ALI DANISH ZAIDI

Neuroscience | Data Science | Medical technology

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Data scientist / neuroscientist with expertise in the acquisition and hypothesis driven analysis of complex, multi-modal datasets, as well as communication of complex scientific insights to both experts and the general public. Also experienced with setting up data-acquisition systems for wearable medical electronics, and developing and implementing novel neural decoding paradigms that leverage modern machine learning techniques. Mentored by the founding fathers of the field of brain-computer interfaces. Experience working with patients suffering from various neurological disorders such as ALS, stroke, depression, Parkinson's, tinnitus, etc. Interested in attacking challenging problems in the fields of healthcare and medical technology

EXPERIENCE

| Jun 2019 - | **MPI FOR BIOLOGICAL CYBERNETICS, TUEBINGEN, GERMANY** |
| | Postdoctoral Researcher / Scientist |

| Dec 2016 - | **WYSS CENTER FOR NEUROTECHNOLOGY, GENEVA, SWITZERLAND** |
| Dec 2018 | Wyss Research Associate |

| Dec 2011 - | **MPI FOR BIOLOGICAL CYBERNETICS, TUEBINGEN, GERMANY** |
| Dec 2016 | PhD student / Researcher under Prof. Nikos Logothetis |

| Sep 2010 - | **CENTER FOR INTEGRATIVE NEUROSCIENCE, TUEBINGEN, GERMANY** |
| Sep 2011 | Graduate Student / Researcher under Prof. Ziad Hafed |

SCIENTIFIC PUBLICATIONS

- Zaidi, Ali Danish, et al. "Simultaneous epidural functional near-infrared spectroscopy and cortical electrophysiology as a tool for studying local neurovascular coupling in primates." Neuroimage 120 (2015): 394-399.
- Robinson, N., Zaidi, A. D., et al. "Real-time subject-independent pattern classification of overt and covert movements from fNIRS signals." PloS one, 11 (2016). e0159959.
- Zaidi, Ali Danish, et al. "The hemodynamic initial-dip consists of both volumetric and oxymetric changes correlated to localized spiking activity." bioRxiv (2018): 259895. (under review: iScience).
- Zaidi, Ali Danish, et al. "The timing of hemodynamic changes reliably reflects spiking activity." bioRxiv (2018): 269696 (under review: Nature Communications Biology).

EDUCATION

2012- 2018	**PHD SYSTEMS/COGNITIVE NEUROSCIENCE** (Submitted Nov 2018)
	Max Planck Institute for Biological Cybernetics, Tuebingen
	Department of Computer Science, University of Tuebingen, Germany
	Institute for Medical Psychology, University of Tuebingen, Germany

| 2008 - 2010 | **MSC (GENETICS/GENOMICS)** University of Delhi, Delhi, India |

| 2005 - 2008 | **BSC (BIOTECHNOLOGY)**, JMI, Delhi, India |

ACADEMIC SKILLS

BASIC SCIENCE: Neural / biophysical basis of perception, cognition and action; neural mechanisms of abstract skill learning; neural decoding

TRANSLATIONAL: Brain-computer / brain-machine interfaces, epilepsy monitoring for seizure prediction and forecasting; cortical stroke monitoring; brain-state classification and neurofeedback based communication and neurorehabilitation; minimally invasive implantable systems

TECHNICAL SKILLS

- **Data science:** Machine learning, Tensorflow, PyTorch, data modeling, visualization, scientific communication, creative problem solving
- **Development**
  Languages: MATLAB, Python, PyQt, C/C++, bash, HTML, Javascript (Node.js)
  IDEs: Qt Creator, Eclipse, VSCode, Vim
  DevOps: Vagrant, Ansible, Docker, SourceTree (git/gitflow)
  Others: LaTeX, Adobe Illustrator, InDesign, Photoshop, Inventor
- **Project Management:** Jira, Bitbucket, Agile and Waterfall development and analysis methodologies
- **Methods:** Bio-electrical signal acquisition, optical imaging, electrophysiology, functional neuroimaging: fMRI, fNIRS, EEG, neurofeedback, human psychophysics.
- **Molecular Biology:** Electrophoresis, DNA/RNA extraction/prep, SDS-PAGE, antibody staining, confocal imaging, cell-line establishment and maintenance, vector transfusions
- **Languages:** English (native), German (A2), Hindi/Urdu (native)

REFERENCES

Please ask before contacting referees

Prof. Niels Birbaumer, Director
Institute for Medical Psychology,
University of Tuebingen, Germany

Prof. Nikos Logothetis, Director
MPI for Biological Cybernetics,
Tuebingen, Germany

Prof. Ranganatha Sitaram, Director
Department of Biomedical Engineering,
University of Santiago, Chile

Prof. John Donoghue, Director
Wyss Center, Geneva, Switzerland

PROJECTS AND ROLES: BRIEF OVERVIEW

Nov 2018 -   Scientist / Researcher   MPI FOR BIOLOGICAL CYBERNETICS, TUEBINGEN, GERMANY

Project 1: Unsupervised (non-parametric) approaches towards identifying neural events

- Implemented a manifold-learning based approach towards event-detection in neural timeseries data (EEG and intra-cortical electrophysiology).
- Currently testing bayesian non-parametric approaches (particle-Gibbs HMM) towards automated identification, discretization and modeling of neural events and their dynamics

Project 2: Forecasting seizure occurrence based on neural and environmental factors (collaboration with Unispital, Zurich)

- Implemented a novel spectral feature engineering technique based on spectral decomposition enabling an SVM classifier to detect seizures from EEG data.
- The algorithm beat IBM Watson on a randomized subset of data and a patent is being prepared.
- Currently mining features in the neural data that will enable reliable forecasting of upcoming seizures.

Project 3: Identifying markers of arousal in completely locked in ALS patients (collaboration with Institute for Medical Psychology, University of Tuebingen)

- Developed an algorithm to infer arousal state in completely locked in patients based on distortions in EEG, pulse-plethysmograph and galvanic skin conductance.
- Currently mining for markers in digital signals that may predict a patient´s ability to use a Brain-Computer Interface for communication.

2017 -2019   Wyss Research Associate   WYSS CENTER FOR NEUROTECHNOLOGY, GENEVA, SWITZERLAND

Project 1: Implantable subcutaneous EEG/fNIRS system for long-term epilepsy and stroke monitoring
Role: Project Coordinator, Programmer

- Collected user needs for the project and translated them to system design specifications.
- Adapted system for neurofeedback based neurorehabilitation.
- Designed and developed prototype of implantable fINRS/EEG sensors with charge-balancing system.
- Programmed graphical interface for controlling the prototype system.
- Submitted patent based on the developed prototype (provisional patent currently being filed).

Project 2: fMRI neurofeedback for chronic tinnitus.
Role: Coordinator, fMRI neurofeedback

- Setup experimental paradigm for fMRI neurofeedback for training tinnitus patients.
- Co-supervised PhD student working on the project. Initiated them into working with patients in the scanner.
- Helped establish EEG neurofeedback paradigm at another site, based on the fMRI paradigm.
- Collected and analysed fMRI/EEG data.

Project 3: Communication in the completely locked-in state using an intracortical microelectrode array
Role: Scientist, Programmer

- Helped establish paradigm for evaluating communication in completely locked-in patients.
- Developed software testing paradigm for regulatory submission (based on IEC 62304 Class A standards).
- Developed data acquisition and real-time decoding modules, as well as the state-machine for the BCI.
- Developed Vagrant/Ansible configurable virtual machines to facilitate software development across multiple sites.
- Analysed EEG/fNIRS data collected from locked-in patients to mine features for non-invasive BCIs.

2011 - 2016   PhD Student   MAX PLANCK INSTITUTE FOR BIOLOGICAL CYBERNETICS, TUEBINGEN, GERMANY

Project 1: Neuronal correlates of volitionally regulated hemodynamic signals

- Conceptualized and executed experiments to understand the neuronal correlates of volitionally regulated hemodynamic signals.
- Developed and evaluated novel technique for studying neurovascular coupling in primates.
- Trained monkeys to perform complex tasks.
- Performed simultaneous epidural fNIRS and intracortical electrophysiology in anesthetized and awake monkeys.
- Successfully wrote a grant to fund my PhD stipend for two years.
- Wrote DFG grant which was accepted but withdrawn due to primate work being discontinued in the lab.

Project 2: Real-time subject independent brain-state classification using fNIRS

- Programmed real-time fNIRS system for SVM based classification of brain states.
- Collected and analysed the data.
- Worked with patients suffering from various diseases such as Parkinson's, Stroke, Depression, ALS.