
Education

University of Southern California	Los Angeles, CA
Ph.D. in Electrical Engineering	2015 – 2021
<i>Thesis:</i> Learning Multi-Annotator Subjective Label Embeddings	
<i>Advisor:</i> Dr. Shri Narayanan	
University of Southern California	Los Angeles, CA
M.Sc. in Electrical Engineering	2015 – 2021
Universidad de Chile	Santiago, Chile
Electrical Engineering Diploma	2007 – 2013
<i>Thesis:</i> Early Online Detection of High Volatility Clusters using Particle Filters	
<i>Advisor:</i> Dr. Marcos Orchard	
<i>Honors:</i> Graduated with highest honors	
Universidad de Chile	Santiago, Chile
B. Sc. in Electrical Engineering	2007 – 2013
<i>Honors:</i> Graduated with honors	

Experience

AWS AI Labs – Amazon Bedrock	SEATTLE, WA
Applied Scientist II	Oct '24 – present
<ul style="list-style-type: none">• Multimodal embedding model development for RAG applications.	
AWS AI Labs – Amazon Lex	SEATTLE, WA
Applied Scientist II	Jul '21 – Sep '2024
<ul style="list-style-type: none">• Automatic speech recognition (ASR)<ul style="list-style-type: none">◦ End-to-end model development (including model size reduction and encoder biasing) [C2, C3].◦ Development of multimodal LLMs for speech recognition and understanding [C1, P1].	
Amazon Lab126	LOS ANGELES, CA (REMOTE)
Applied Scientist II Intern	May '20 – Aug '20
<ul style="list-style-type: none">• Deep audiovisual models for video summarization and highlight detection [C4].	
USC Signal Analysis and Interpretation Lab	LOS ANGELES, CA
Research Assistant	Aug '15 – May '21
<ul style="list-style-type: none">• Tracking Individual Performance with Sensors (TILES) (IARPA's MOSAIC program):<ul style="list-style-type: none">◦ Design and implementation of two longitudinal data collections of physiological and behavioral data of hospital workers. Tasks included: data curation, analysis, development of models, and publication of data sets [J1, J4, J5, J7, C5, C6, C9].• Learning from subjective human annotations<ul style="list-style-type: none">◦ Design of algorithms to generate unique labels for supervised machine learning from diverse annotations of subjective constructs [J6, C8, C10, C11, C12].• Mice Ultrasonic Profile ExTractor (MUPET)<ul style="list-style-type: none">◦ Mentored a Master's student to refactor code base: https://github.com/mvansegbroeck/mupet.◦ Mentored an undergraduate student to improve the dictionary learning of the MUPET software using sparse subspace clustering techniques [C7].	
Meteodata	SANTIAGO, CHILE
Research Engineer	Oct '13 – Jan '14
Development of signal processing algorithms for a low-cost ultrasonic anemometer.	
Infosys	BANGALORE, INDIA
Engineering Intern	Jan '12 – Mar '12
Development of models for detection of mitosis in histopathological images.	

- Volatility estimation of financial returns with Particle Filters [J8, J9].
- Statistical learning for self-modeling robots.
- Design of an open hardware/software radiosonde for atmospheric sensing [J10].












Teaching Assistant & Grader


Mar '10 – Dec '12

Courses: Principles of Communications, Analog Electronic Circuits, Remote Atmospheric Sensing Seminar.






Publications

Peer-reviewed conferences



- [C1] Raghuveer Peri, Sai Muralidhar Jayanthi, Srikanth Ronanki, Anshu Bhatia, **Karel Mundnich**, Saket Dingliwal, Nilaksh Das, Zejiang Hou, Goeric Huybrechts, Srikanth Vishnubhotla, Daniel Garcia-Romero, Sundararajan Srinivasan, Kyu Han, and Katrin Kirchhoff. SpeechGuard: Exploring the adversarial robustness of multi-modal large language models. In *Findings of the Association for Computational Linguistics ACL 2024*, pages 10018–10035, August 2024. .
- [C2] Tyler Vuong, **Karel Mundnich**, Dhanush Bekal, Veera Raghavendra Elluru, Srikanth Ronanki, and Sravan Bodapati. AdaBERT-CTC: Leveraging BERT-CTC for text-only domain adaptation in ASR. In *Proceedings of the 2023 Conference on Empirical Methods in Natural Language Processing: Industry Track*, pages 364–371, 2023. .
- [C3] Dhanush Bekal, Karthik Gopalakrishnan, **Karel Mundnich**, Srikanth Ronanki, Sravan Bodapati, and Katrin Kirchhoff. A metric-driven approach to conformer layer pruning for efficient asr inference. In *Proceedings of Interspeech 2023*, 2023. .
- [C4] **Karel Mundnich**, Alexandra Fenster, Aparna Khare, and Shiva Sundaram. Audiovisual highlight detection in videos. In *ICASSP 2021 - 2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2021. .
- [C5] Vinesh Ravuri, Projna Paromita, **Karel Mundnich**, Amrutha Nadarajan, Brandon M Booth, Shrikanth S Narayanan, and Theodora Chaspari. Group-specific models of healthcare workers' well-being using iterative participant clustering. In *2020 Second International Conference on Transdisciplinary AI (TransAI)*, pages 115–118. IEEE, 2020. .
- [C6] George Hadjiantonis, Projna Paromita, **Karel Mundnich**, Amrutha Nadarajan, Brandon M Booth, Shrikanth Narayanan, and Theodora Chaspari. Dynamical systems modeling of day-to-day signal-based patterns of emotional self-regulation and stress spillover in highly-demanding health professions. In *2020 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, pages 284–287. IEEE, 2020. .
- [C7] Jiaxi Wang, **Karel Mundnich**, Allison T. Knoll, Pat Levitt, and Shrikanth Narayanan. Bringing in the outliers: A sparse subspace clustering approach to learn a dictionary of mouse ultrasonic vocalizations. In *ICASSP 2020 - 2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 3432–3436, 2020. .
- [C8] Timothy Greer, **Karel Mundnich**, Matthew Sachs, and Shrikanth Narayanan. The role of annotation fusion methods in the study of human-reported emotion experience during music listening. In *ICASSP 2020 - 2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 776–780, 2020. .
- [C9] **Karel Mundnich**, Benjamin Girault, and Shrikanth Narayanan. Bluetooth based indoor localization using triplet embeddings. In *ICASSP 2019 - 2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 7570–7574, 2019. .
- [C10] Brandon M. Booth, **Karel Mundnich**, and Shrikanth Narayanan. Fusing Annotations with Majority Vote Triplet Embeddings. In *Proceedings of the 2018 on Audio/Visual Emotion Challenge and Workshop, AVEC'18*, pages 83–89. ACM, 2018. **Winner of the AVEC GES 2018 subchallenge.** .
- [C11] Brandon M Booth, **Karel Mundnich**, and Shrikanth Narayanan. A Novel Method for Human Bias Correction of Continuous-time Annotations. In *2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 3091–3095. IEEE, 2018. .

- [C12] **Karel Mundnich**, Md Nasir, Panayiotis Georgiou, and Shrikanth Narayanan. Exploiting Intra-annotator Rating Consistency through Copeland's Method for Estimation of Ground Truth Labels in Couples' Therapy. In *Proceedings of Interspeech 2017*, pages 3167–3171, 2017. .

Journals

- [J1] Projna Paromita, **Karel Mundnich**, Amrutha Nadarajan, Brandon M Booth, Shrikanth S Narayanan, and Theodora Chaspari. Modeling inter-individual differences in ambulatory-based multimodal signals via metric learning: a case study of personalized well-being estimation of healthcare workers. *Frontiers in Digital Health*, 5:1195795, 2023.
- [J2] Joanna Yau, Benjamin Girault, Tiantian Feng, **Karel Mundnich**, Amrutha Nadarajan, Brandon M. Booth, Kristina Lerman, Emilio Ferrara, Eric Hsieh, and Shrikanth Narayanan. TILES-2019, a longitudinal physiologic and behavioral data set of hospital residents in medical care units. *Sci Data*, 9(536), 2022. .
- [J3] Arindam Jati, Amrutha Nadarajan, Raghuveer Peri, **Karel Mundnich**, Tiantian Feng, Benjamin Girault, and Shrikanth Narayanan. Temporal Dynamics of Workplace Acoustic Scenes: Egocentric Analysis and Prediction. *IEEE/ACM Transactions on Audio, Speech and Language Processing*, 29:756–769, 2021. .
- [J4] Vinesh Ravuri, Projna Paromita, **Karel Mundnich**, Amrutha Nadarajan, Brandon M Booth, Shrikanth S Narayanan, and Theodora Chaspari. Investigating group-specific models of hospital workers' well-being: Implications for algorithmic bias. *International Journal of Semantic Computing*, 14(4):477–499, 2020.
- [J5] **Karel Mundnich**, Brandon M. Booth, Michelle L'Hommedieu, Tiantian Feng, Benjamin Girault, Justin L'Hommedieu, Mackenzie Wildman, Sophia Skaaden, Amrutha Nadarajan, Jennifer L. Villatte, Kristina Lerman, Emilio Ferrara, and Shrikanth Narayanan. TILES-2018, a longitudinal behavioral and pyshologic dataset of hospital workers. *Sci Data*, 7(354), 2020. .
- [J6] **Karel Mundnich**, Brandon M. Booth, Benjamin Girault, and Shrikanth Narayanan. Generating Labels for Regression of Subjective Constructs using Triplet Embeddings. *Pattern Recognition Letters*, 128:385–392, 2019. .
- [J7] Brandon M Booth*, **Karel Mundnich***, Tiantian Feng*, Amrutha Nadarajan, Tiago H. Falk, Jennifer L. Villatte, Emilio Ferrara, and Shrikanth Narayanan. Multimodal Human and Environmental Sensing for Longitudinal Behavioral Studies in Naturalistic Settings: Framework for Sensor Selection, Deployment, and Management. *J Med Internet Res*, 21(8):e12832, Aug 2019. .
- [J8] **Karel Mundnich** and Marcos E. Orchard. Early Online Detection of High Volatility Clusters using Particle Filters. *Expert Systems with Applications*, 54:228–240, 2016. .
- [J9] **Karel Mundnich**, Marcos E. Orchard, Jorge F. Silva, and Patricio Parada. Volatility Estimation of Financial Returns using Risk-Sensitive Particle Filters. *Studies in Informatics and Control*, 22(3):297–306, September 2013. .
- [J10] Federico Flores, Roberto Rondanelli, Marcos Díaz, Richard Querel, **Karel Mundnich**, Luis Alberto Herrera, Daniel Pola, and Tomás Carricajo. The Life Cycle of a Radiosonde. *Bulletin of the American Meteorological Society*, 94(2):187–198, 2013. .

Pre-prints

- [P1] Nilaksh Das, Saket Dingliwal, Srikanth Ronanki, Rohit Paturi, Zhaocheng Huang, Prashant Mathur, Jie Yuan, Dhanush Bekal, Xing Niu, Sai Muralidhar Jayanthi, Xilai Li, **Karel Mundnich**, Monica Sunkara, Sundararajan Srinivasan, Kyu J. Han, and Katrin Kirchhoff. SpeechVerse: A Large-scale Generalizable Audio Language Model. In *arXiv:2405.08295v2*, 2024. .
- [P2] Arindam Jati, Amrutha Nadarajan, **Karel Mundnich**, and Shrikanth Narayanan. Characterizing Dynamically Varying Acoustic Scenes from Egocentric Audio Recordings in a Workplace Setting. In *arXiv:1911.03843v1*. .

Skills & Background

Scientific Programming: Python, Julia, MATLAB. Classwork experience with C and Java.

Languages: Spanish (*mother tongue*), English (*IELTS score: 8.0/9.0 Oct '14*).

Awards & Distinctions

AVEC Workshop 2018: Winner of the AVEC GES sub-challenge 2018 [[C10](#)].

ACM Multimedia 2018: NSF student travel award.

Outstanding Student Award (2010, 2012): Awarded to the top 6% of students of a given class (from a total of 700 students) with highest academic performance in the School of Engineering at Universidad de Chile.

Review Services

Journals

- IEEE/ACM Transactions in Audio, Speech, and Language (TASL)
- IEEE/ACM Transactions in Affective Computing (TAFFC)
- Nature Communications Biology
- International Journal of Human-Computer Studies

Conferences

- International Conference in Acoustic, Speech, and Language (ICASSP)
 - Engineering in Medicine and Biology Conference (EMBC)
 - Association for the Advancement of Artificial Intelligence (AAAI)
 - Affective Computing and Intelligent Interaction (ACII)
 - International Conference on Multimodal Interaction (ICMI)
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