

# Asterios Toutios

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## Education

- 2007            PhD in Applied Informatics  
University of Macedonia, Thessaloniki, Greece  
*Thesis topic:* Machine learning for inferring articulation from the speech signal  
*Advisor:* Konstantinos Margaritis
- 2002            MSc in Information Systems, University of Macedonia, Thessaloniki, Greece  
*Thesis topic:* Neural network-based speaker identification
- 1999            Diploma/MEng in Electrical and Computer Engineering  
Aristotle University of Thessaloniki, Greece  
*Thesis topic:* Computer-generated holograms from tilted planar objects

## Professional History

- since July 2017            Research Assistant Professor of Electrical Engineering  
Ming Hsieh Department of Electrical Engineering  
University of Southern California, Los Angeles
- June 2012 - June 2017            Research Associate, Ming Hsieh Department of Electrical Engineering  
University of Southern California, Los Angeles  
*Supervisor:* Shrikanth Narayanan
- May 2011 – May 2012            Research Associate, CNRS LTCI; TELECOM ParisTech, Paris, France  
*Supervisor:* Shinji Maeda
- Nov 2009 – Apr 2011            Research Associate, Université Nancy 2 / LORIA, Nancy, France  
*Supervisor:* Slim Ouni
- Sep 2007 – June 2009            Postdoctoral Fellow, INRIA / LORIA, Nancy, France  
*Supervisor:* Yves Laprie

## Teaching

- Oct 2004 – Sep 2006            Teaching Assistant, Department of Applied Informatics  
University of Macedonia, Thessaloniki, Greece.  
*Courses:* Digital Systems, Distributed Systems, Parallel Processing.
- Oct 2004 – Sep 2005            Laboratory Associate, Department of Informatics and Communications  
Technological Educational Institute of Serres, Greece.  
*Courses:* Computer Architecture, Numerical Analysis.

## Awards and Honors

Interspeech Best Student Award (awarded to Tanner Sorensen), 2016  
*Tanner Sorensen, Asterios Toutios, Louis Goldstein, Shrikanth Narayanan, "Characterizing vocal tract dynamics across speakers using real-time MRI", Interspeech, San Francisco, CA, 2016.*

ISMRM Magna cum Laude Merit Award, 2014

*Sajan Goud Lingala, Yinghua Zhu, Yoon-Chul Kim, Asterios Toutios, Shrikanth S. Narayanan, Krishna S. Nayak, "High spatio-temporal resolution multi-slice real time MRI of speech using golden angle spiral imaging with constrained reconstruction, parallel imaging, and a novel upper airway coil", International Society for Magnetic Resonance in Medicine (ISMRM) 20th Scientific Sessions, Toronto, Canada, pp. 1539, 2014.*

Full PhD scholarship from the Greek research program HERAKLEITOS, co-funded by the European Social Fund and national resources, 2002

## **Professional Societies**

International Phonetic Association

Acoustical Society of America

IEEE and IEEE Signal Processing Society

International Speech Communication Association

Technical Chamber of Greece

## **Professional Service**

*Session chair*, Interspeech, San Francisco, CA, 2016

*Co-organizer*, USC Speech MRI Summit, Los Angeles, California, 2014

*Co-organizer*, Special Session "Articulatory Data Acquisition and Processing", in Interspeech, Lyon, France, 2013

*Ad-hoc reviewer for*: The Journal of the Acoustical Society of America; Journal of Phonetics; Journal of Speech, Language, and Hearing Research; IEEE Transactions on Audio, Speech, and Language Processing; Computer, Speech & Language; Behavior Research Methods

*Conference reviewer for*: Interspeech; IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP); European Signal Processing Conference (EUSIPCO)

## **Invited Talks**

"Vocal tract dynamics and speech acoustics", 11<sup>th</sup> Annual Hearing Symposium, Center for Speech and Hearing, UC Irvine, CA, 2016

"Revolving around dynamic speech data", Laboratoire de Phonétique et Phonologie, Paris, France, 2011.

## **Grants and Funding**

Understanding individual-level speech variability: From novel articulatory data to robust speaker recognition (2015-2019). NSF RI Medium. Status: Senior Researcher. PI: Shrikanth Narayanan.

Dynamics of vocal tract shaping (2015-2020). NIH R01. Status: Research Investigator. PI: Shrikanth Narayanan.

Data collection and analysis of vocal tract MRI (2012-2015). DoJ/MIT Lincoln Laboratory Grant. Status: Research Investigator. PI: Shrikanth Narayanan.

Emotional speech production: Analysis, modeling and synthesis (2011-2016). NSF RI Small. Research Investigator (6/2012-2016). PI: Sungbok Lee.

Dynamics of vocal tract shaping (2009-2014). NIH R01. Status: Research Investigator (6/2012 – 2014). PI: Shrikanth Narayanan.

ARTIS: Articulatory inversion from audiovisual speech for augmented speech presentation. (2009-2013) French ANR. Status: Research Investigator (5/2011 – 5/2012). PI: Yves Laprie.

ViSAC: Acoustic-visual speech synthesis by bimodal unit concatenation (2009-2013). French ANR. Status: Research Investigator (11/2009 – 4/2011). PI: Slim Ouni.

## Publications - Journal Articles

Johannes Töger, Tanner Sorensen, Krishna Somandepalli, Asterios Toutios, Sajan Goud Lingala, Shrikanth Narayanan, Krishna Nayak, "Test-retest repeatability of human speech biomarkers from static and real-time dynamic magnetic resonance imaging", *The Journal of the Acoustical Society of America*, vol. 141, no. 5, pp. 3323-3336, 2017.

Sajan Goud Lingala, Yinghua Zhu, Yongwan Lim, Asterios Toutios, Yunhua Ji, Wei-Ching Lo, Nicole Seiberlich, Shrikanth Narayanan, Krishna S. Nayak, "Feasibility of through-time spiral generalized autocalibrating partial parallel acquisition for low latency accelerated real-time MRI of speech", *Magnetic Resonance in Medicine*, 2017. Early view.

Sajan Goud Lingala, Yinghua Zhu, Yoon-Chul Kim, Asterios Toutios, Shrikanth S. Narayanan, Krishna S. Nayak, "A fast and flexible MRI system for the study of dynamic vocal tract shaping", *Magnetic Resonance in Medicine*, vol. 77, pp. 112-125, 2017.

Asterios Toutios, Shrikanth Narayanan, "Advances in real-time magnetic resonance imaging of the vocal tract for speech science and technology research", *APSIPA Transactions on Signal and Information Processing*, vol. 5, pp. e6, 2016.

Sajan Goud Lingala, Yinghua Zhu, Yoon-Chul Kim, Asterios Toutios, Shrikanth S. Narayanan, Krishna S. Nayak, "Towards high frame rate real-time magnetic resonance imaging of speech production", *SPIE Newsroom*, 10.1117/2.1201505.005916, 2015.

Jangwon Kim, Asterios Toutios, Sungbok Lee, Shrikanth S. Narayanan, "A kinematic study of critical and non-critical articulators in emotional speech production", *The Journal of the Acoustical Society of America*, vol. 137, no. 3, pp. 1411-1429, 2015.

Shrikanth Narayanan, Asterios Toutios, Vikram Ramanarayanan, Adam Lammert, Jangwon Kim, Sungbok Lee, Krishna Nayak, Yoon-Chul Kim, Yinghua Zhu, Louis Goldstein, Dani Byrd, Erik Bresch, Prasanta Ghosh, Athanasios Katsamanis, Michael Proctor, "Real-time magnetic resonance imaging and electromagnetic articulography database for speech production research (TC)", *The Journal of the Acoustical Society of America*, vol. 136, no. 3, pp. 1307-1311, 2014.

Slim Ouni, Vincent Colotte, Utpala Musti, Asterios Toutios, Brigitte Wrobel-Dautcourt, Marie-Odile Berger, Caroline Lavecchia, "Acoustic-visual synthesis technique using bimodal unit-selection", *EURASIP Journal on Audio, Speech, and Music Processing*, Springer International Publishing, vol. 2013, no. 1, pp. 1-13, 2013.

Asterios Toutios, Slim Ouni, Yves Laprie, "Estimating the control parameters of an articulatory model from electromagnetic articulograph data", *The Journal of the Acoustical Society of America*, vol. 129, no. 5, pp. 3245-3257, 2011.

Asterios Toutios, Konstantinos Margaritis, "Estimating electropalatographic patterns from the speech signal", *Computer Speech & Language*, Elsevier, vol. 22, no. 4, pp. 346-359, 2008.

## **Publications - Book Chapters**

Michael Proctor, Yinghua Zhu, Adam Lammert, Asterios Toutios, Bonny Sands, Ulrich Hummel, Shrikanth Narayanan, "Click consonant production in Khoekhoe: a real-time MRI study", *Khoisan Languages and Linguistics. Proc. 5th Intl. Symposium, July 13-17, 2014, Riezlern/Kleinwalsertal (Sheena Shah, Matthias Brenzinger, eds.)*, Rüdiger Köppe, Cologne, pp. 337-366, 2016.

## **Publications - Papers in Conference Proceedings**

Rachel Alexander, Tanner Sorensen, Asterios Toutios, Shrikanth S. Narayanan, "VCV synthesis using Task Dynamics to animate a factor-based articulatory model", *Interspeech*, Stockholm, Sweden, 2017.

Krishna Somandepalli, Asterios Toutios, Shrikanth S. Narayanan, "Semantic edge detection for tracking vocal tract air-tissue boundaries in real-time magnetic resonance images", *Interspeech*, Stockholm, Sweden, 2017.

Tanner Sorensen, Zisis Skordilis, Asterios Toutios, Yoon-Chul Kim, Yinghua Zhu, Jangwon Kim, Adam Lammert, Vikram Ramanarayanan, Louis Goldstein, Dani Byrd, Krishna Nayak, Shrikanth S. Narayanan, "Database of volumetric and real-time vocal tract MRI for speech science", *Interspeech*, Stockholm, Sweden, 2017.

Tanner Sorensen, Asterios Toutios, Johannes Töger, Louis Goldstein, Shrikanth S. Narayanan, "Test-retest repeatability of articulatory strategies using real-time magnetic resonance imaging", *Interspeech*, Stockholm, Sweden, 2017.

Johannes Töger, Tanner Sorensen, Krishna Somandepalli, Asterios Toutios, Sajan Goud Lingala, Shrikanth Narayanan, Krishna Nayak, "Test-retest repeatability of human speech biomarkers from static and real-time dynamic magnetic resonance imaging", *International Society for Magnetic Resonance in Medicine (ISMRM) 25th Scientific Sessions*, Honolulu, HI, 2017.

Jieshen Chen, Sajan Goud Lingala, Yongwan Lim, Asterios Toutios, Shrikanth Narayanan, Krishna Nayak, "Task-based optimization of regularization in highly accelerated speech RT-MRI", *International Society for Magnetic Resonance in Medicine (ISMRM) 25th Scientific Sessions*, Honolulu, HI, 2017.

Zisis Skordilis, Asterios Toutios, Johannes Töger, Shrikanth S. Narayanan, "Estimation of vocal tract area function from volumetric magnetic resonance imaging", *IEEE International Conference on Audio, Speech and Signal Processing (ICASSP)*, New Orleans, LA, 2017.

Sajan Goud Lingala, Asterios Toutios, Johannes Toger, Yongwan Lim, Yinghua Zhu, Yoon-Chul Kim, Colin Vaz, Shrikanth Narayanan, Krishna Nayak, "State-of-the-art MRI protocol for comprehensive assessment of vocal tract structure and function", *Interspeech*, San Francisco, CA, 2016.

Yongwan Lim, Sajan Goud Lingala, Asterios Toutios, Shrikanth Narayanan, Krishna Nayak, "Improved depiction of tissue boundaries in vocal tract real-time MRI using automatic off-resonance correction", *Interspeech*, San Francisco, CA, 2016.

Asterios Toutios, Sajan Goud Lingala, Colin Vaz, Jangwon Kim, John Esling, Patricia Keating, Matthew Gordon, Dani Byrd, Louis Goldstein, Krishna Nayak, Shrikanth Narayanan, "Illustrating the production of the International Phonetic Alphabet sounds using fast real-time magnetic resonance imaging", *Interspeech*, San Francisco, CA, 2016.

Tanner Sorensen, Asterios Toutios, Louis Goldstein, Shrikanth Narayanan, "Characterizing vocal tract dynamics across speakers using real-time MRI", *Interspeech*, San Francisco, CA, 2016.

Colin Vaz, Asterios Toutios, Shrikanth Narayanan, "Convex hull convolutive non-negative matrix factorization for uncovering temporal patterns in multivariate time-series data", *Interspeech*, San Francisco, CA, 2016.

- Asterios Toutios, Tanner Sorensen, Krishna Somandepalli, Rachel Alexander, Shrikanth Narayanan, "Articulatory synthesis based on real-time magnetic resonance imaging data", *Interspeech*, San Francisco, CA, 2016.
- Sajan Goud Lingala, Yinghua Zhu, Yunhua Ji, Asterios Toutios, Wei-Ching Lo, Nicole Seiberlich, Shrikanth S. Narayanan, Krishna S. Nayak, "Accelerating real-time MRI of speech using spiral through-time GRAPPA", *International Society for Magnetic Resonance in Medicine (ISMRM) 24th Scientific Sessions*, Singapore, 2016.
- Asterios Toutios, Shrikanth S. Narayanan, "Factor analysis of vocal-tract outlines derived from real-time magnetic resonance imaging data", *International Congress of Phonetic Sciences (ICPhS 2015)*, Glasgow, UK, 2015.
- Michael Proctor, Yinghua Zhu, Adam Lammert, Asterios Toutios, Bonny Sands, Shrikanth Narayanan, "Articulatory coordination in Nama click consonants", *15th Australasian International Conference on Speech Science and Technology*, Christchurch, New Zealand, 2014.
- Sajan Goud Lingala, Yinghua Zhu, Yoon-Chul Kim, Asterios Toutios, Shrikanth S. Narayanan, Krishna S. Nayak, "High spatio-temporal resolution multi-slice real time MRI of speech using golden angle spiral imaging with constrained reconstruction, parallel imaging, and a novel upper airway coil", *International Society for Magnetic Resonance in Medicine (ISMRM) 20th Scientific Sessions*, Toronto, Canada, pp. 1539, 2014.
- Jangwon Kim, Asterios Toutios, Yoon-Chul Kim, Yinghua Zhu, Sungbok Lee, Shrikanth S. Narayanan, "USC-EMO-MRI corpus: An emotional speech production database recorded by real-time magnetic resonance imaging", *International Seminar on Speech Production (ISSP)*, Cologne, Germany, 2014.
- Yoon-Chul Kim, Jangwon Kim, Michael I. Proctor, Asterios Toutios, Krishna S. Nayak, Sungbok Lee, Shrikanth S. Narayanan, "Toward automatic vocal tract area function estimation from accelerated three-dimensional magnetic resonance imaging", *ISCA Workshop on Speech Production in Automatic Speech Recognition (SPASR)*, Lyon, France, 2013.
- Yinghua Zhu, Asterios Toutios, Shrikanth S. Narayanan, Krishna S. Nayak, "Faster 3D vocal tract real-time MRI using constrained reconstruction", *Interspeech*, Lyon, France, 2013.
- Asterios Toutios, Shrikanth S. Narayanan, "Articulatory synthesis of French connected speech from EMA data", *Interspeech*, Lyon, France, 2013.
- Michael I. Proctor, Louis Goldstein, Adam Lammert, Dani Byrd, Asterios Toutios, Shrikanth S. Narayanan, "Velic Coordination in French Nasals: a Realtime Magnetic Resonance Imaging Study", *Interspeech*, Lyon, France, 2013.
- Asterios Toutios, Shinji Maeda, "Articulatory VCV Synthesis from EMA Data", *Interspeech*, Portland, Oregon, 2012.
- Utpala Musti, Vincent Colotte, Asterios Toutios, Slim Ouni, "Introducing visual target cost within an acoustic-visual unit-selection speech synthesizer", *International Conference on Auditory-Visual Speech Processing (AVSP)*, Volterra, Italy, 2011.
- Asterios Toutios, Utpala Musti, Slim Ouni, Vincent Colotte, "Weight optimization for bimodal unit-selection talking head synthesis", *Interspeech*, Florence, Italy, 2011.
- Asterios Toutios, Slim Ouni, "Predicting tongue positions from acoustics and facial features", *Interspeech*, Florence, Italy, 2011.
- Asterios Toutios, Utpala Musti, Slim Ouni, Vincent Colotte, Brigitte Wrobel-Dautcourt, Marie-Odile Berger, "Towards a true acoustic-visual speech synthesis", *International Conference on Auditory-Visual Speech Processing (AVSP)*, Hakone, Kanagawa, Japan, pp. POS1-8, 2010.

Utpala Musti, Asterios Toutios, Slim Ouni, Vincent Colotte, Brigitte Wrobel-Dautcourt, Marie-Odile Berger, "HMM-based automatic visual speech segmentation using facial data", *Interspeech*, Makuhari, Japan, pp. 1401-1404, 2010.

Asterios Toutios, Utpala Musti, Slim Ouni, Vincent Colotte, Brigitte Wrobel-Dautcourt, Marie-Odile Berger, "Setup for acoustic-visual speech synthesis by concatenating bimodal units", *Interspeech*, Makuhari, Japan, pp. 486-489, 2010.

Michael Aron, Asterios Toutios, Marie-Odile Berger, Erwan Kerrien, Brigitte Wrobel-Dautcourt, Yves Laprie, "Registration of multimodal data for estimating the parameters of an articulatory model", *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Taipei, Taiwan, pp. 4489-4492, 2009.

Asterios Toutios, Slim Ouni, Yves Laprie, "Protocol for a model-based evaluation of a dynamic acoustic-to-articulatory inversion method using electromagnetic articulography", *International Seminar on Speech Production (ISSP)*, Strasbourg, France, pp. 317-320, 2008.

Asterios Toutios, Konstantinos Margaritis, "Contribution to statistical acoustic-to-EMA mapping", *European Signal Processing Conference (EUSIPCO)*, Lausanne, Switzerland, 2008.

Asterios Toutios, Konstantinos Margaritis, "Enhancing acoustic-to-EPG mapping with lip position information", *Interspeech*, Antwerp, Belgium, pp. 1374-1377, 2007.

Asterios Toutios, Konstantinos Margaritis, "Learning electropalatograms from acoustics", *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, vol. I, Toulouse, France, pp. 361-364, 2006.

Asterios Toutios, Konstantinos Margaritis, "Learning articulation from cepstral coefficients", *International Conference on Speech and Computer (SPECOM)*, Patras, Greece, 2005.

Asterios Toutios, Konstantinos Margaritis, "Mapping the speech signal onto electromagnetic articulography trajectories using support vector regression", *International Conference on Text Speech and Dialogue (TSD)*, Karlovy Vary, Czech Republic, pp. 318-325, 2005.

Asterios Toutios, Konstantinos Margaritis, "Mapping between the speech signal and articulatory trajectories", *Hellenic European Conference on Computer Mathematics and its Applications (HERCMA)*, Athens, Greece, 2005.

Asterios Toutios, Konstantinos Margaritis, "A support vector approach to the acoustic-to-articulatory mapping", *Interspeech*, Lisbon, Portugal, pp. 3221-3224, 2005.

Asterios Toutios, Konstantinos Margaritis, "On the acoustic-to-electropalato-graphic mapping", *International Conference on Non-Linear Speech Processing (NOLISP)*, Barcelona, Spain, pp. 186-195, 2005.

Asterios Toutios, Konstantinos Margaritis, "Estimating tongue-palate contact patterns from the speech signal", *International Conference on Speech and Computer (SPECOM)*, St. Petersburg, Russia, pp. 158-165, 2004.

Asterios Toutios, Konstantinos Margaritis, "A rough guide to the acoustic-to-articulatory inversion of speech", *Hellenic European Conference on Computer Mathematics and its Applications (HERCMA)*, Athens, Greece, 2003.

Asterios Toutios, Konstantinos Margaritis, "Acoustic-to-articulatory inversion of speech: a review", *International Turkish Symposium on Artificial Intelligence and Neural Networks (TAINN)*, Canakkale, Turkey, 2003.

Asterios Toutios, Konstantinos Margaritis, "Development of a text-dependent speaker identification system with the OGI toolkit", *Hellenic Conference on Artificial Intelligence (SETN)*, Thessaloniki, Greece, 2002.

## **Publications – Peer-Reviewed Abstracts**

Rachel Alexander, Tanner Sorensen, Asterios Toutios, Shrikanth S. Narayanan, "VCV synthesis using Task Dynamics to animate a factor-based articulatory model", *Workshop for Young Female Researchers in Speech Science & Technology*, Stockholm, Sweden, 2017.

Tanner Sorensen, Asterios Toutios, Louis Goldstein, Shrikanth Narayanan, "Decomposing vocal tract constrictions into articulator contributions using real-time magnetic resonance imaging", *Speech Motor Control*, Groningen, The Netherlands, pp. 19, 2017.

Gary Yeung, Steven Lulich, Asterios Toutios, Abeer Alwan, Amber Afshan, "Analysis of children's high front vowel area function using 3D ultrasound imaging", *172nd Meeting of the Acoustical Society of America*, Honolulu, HI, 2016.

Rachel Alexander, Asterios Toutios, Shrikanth Narayanan, "Articulatory speech synthesis from vocal-tract MRI data", *Workshop for Young Female Researchers in Speech Science & Technology*, San Francisco, CA, 2016.

Tanner Sorensen, Asterios Toutios, Louis Goldstein, Shrikanth S. Narayanan, "Characterizing vocal tract dynamics with real-time MRI", *15th Conference on Laboratory Phonology*, Ithaca, NY, 2016.