Ameeruddin (Ameer) Ghouse

Università di Pisa - Centro di Ricerca E Piaggio
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Born: 18 October, 1992—Akron, Ohio, United States of America
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Areas of Specialization

Neuroscience; Cognitive Sciences; Dynamical Systems; Complex Systems; Causality; Statistical Physics; Bayesian Analysis, Emergent Phenomenons, Random Systems

Work Experience

2019-Present PhD Researcher, Università di Pisa – Pisa, Italy
Key Skills: *Computational Modeling, Dynamical Systems, Complex Systems, Biomedical Imaging, Bayesian Statistics, Stochastic Differential Equations, fMRI, EEG, fNIRS, Information Theory, System Approximations and Control, Statistical Signal Processing, Numerical Methods*

- Developing new state space methods for extracting interesting dynamical system characteristics from brain data
- Causal inference with Gaussian Process Priors on reconstructed state spaces – implemented in PyTorch
- Universal first order dynamics and control modeling of neurovascular systems over observable data state space – implemented in PyTorch
- Multivoxel pattern analysis of fMRI data in decision making tasks – Bash scripting, NiLearn
- Autonomous system regulation analysis in mental stress tasks with multimodal systems
- Dissemination and discussion of results
  - Wrote academic (first author) journal articles and conference papers
  - Project and group meetings
- Supervisory board representative in European project committee.

2016-2019 Research Engineer, Institut de Ciencies Fotoniques– Barcelona, Spain
Key Skills: *Biophotonics, Machine Learning, Image Processing, Control Systems, Software Engineering, Embedded Systems Engineering, Neurovascular Modeling, Mixed Effect Modeling, Start-ups, Project Supervision, Patent writing*

- Research in noninvasive medical imaging and sensing modalities (diffuse correlation spectroscopy).
- Developed algorithms for signal analysis of wearables
- Developed machine learning models for classifying pathological waveforms in blood flow signals
- Python for simulation circuit designs, photon propogation in tissues and scientific visualization of data
- Image processing and computer vision
- Profiled/characterized sensors, analyzed control systems, designed signal conditioning circuits
- AVR embedded programming for sensor systems
- Coded digital communications for I2C, RS232, SMBus, SPI, UART protocols
- Developed software front-end for interfacing with laboratory equipment.
- Used CAD to design optical peripherals that can interface with a plethora of environmental sensors
- Wrote a patent document
- Entrepreneurial Training
- Supervised student projects
- European Projects
  - BabyLux: http://www.babylux-project.eu/
  - Laser and Ultrasound Co-Analyzer for Thyroid Cancer: http://www.luca-project.eu/

Education

2019-Present PhD in Information Engineering, Università di Pisa, Pisa Italy
Key Skills: *Computational Modeling, Dynamical Systems, Complex Systems, Biomedical Imaging, Bayesian Statistics, Stochastic Differential Equations, fMRI, EEG, fNIRS, Embedding Theory, Information Theory, System Approximations and Control, Statistical Signal Processing, Numerical Methods*

- **Title: New Neurometrics Based on the Analysis of Brain Dynamics**
  Marie Skłodowska Curie Scholarship RHUMBO

2016-2018 MSc in Cognitive Systems and Interactive Media, Universitat Pompeu Fabra, Barcelona Spain
Key Skills: *Cognitive Systems, Biomimetics, Virtual Reality, Computational Modeling, Human Behavior Dynamics, Neural Correlates of Cognitive Processes*

- **Title: Feature Learning and Prediction Algorithms for Noninvasive Monitoring of Cerebral Autoregulation Parameters**

2011-2015 BSc in Biomedical Engineering, Illinois Institute of Technology, Chicago Illinois USA
Key Skills: *Quantitative Neural Function, Quantitative Physiology, Biomedical Electronics and Sensors, Numerical Methods, Circuit Analysis, Digital Design, Control System, Neuroimaging*

- **Capstone Project – Neonatal Oxygen Metabolism Monitor**
  - Developed a near infrared spectroscopy peripheral to monitor arteriovenous difference of oxygenation and subsequent oxygen metabolism

Publications & Talks

Journal Articles

2021 Ghouse A et al (2021). Inferring directionality of coupled dynamical systems using gaussian process priors: Application on neurovascular systems. Physical Review E, 104(6).

2020 Ghouse A et al (2020), "fNIRS Complexity Analysis for the Assessment of Motor Imagery and Mental Arithmetic Tasks", *Entropy* 22, 7: 761.

2020 Fischer J, Ghouse A et al (shared first author) (2020) , "Non-invasive estimation of intracranial pressure by diffuse optics: a proof-of-concept study", *Journal of Neurotrama* 37, 23

Conference Abstracts

2022 Ghouse A, Rramani Q, Weber B, Valenza G, Schultz J, Surface-based MVPA reveals cortical representations of nutrition claims during tasting , In: Organization of Human Brain Mapping 2022, July, Edinburgh, Scotland

2020 Ghouse A, Nardelli M, Catrambone V, Valenza G, Complexity Analysis on Functional-Near Infrared Spectroscopy Time Series: a Preliminary Study on Mental Arithmetic, In: 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society, July

2019 Fischer JB, Ghouse A, et al, Machine learning for the derivation of an intracranial pressureindex using the waveform of the cerebral blood flow measured non-invasively using fast diffuse correlation spectroscopy. In: European Conferences On Biomedical Optics, 23-27 June, Munich Germany.

2019 Fischer JB, Ghouse A et al, Derivation of an Intracranial Pressure Index By Waveform Analysis of Cerebral Blood Flow Measured Non-Invasively Using Fast Diffuse Correlation Spectroscopy. In: Brain 4-7 July, Yokohama Japan

2018 Fischer JB, Giacalone G, Fernandez Cuenca D, Ghouse A, Baker W, Durduran T, Weigel UM, Effects of head-of-bed position on the critical closing pressureand the pulsatility of blood flow measured by fast diffuse correlation spectroscopy. In: European Conferences On Biomedical Optics, 23-27 June, Munich Germany.

2018 Fernandez Cuenca D, Fischer JB, Cortese L, Ghouse A, Lo Presti G, Pagliazzi M, Jose Torra F, Weigel UM, Durduran T, A Multi-Tau, Fast, Stackable Correlator For Multichannel Diffuse Correlation Spectroscopy. In: European Conferences on Biomedical Optics, 23-27 June, Munich Germany

Submitted Patent Applications

2019 Durduran T, Fischer J, Ghouse A, Weiger U, System and computer-implemented method for detecting and categorizing pathologies through an analysis of pulsatile blood flow, US Patent Application

Hobbies

- Coding GPU Shaders
- Composing music (guitar and electronic)
- Poetry and Literature (reading and writing)
- Cooking

Languages Spoken

English (Native), Italian (Proficient), French (Proficient), Spanish (Intermediate), Urdu (Intermediate)

Last updated: January 3, 2022 •