High-Speed Videos: Case Studies on Diplophonic and Euphonic Phonation. *Proceedings of the 8th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, 2013;8:81-84.

2 **Aichinger P**, Schneider-Stickler B, Bigenzahn W, Fuchs AK, Geiger B, Hagmüller M, Kubin G. Double pitch marks in diplophonic voice. *IEEE International Conference on Acoustics, Speech, and Signal Processing*, 2013;38:7437-7441.

1 **Aichinger P**, Sontacchi A, Schneider-Stickler B. Describing the Transparency of Mixdowns: The Masked-to-Unmasked-Ratio. *130th Audio Engineering Society Convention*, 2011;130.

Selected oral presentations

8 **Aichinger P**. Voice quality assessment in the digital medicine of the future. *Lab talks: Two directed to engineers and one to clinicians*, 2022, Friedrich-Alexander University Erlangen-Nürnberg / University Clinic Erlangen.

7 **Aichinger P**. Electrical Stimulation Versus Acoustical Amplification: Comparison of Predicted Auditory Nerve Signals. *44th MidWinter Meeting of the Association for Research in Otolaryngology (ARO)*, February, 2021, Online / USA.

6 **Aichinger P**. Medical diagnosis aided by automatic classification: Non-blackbox approaches for clinical voice assessment. *Colloquium of the Technical Faculty, Kiel University*, May 6, 2019, Kiel, Germany.

5 **Aichinger P**. Diplophonic Voice - Definitions, models, and detection. *GIPSA-lab (Grenoble Images Parole Signal Automatique)*, May 18, 2017, Grenoble, France.

4 **Aichinger P**. Diplophonic Voice - Definitions, models, and detection. *University of California, Los Angeles (UCLA), School of Medicine, Department of Head and Neck Surgery*, July 27, 2016, Los Angeles, USA.

3 **Aichinger P**. Diplophonic Voice - Definitions, models, and detection. *Austrian Academy of Sciences, Acoustics Research Institute (ARI)*, November 5, 2015, Vienna, Austria.

2 **Aichinger P**. Diplophonic Voice - Definitions, models, and detection. *1st MIC - Image Computing, Analysis and Visualization Meet-Up*, May 21, 2015, Vienna, Austria.

1 **Aichinger P**, Sontacchi A, Schneider-Stickler B. Describing the Transparency of Mixdowns: The Masked-to-Unmasked-Ratio. *130th Audio Engineering Society Convention*, May 13, 2011, London, United Kingdom.

Scientific meetings - organization and chairing

September 2023 **Round table on "Medical Imaging and Artificial Intelligence"**, *Annual meeting of the Austrian Association for Otorhinolaryngology, Vienna, Austria.*.

September 2023	**Session on "Psychoacoustics in Communication"**, *10th Convention of the European Acoustics Association - Forum Acusticum 2023, Turin, Italy.*.
October 2021	**6th Viennese workshop on voice quality research**, *Vienna, Austria*, with Sten Ternström (KTH Sweden), Johann Sundberg (KTH Sweden), Jean Schoentgen (Université Libre de Bruxelles), Jan Švec (Palacký University Olomouc), Manfred Kaltenbacher (Graz University of Technology), Andreas Kist (Friedrich-Alexander-University Erlangen), Stefan Kniesburges (University Hospital Erlangen), ..., online meeting.
September 2021	**Special session on "Voice quality characterization for clinical voice assessment: Voice production, acoustics, and auditory perception"**, *Brno, Czech Republic*, Jean Schoentgen (Université Libre de Bruxelles), ISCA Interspeech conference 2021.
August 2021	**5th Viennese workshop on voice quality research**, *Vienna, Austria*, with Sten Ternström (KTH Sweden), Johann Sundberg (KTH Sweden), Jean Schoentgen (Université Libre de Bruxelles), Gernot Kubin (Graz University of Technology), ..., online meeting.
September 2019	**Special session on "Voice quality characterization for clinical voice assessment: Voice production, acoustics, and auditory perception"**, *Graz, Austria*, with Abeer Alwan (UCLA), Carlo Drioli (University of Udine), Jody Kreiman (UCLA), and Jean Schoentgen (Université Libre de Bruxelles), ISCA Interspeech conference 2019.
November 2018	**Viennese Seminar on Voice Quality Research**, *Vienna, Austria*, with Jean Schoentgen (Université Libre de Bruxelles), Jan Švec & S. Pravin Kumar (Palacký University Olomouc), Stefan Kniesburges (Universitätsklinikum Erlangen), Annemie Van Hirtum & Xavier Pelorson (Université Grenoble Alpes), Carlo Drioli (University of Udine).
December 2017	Round table I Voice quality assessment and monitoring, *10th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, Florence, Italy.
December 2017	Voice quality monitoring, *10th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, Florence, Italy.
December 2017	Voice quality assessment, *10th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, Florence, Italy.
September 2015	FP-EGG-Imaging, *9th International Workshop on Models and Analysis of Vocal Emissions for Biomedical Applications*, Florence, Italy.
August 2015	FP-Acoustical/Mechanical Analysis 2, *11th Pan-European Voice Conference*, Florence, Italy.
April 30, 2014	**Scientific Seminar III**, *Vienna, Austria*, with: Wolfgang Bigenzahn (MedUni Vienna), Denis Dubrovskiy (Universitätsklinikum Erlangen), Christian Kaseß (Acoustics Research Institute, Vienna), Gernot Kubin (TU Graz), Sylvia Moosmüller (Acoustics Research Institute, Vienna), Berit Schneider-Stickler (MedUni Vienna), Jean Schoentgen (Université Libre de Bruxelles), Jan Švec (Palacký University Olomouc).

October 30, 2013	**Scientific Seminar II**, *Vienna, Austria*, with: Wolfgang Bigenzahn (MedUni Vienna), Gernot Kubin (TU Graz), Berit Schneider-Stickler (MedUni Vienna), Jean Schoentgen (Université Libre de Bruxelles), Jan Švec (Palacký University Olomouc).
June 1, 2013	**New Investigator Research Forum, The Voice Foundation**, *Philadelphia, USA*, with: Ron Baken, Mara Behlau, Molly Erickson, Michael Johns, Robert Sataloff, Nancy Pearl Solomon, Sten Ternstroem, Harvey Tucker and Edwin Yiu..
January 23, 2013	**Scientific Seminar I**, *Vienna, Austria*, with: Wolfgang Bigenzahn (MedUni Vienna), Christian Herbst (Palacký University Olomouc), Berit Schneider-Stickler (MedUni Vienna), Jan Švec (Palacký University Olomouc).

Teaching - Undergraduate and PhD level university courses

Annually since 2018	"Methods of diagnostic analyses for audio recordings of dysphonic voices", Medical University of Vienna.
Each semester since 2020	"Thesis seminar: Artificial Intelligence", Medical University of Vienna.

Mentoring

Florian Wendt	Auditory experimentation - Postdoc level
Armin Dadras	Computer Vision and AI - PhD level
Vinod Devaraj	Medical Signal Processing - PhD level
Sridhar Bulusu	Image Processing - PhD level
Hugo Lehoux	Voice science - PhD level
Marcel Koseler	MD level
Simon Windtner	BSc. thesis: "Perceived Breathiness, Pressedness, and Vocal Fry in Synthetic Voice Stimuli", University of Music and Performing Arts, Graz, Austria, 2021.
Paul Berghold	BSc. thesis: "Inverse Filtering of Pathologic Voice", Signal Processing and Speech Communication Lab, Graz University of Technology, Graz, Austria, 2015, Graz, Austria.
Christoph Aigner	BSc. thesis: "Glottal Movement Extraction from High-Speed Videos", Signal Processing and Speech Communication Lab, Graz University of Technology, 2014, Graz, Austria.
Tamara Jagersberger	Mag.art. thesis: "Vibratoanalysen anhand von Stimmaufnahmen klassischer Sänger bezogen auf die Dauer ihrer gesanglichen Ausbildung und Bühnenerfahrung", Institut Antonio Salieri, University of Music and Performing Arts Vienna, 2014, Vienna, Austria.
Fabian Schenk	MSc. thesis: "Glottal Movement Extraction from High-Speed Videos", Institute for Computer Graphics and Vision, Graz University of Technology, 2014, Graz, Austria.

Reviewing activities - Funding agencies, Journals, Conferences

German Research Foundation (DFG)

Agence nationale de la recherche (ANR France)

OeAD Scientific & Technological Cooperation

Nature Scientific Data

Frontiers in Digital Health

Journal of the Acoustical Society of America

IEEE Transactions on Audio, Speech and Language Processing

IEEE Access

Journal of the Speech, Language, and Hearing Research

Biomedical Signal Processing and Control

Speech Communication

ISCA Interspeech

Journal of Voice

Acta Acustica united with Acustica

International Journal of Environmental Research and Public Health

Journal of Medical and Biological Engineering

Open Computer Science

Applied Sciences

Memberships

IEEE Signal Processing Society

Vienna Data Science Group

Vienna Biometric Section, International Biometric Society

Austrian Society of Epidemiology

International Speech Communication Association (ISCA)

American Speech-Language-Hearing Association (ASHA)

Audio Engineering Society (AES)

Acoustical Society of America (ASA)

The Voice Foundation

Austrian Society of Logopedics, Phoniatrics and Pediatric Audiology (International Association of Logopedics and Phoniatrics)

Austrian Acoustics Association

Alumni-Club of the Medical University of Vienna

Awards

July 2018 **Elsevier outstanding reviewer award**.

September 2016 **Elsevier recognized reviewer award**.

May 2013	**Result of the month award**, *Double Pitch Marks in Diplophonic Voice*, Signal Processing and Speech Communication Lab, Graz University of Technology.

Additional information

2002–2005	Austrian Red Cross, ambulance driver and paramedic: civilian service followed up by voluntary service.
since 2005	Musician (electric guitar, bass guitar), playing together with professional musicians.
Hobbies	Concerts