Krishna Subramani

CONTACT INFORMATION

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EDUCATION

Indian Institute of Technology Bombay, India — August 2015 to present

Dual Degree (B.Tech + M.Tech), Electrical Engineering specializing in Signal Processing, GPA : 9.29/10

Pompeu Fabra University Barcelona, Spain — September 2018 to December 2018

Erasmus+ Funded Semester Exchange Program in Audiovisual Systems Engineering, GPA : 9.33/10

PUBLICATIONS

Accepted :

- **Krishna Subramani**, Preeti Rao, Alexandre D'Hooge. "VaPar Synth - A Variational Parametric Model for Audio Synthesis", To appear in ICASSP 2020
- **Krishna Subramani**, Srivatsan Sridhar, Rohit M. A., Preeti Rao (2018, February). "Energy-Weighted Multi-Band Novelty Functions for Onset Detection in Piano Music". In 2018 Twenty Fourth National Conference on Communications (NCC) (pp. 1-6). IEEE
- **Krishna Subramani**, Alexandre D'Hooge, Preeti Rao. "Generative Audio Synthesis with a Parametric Model", Late Breaking/Demo at the 20th International Society for Music Information Retrieval, Delft, The Netherlands, 2019

Submitted :

- HaDi Maboudi, **Krishna Subramani**, Hamid Soltanian-Zadeh, Shun-ichi Amari, Hideaki Shimazaki. "Learning Complex Representations from Spatial Phase Statistics of Natural Scenes", Submitted to Neural Networks (Under Review)

RESEARCH EXPERIENCE

Variational Parametric Models for Audio Synthesis, Master's Thesis
Advised by Prof. Preeti Rao — January 2019 to present

- Performed an extensive literature review in the field of audio synthesis, including physical and spectral modeling synthesis and the more recent generative audio synthesis
- Proposed a parametric representation for audio corresponding to more direct control over musical attributes such as pitch, dynamics and timbre
- For more control over generation, proposed the use of a conditional Variational Autoencoder(CVAE) which models the timbral dependence on pitch
- To the best of our knowledge, ours is the first work using a parametric model for musical tones in the neural synthesis framework, especially exploiting the conditioning function of the CVAE

Learning Complex Representation from Natural Scene Statistics, Kyoto University Research Intern
Advised by Prof. Hideaki Shimazaki — May 2018 to present

- Proposed a phase-aware complex-domain Independent Component Analysis for natural images and derived analytical gradient expressions for maximum likelihood estimation using Wirtinger Calculus
- Demonstrated our model's improved performance with a non-uniform phase prior, over conventional models with uniform priors using the likelihood-ratio test and the Amari Index
- Tried out various optimization routines like conjugate gradient with line search, BFGS etc. for faster gradient search. Zeroed in on ADAM, leading to a 10x speedup in convergence

Automatic Musical Assessment Systems, Music Technology Group Research Intern
Advised by Prof. Xavier Serra — September 2018 to December 2018

- Worked on the signal processing part of Music Critic, an automatic music assessment system
- Studied and implemented the current system in place to analyze the evaluation methodology
- Tested various pitch-extractors like YIN, P-YIN and CREPE, and proposed the usage of P-YIN for extracting non-smooth pitch contours which are characteristic in Hindustani music
- Tested the proposed system on recordings collected from the online MOOC

Onset Detection for Piano Music, Research Project
Advised by Prof. Preeti Rao — May 2017 to March 2018

- Studied onset detection algorithms extensively in the context of piano onset detection
- Proposed energy-based weighting of multi-band onset detection functions, and a new criterion for adapting the peak-picking threshold to improve detection of soft onsets in the vicinity of loud notes
- Also proposed a grouping algorithm to reduce spurious onsets
- Demonstrated our proposed algorithm on a piano dataset, and reported improved F-measures over literature

Data Sonification using Granular Synthesis, Course Project in Real-time Audio Processing
Supervised by Prof. Angel Faraldo — October 2018 to December 2018

- Implemented a real-time granulator and glisson synthesizer on Pure Data
- Incorporated a data-sonifier with the above system. Sonified the UCI Machine Learning - Epileptic Seizure Recognition Data Set, allowing you to 'hear' if the patient has epilepsy or not by mapping the data to parameters of the granulator/glisson synthesizer

Compression using Graph Signal Processing, Course Project in Analytical Signal Processing
Supervised by Prof. Animesh Kumar — February 2019 to April 2019

- Analyzed and implemented graph compression algorithms inspired from state of the art work, which used Graph Product Decomposition and Graph Fourier Transform to achieve compression
- Extended the idea to a new dataset by performing outlier removal, data imputation and clipping

Oscillatory Neural Networks, Course Project in Neuromorphic Engineering
Supervised by Prof. Udayan Ganguly — September 2017 to November 2017

- Studied the Kuramoto model and Hopfield Networks for visual recall and simulated the same
- Used a modification of the above network to approximate a solution to the graph coloring problem

Miscellaneous Achievements

- Received the Honors Mark for being in the top 3 of the class for Pattern Recognition, Real-time Audio Processing during my exchange semester
- One among 5 people across India to receive the Erasmus+ scholarship for a semester exchange
- Ranked 1320 ($\approx$ 150,000) in the IIT-JEE Entrance Examination
- Recipient of the Kishore Vaignyanik Protsahan Yojna program (top 200 students in India) to pursue higher education at the Indian Institute of Science
- Have learnt Hindustani (North Indian) Classical Music upto Sangeet Praveen ($\approx$ 5 years training)

Teaching Experience

Teaching Assistant

- EE325 - Probability and Random Processes
- PH108 - Introduction to Electricity and Magnetism

Voluntary Teaching at Abhyasika, an NGO

- Organic Chemistry for the IIT-JEE Entrance Examination

Software Skills

Scripting/Programming/Typesetting:

- Python, MATLAB, Julia, C++, LaTeX

References

Dr. Preeti Rao
Professor, Dept of Electrical Engg., IIT Bombay
prao@ee.iitb.ac.in

Dr. Xavier Serra
Full Professor of the Dept. of Information and Communication Technologies, UPF Barcelona
xavier.serra@upf.edu

Dr. Hideaki Shimazaki
Program-specific Associate Professor at Kyoto University / Senior Scientist at Honda Research Institute Japan
h.shimazaki@i.kyoto-u.ac.jp