

# Nikolaos (Nikos) Flemotomos

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RESEARCH INTERESTS Automatic Speech Recognition, Speaker Diarization and Identification, Natural Language Processing, Machine Learning for Healthcare

EDUCATION **Ph.D., Electrical Engineering** May 2022  
University of Southern California, Los Angeles, CA, USA  
Thesis: *Extracting and Using Speaker Role Information in Speech Processing Applications*

**M.Sc., Computer Science** Aug 2021  
University of Southern California, Los Angeles, CA, USA  
GPA: 3.94/4.00

**M.Sc., Electrical Engineering** Dec 2018  
University of Southern California, Los Angeles, CA, USA  
GPA: 4.00/4.00

**Diploma (5-years degree), Electrical and Computer Engineering** Apr 2016  
National Technical University of Athens, Athens, Greece  
Thesis: *Robust Acoustic Features for Distant Speech Recognition*  
GPA: 9.34/10.00

EXPERIENCE **Apple**, Cambridge, MA, USA  
Siri and Language Technologies  
*Machine Learning Researcher* Jun 2022 to present

**University of Southern California**, Los Angeles, CA, USA  
Signal Analysis and Interpretation Laboratory (SAIL)  
*Graduate Research Assistant* May 2017 to May 2022  
Supervisor: Prof. Shrikanth Narayanan

- Proposed methods and frameworks to extract speaker role information in structured conversational interactions and used this contextual information to improve the performance in various speech processing tasks (e.g., diarization, speech recognition)
- Led a subgroup of Ph.D. students that, in collaboration with experts from the medical field, developed a real-world system which processes audio recordings of psychotherapy sessions and gives feedback to the therapist. The system is used for computer-aided therapist training.
- Published results in top-tier journals and peer-reviewed conferences.

**Apple**, Los Angeles, CA, USA (home office)  
Siri – Automatic Speech Recognition R&D Team  
*Machine Learning Engineering Intern* May 2021 to Aug 2021  
Supervisor: Dr. Arnab Ghoshal

- Explored acoustic-based speaker adaptation methods for end-to-end speech recognition.

**Microsoft Research**, Bellevue, WA, USA  
Speech and Dialog Research Group  
*Research Intern* May 2019 to Aug 2019  
Supervisor: Dr. Dimitrios Dimitriadis

- Worked on speaker identification and diarization in meeting scenarios.
- Proposed a novel algorithm for continuous speaker identification based on memory-augmented neural networks (presented at ICASSP '20).

	<b>Czech Technical University in Prague</b> , Prague, Czech Republic Biomedical Data and Signal Processing Group (BioDat) <i>Research Intern</i> Mar 2016 to Jun 2016 Supervisor: Assoc. Prof. Lenka Lhotská <ul style="list-style-type: none"> <li>Developed an algorithm for automatic sleep staging from polysomnographic signals, motivated by ideas used in speech recognition.</li> </ul>
	<b>National Technical University of Athens</b> , Athens, Greece Computer Vision, Speech Communication and Signal Processing Group (CVSP) <i>Undergraduate Research Assistant</i> Feb 2015 to Mar 2016 Supervisor: Prof. Petros Maragos <ul style="list-style-type: none"> <li>Explored the Teager-Kaiser energy operator for energy estimation in speech signals.</li> <li>Developed a system for single-microphone distant speech recognition, comparing various acoustic feature sets, with an emphasis on those based on the AM-FM speech model.</li> </ul>
SOFTWARE SKILLS	<b>Programming Languages:</b> Python, UNIX shell scripting, MATLAB  <b>Tools &amp; Libraries:</b> Tensorflow, PyTorch, Kaldi, OpenFST, SRILM, L <sup>A</sup> T <sub>E</sub> X
GRADUATE COURSEWORK	Analysis of Algorithms, Multimodal Probabilistic Learning of Human Communication, Advanced Natural Language Processing, Law and Intellectual Property, Computational Social Sciences, Mathematics of High-Dimensional Data, Machine Learning Theory, Deep Learning, Machine Learning from Signals, Pattern Recognition, Statistics, Probability, Random Processes
TEACHING EXPERIENCE	<b>University of Southern California</b> , Los Angeles, CA, USA <i>Teaching Assistant</i> Spring 2019, 2020 & 2021 Speech Recognition and Processing for Multimedia  <b>Society of Astronomy and Space</b> , Volos, Greece <i>Teaching Assistant</i> Summer 2011 & 2012 Preparation for the International Olympiad on Astronomy and Astrophysics
HONORS AND AWARDS	<b>Myronis Endowed Ph.D. Fellowship</b> Aug 2021 to May 2022 University of Southern California  <b>Annenberg Ph.D. Fellowship</b> Aug 2016 to Aug 2020 University of Southern California  <b>Phi Kappa Phi</b> initiation: May 2020 Member (academic honor society)  <b>Gerontelis Graduate Studies Scholarship</b> Apr 2020 Gerontelis Foundation  <b>Travel Grant</b> Sep 2018 International Speech Communication Association (ISCA)  <b>Honorable Mention</b> Sep 2010 4th International Olympiad on Astronomy and Astrophysics
MANUSCRIPTS SUBMITTED & IN PREPARATION	1. C. Berkel, D. Knox, <b>N. Flemotomos</b> , V.R. Martinez, D.C. Atkins, S. Narayanan, L.A. Rodriguez, C.G. Gallo, and J.D. Smith, “A Machine Learning Approach to Improve Implementation Monitoring of Family-Based Preventive Interventions in Primary Care”, <i>under review</i> .
JOURNAL PUBLICATIONS	1. C.S. Soma, B. Wampold, <b>N. Flemotomos</b> , R. Peri, S. Narayanan, D.C. Atkins, and Z.E. Imel. “The Silent Treatment?: Changes in Patient Emotional Expression after Silence”, <i>Counselling and Psychotherapy Research</i> , 2022.

2. Z. Chen, **N. Flemotomos**, K. Singla, T.A. Creed, D.C. Atkins, and S. Narayanan, “An Automated Quality Evaluation Framework of Psychotherapy Conversations with Local Quality Estimates”, *Computer Speech & Language*, 2022.
3. **N. Flemotomos**, V.R. Martinez, Z. Chen, T.A. Creed, D.C. Atkins, and S. Narayanan, “Automated Quality Assessment of Cognitive Behavioral Therapy Sessions through Highly Contextualized Language Representations”, *PLOS ONE*, 2021.
4. **N. Flemotomos**, V.R. Martinez, Z. Chen, K. Singla, V. Ardulov, R. Peri, D. Caperton, J. Gibson, M.J. Tanana, P. Georgiou, J. Van Epps, S.P. Lord, T. Hirsch., Z.E. Imel, D.C. Atkins, and S. Narayanan. “Automated Evaluation of Psychotherapy Skills Using Speech and Language Technologies”, *Behavior Research Methods*, 2021.
5. S.B. Goldberg, **N. Flemotomos**, V.R. Martinez, M. Tanana, P. Kuo, B.T. Pace, J.L. Villatte, P. Georgiou, J. Van Epps, Z.E. Imel, S. Narayanan, and D.C. Atkins. “Machine Learning and Natural Language Processing in Psychotherapy Research: Alliance as Example Use Case”, *Journal of Counseling Psychology*, 2020.

PEER  
REVIEWED  
CONFERENCE  
& WORKSHOP  
PROCEEDINGS

1. **N. Flemotomos** and S. Narayanan. “Multimodal Clustering with Role Induced Constraints for Speaker Diarization”, *Interspeech*, 2022.
2. Z. Chen, **N. Flemotomos**, V. Ardulov, T.A. Creed, Z.E. Imel, D.C. Atkins, and S. Narayanan. “Feature Fusion Strategies for End-to-End Evaluation of Cognitive Behavior Therapy Sessions”, *EMBC*, 2021.
3. **N. Flemotomos**, P. Georgiou, and S. Narayanan. “Linguistically Aided Speaker Diarization Using Speaker Role Information”, *Odyssey*, 2020.  
**Best Student Paper Finalist**
4. **N. Flemotomos** and D. Dimitriadis. “A Memory Augmented Architecture for Continuous Speaker Identification in Meetings”, *ICASSP*, 2020.
5. T.J. Park, M. Kumar, **N. Flemotomos**, M. Pal, R. Peri, R. Lahiri, P. Georgiou, and S. Narayanan. “The Second DIHARD Challenge: System Description for USC-SAIL Team”, *Interspeech*, 2019
6. V.R. Martinez, **N. Flemotomos**, V. Ardulov, K. Somandepalli, S.B. Goldberg, Z.E. Imel, D.C. Atkins, and S. Narayanan. “Identifying Therapist and Client Personae for Therapeutic Alliance Estimation”, *Interspeech*, 2019.
7. **N. Flemotomos**, P. Georgiou, D.C. Atkins, and S. Narayanan, “Role Specific Lattice Rescoring for Speaker Role Recognition from Speech Recognition Outputs”, *ICASSP*, 2019.
8. **N. Flemotomos**, Z. Chen, D.C. Atkins, and S. Narayanan, “Role Annotated Speech Recognition for Conversational Interactions”, *SLT*, 2018.
9. **N. Flemotomos**, P. Papadopoulos, J. Gibson, and S. Narayanan, “Combined Speaker Clustering and Role Recognition in Conversational Speech”, *Interspeech*, 2018.
10. **N. Flemotomos**, V.R. Martinez, J. Gibson, D.C. Atkins, T.A. Creed, and S. Narayanan, “Language Features for Automated Evaluation of Cognitive Behavior Psychotherapy Sessions”, *Interspeech*, 2018.
11. K. Singla, Z. Chen, **N. Flemotomos**, J. Gibson, D. Can, D.C. Atkins, and S. Narayanan, “Using Prosodic and Lexical Information for Learning Utterance-level Behaviors in Psychotherapy”, *Interspeech*, 2018.

INVITED & CAMPUS TALKS	1. <b>The Alan Turing Institute</b> , London, UK	Mar 2022
	Data Science for Mental Health Interest Group <i>Automated Quality Assessment of Cognitive Behavioral Therapy Sessions Through Highly Contextualized Language Representations</i>	
	2. <b>Alberta Hospital Edmonton/University of Alberta</b> , Edmonton, AB, Canada	Sep 2021
	Forensic Grand Rounds <i>Towards Automated Large-Scale Evaluation of Psychotherapy</i>	
	3. <b>University of Southern California</b> , Los Angeles, CA, USA	Apr 2021
	Interaction Lab <i>Who Spoke When? and how speaker roles can help us find the answer</i>	
REVIEWER	<b>Journals:</b> npj Mental Health, Applied Artificial Intelligence, PLOS ONE, Cogent Psychology, Behavior Research Methods  <b>Conferences:</b> Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)	
SERVICE AND VOLUNTARY WORK	<b>USC Behavioral Science Society</b> Student executive board member	Dec 2020 to present
	<b>Hellenic Student Association of USC</b> Student volunteer and board member	Jan 2018 to May 2019
	<b>IEEE Engineering in Medicine &amp; Biology Society NTUA Student Chapter</b> President	Sep 2014 to Jun 2015
	Student volunteer	Sep 2013 to Jun 2014