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Biosketch

Qualification

M.Sc, Physics, Bharathidasan University, Tiruchirappalli

Ph.D, Physics, Indian Institute of Science, Bangalore

Postdoctoral fellowship, Magnetic Resonance imaging and spectroscopy, University of California, Los Angeles, California

Employment

1996-2005, Scientist, Institute of Nuclear Medicine and Allied Sciences, DRDO, Delhi

2006- present, Faculty, All India Institute of Medical Sciences, New Delhi

Professional Memberships

1. National Magnetic Resonance Society, India (Life Member)
2. Indian Physics Association (Life Member)
3. Indian Biophysical Society (Life Member)
4. International Society for Magnetic Resonance in Medicine (ISMRM)

Honors

DRDO Technology Award, from DG and SA, DRDO (2002)

National Science Day Oration, SSPL-DRDO (2008)

A. Contribution to Science

1. Established ***Clinical Functional MRI Facility for clinical evaluation*** at the All India Institute of Medical Sciences (AIIMS), and for pre-surgical evaluation and research in neuroscience in India. The “Pre-surgical fMRI” facility was established for pre-surgical functional evaluation of language areas. I developed and standardized the language paradigms carried out routinely in temporal lobe and extra-temporal lobe **epilepsy patients and glioma patients**. This work is carried out in collaboration with the faculty from Neurology, Neuro-surgery and Neuro-radiology at AIIMS, epilepsy surgery. I also established protocols for cardiac MRI in experimental models.
 - a. Chaudhary K, **Kumaran SS**, Chandra SP, Wadhawan AN, Tripathi M. Mapping of cognitive functions in chronic intractable epilepsy: Role of fMRI. *Indian J Radiol Imaging*. 2014;24(1):51-6. PMID: 24851005 **Corresponding Author**
 - b. Kapil Chaudhary, Manjari Tripathi, P Sarat Chandra, Ashima Nehra, **S. Senthil Kumaran**, Evaluation of Memory in persons with mesial temporal lobe sclerosis: a combined fMRI and VBM study, *J. BioSci*. 2020, 45 (In press). **Corresponding Author**
 - c. Varsha Singh, Kapil Chaudhary, **Senthil S. Kumaran**, Sarat P. Chandra and Manjari Tripathi, Functional Cerebral Specialization for Decision Making in the Iowa Gambling Task: A Single-case Study of Left-hemispheric Atrophy and Hemispherotomy, *Front. Psychol.*, 2020 CASE REPORT ARTICLE, doi: 10.3389/fpsyg.2020.00725.
 - d. Chaudhary K, Ramanujam B, **Kumaran SS**, Chandra PS, Wadhawan AN, Garg A, Tripathi M., Does education play a role in language reorganization after surgery in drug refractory temporal lobe epilepsy: An fMRI based study?, *Epilepsy Res.*, 2017 Oct;136:88-96,10.1016/j.eplepsyres.2017.07.017,28802988.

2. Conducted ***functional, structural imaging, computational studies and Metabolomics***, to understand the neurobiology of **Parkinson’s and atypical Parkinsonism**, in collaboration with the faculty from Neurology.
 - a. Anshul Srivastava, Ratna Sharma, Vinay Goyal, Shefali Chaudhary, Sanjay Kumar Sood & **S. Senthil Kumaran**, Saccadic Eye Movements in Young-Onset Parkinson’s Disease - A BOLD fMRI Study, *Neuro-Ophthalmology*, Published online: 09 Oct 2019, <https://doi.org/10.1080/01658107.2019.1652656>. **Corresponding Author**
 - b. Saxena M, Behari M, **Kumaran SS**, Goyal V, Narang V. Assessing speech dysfunction using BOLD and acoustic analysis in parkinsonism. *Parkinsonism Relat Disord*. 2014;20(8):855-61. PMID: 24857769 **Corresponding Author**
 - c. Kumari S, **Kumaran SS**, Goyal V, Bose S, Jain S, Dwivedi SN, Srivastava AK, Jagannathan NR., Metabolomic analysis of serum using proton NMR in 6-OHDA experimental PD model and patients with PD., *Neurochem Int.*, 2020 Jan 7;134: 104670., 10.1016/j.neuint.2020.104670., 31917997. **Corresponding Author**
 - d. Kumari S, Goyal V, **Kumaran SS**, Dwivedi SN, Srivastava A, Jagannathan NR, Quantitative metabolomics of saliva using proton NMR spectroscopy in patients with Parkinson's disease and healthy controls, *Neurological Sciences*, 2020, 41:1201-1210; doi.org/10.1007/s10072-019-04143-4, 31897951. **Corresponding Author**
 - e. S Kumari, **S Kumaran**, V Goyal, Saliva as a diagnostic fluid for Neurological disorder. *J. Neurosci. Neurophysic.* 2019; 3: 103.
 - f. Rana B, Juneja A, Saxena M, Gudwani S, **Kumaran SS**, Behari M, Agrawal RK, Graph-theory-based spectral feature selection for computer aided diagnosis of Parkinson's disease using T1-weighted MRI, *International Journal of Imaging Systems and Technology*,2015; 25(3):245-255
 - g. Rana B, Juneja A, Saxena M, Gudwani S, **Kumaran SS**, Agrawal RK, Behari M., Regions-of-interest based automated diagnosis of Parkinson’s disease using T1-weighted MRI, *Expert Systems with Applications*,2015; 42(9):4506-4516
 - h. Sachin S, **Senthil Kumaran S**, Singh S, Goyal V, Shukla G, Mahajan H, and Behari M, Neurocognitive Mapping in PD and PSP for Sustained Phonation and Phoneme Tasks, *J Neurol Sci.*, 2008; 15 :51-6.

3. Conducted *functional and structural imaging studies to assess various therapeutic processes to target and improve the outcomes of stroke rehabilitation*, in collaboration with the faculty from Neurology.
 - a. Bhasin A, Srivastava MVP, Vivekanandhan S, Moganty R, Talwar T, Sharma S, Kuthiala N, **Kumaran S**, Bhatia R., Vascular Endothelial Growth Factor as Predictive Biomarker for Stroke Severity and Outcome; An Evaluation of a New Clinical Module in Acute Ischemic Stroke., *Neurol India*, 2019 Sep-Oct; 67(5):1280-1285, 10.4103/0028-3886.271241, 31744959.
 - b. Bhasin A, **Kumaran SS**, Bhatia R, Mohanty S, Srivastava MVP., Safety and Feasibility of Autologous Mesenchymal Stem Cell Transplantation in Chronic Stroke in Indian patients. A four-year follow up., *J Stem Cells Regen Med.*, 2017 May 30; 13(1):14-19. eCollection 2017, 28684893.
 - c. Bhasin A, Srivastava MVP, Mohanty S, Vivekanandhan S, Sharma S, **Kumaran S**, Bhatia R., Paracrine Mechanisms of Intravenous Bone Marrow-Derived Mononuclear Stem Cells in Chronic Ischemic Stroke., *Cerebrovasc Dis Extra.*, 2016; 6(3):107-119, 10.1159/000446404, 27846623.
 - d. Bhasin A, Srivastava MV, Mohanty S, Bhatia R, **Kumaran SS**, Bose S. Stem cell therapy: a clinical trial of stroke. *Clin Neurol Neurosurg.* 2013; 115(7):1003-8. PMID: 23183251
 - e. Bhasin A, Padma Srivastava MV, **Kumaran SS**, Bhatia R, Mohanty S. Neural interface of mirror therapy in chronic stroke patients: a functional magnetic resonance imaging study. *Neurol India.* 2012; 60(6):570-6. PMID: 23287316

4. Conducted several *research studies in blindness, color blindness, strabismus, glaucoma and optic neuritis focusing on patient rehabilitation*. These studies were conducted in collaboration with the faculty and residents of Dr. RPC Ophthalmic Sciences. We have studied the neuro-cognitive functioning and patho-physiology of various disorders (like Optic Neuritis, Amblyopia, Glaucoma, etc) with a focus on understanding the neural mechanism for effective patient care.
 - a. Gupta S, **Kumaran SS**, Saxena R, Gudwani S, Menon V, Sharma P., BOLD fMRI and DTI in strabismic amblyopes following occlusion therapy., *Int Ophthalmol.*, 2016 Aug; 36(4):557-68., 10.1007/s10792-015-0159-2, 26659010 **Corresponding Author**
 - b. Gupta AK, Menon V, Sharma P, Saxena R, **Kumaran S**. A sphenoid sinus mucocele simulating as retro bulbar optic neuritis. *Indian J Ophthalmol.* 2012; 60(3):216-8. PMID: 22569385

5. Carried out *developmental and characterization work of contrast agents that may be used for MRI and PET*.
 - e. Raunak Varshney, Swarndeeep K. Sethi, Sandhya Rangaswamy, Anjani K. Tiwari, Marilyn D. Milton, **Senthil Kumaran**, Anil K. Mishra. Design, synthesis and relaxation studies of triazole linked gadolinium(III)-DO3A-BT-bistriazaspirodecanone as a potential MRI contrast agent. *New Journal of Chemistry*, 2016 (Accepted).
 - f. Tanwar J, Datta A, Chauhan K, **Kumaran SS**, Tiwari AK, Kadiyala KG, Pal S, Thirumal M, Mishra AK. Design and synthesis of calcium responsive magnetic resonance imaging agent: Its relaxation and luminescence studies. *Eur J Med Chem.* 2014; 82:225-32. PMID: 24904969

6. Conducted *nuclear magnetic resonance imaging and neuro-cognitive research on diabetic patients with co-morbid depression*.
 - a. Haroon E, Watari K, Thomas A, Ajilore O, Mintz J, Elderkin-Thompson V, Darwin C, **Kumaran S**, Kumar A. Prefrontal myo-inositol concentration and visuospatial functioning among diabetic depressed patients. *Psychiatry Res.* 2009; 171(1):10-9. PMID: 19097871
 - b. Ajilore O, Haroon E, **Kumaran S**, Darwin C, Binesh N, Mintz J, Miller J, Thomas MA, Kumar A. Measurement of brain metabolites in patients with type 2 diabetes and major

depression using proton magnetic resonance spectroscopy. *Neuropsychopharmacology*. 2007;32(6):1224-31. PMID: 17180124

7. Conducted *nuclear magnetic resonance imaging and neuro-cognitive research on Financial Literacy, Creativity, Language*, etc.

- a. Mrinalini Srivastava, Gagan Deep Sharma, Achal Kumar Srivastava and **S. Senthil Kumaran**, What's in the brain for us: a systematic literature review of neuroeconomics and neurofinance, *Qualitative Research in Financial Markets* 2020, DOI 10.1108/QRFM-10-2019-0127
- b. Sadana D, Gupta RK, Jain S, **Kumar SS**, G S R, Thennarasu K, Rajeswaran J, Neurocognitive profile of patients with Bipolar Affective Disorder in the euthymic phase, *Asian J Psychiatr.*, 2019 Aug; 44:121-126,10.1016/j.ajp.2019.07.037,31369947
- c. Mishra J, Sagar R, Parveen S, **Kumar S**, Modi K, Maric V, Ziegler D, Gazzaley A. Closed-loop digital meditation for neurocognitive and behavioral development in adolescents with childhood neglect. *Transl Psychiatry*. 2020 May 18;10(1):153. doi: 10.1038/s41398-020-0820-z.
- d. Shobhit Jain, Anju Dhawan, **S Senthil Kumaran**, Raman Deep, Raka Jain, BOLD activation during cue induced craving in adolescent inhalant users, *Asian Journal of Psychiatry*, (2020)
- e. Shambhu Prasad, Rajesh Sagar, **S. Senthil Kumaran**, Manju Mehta, Study of Functional Magnetic Resonance Imaging (fMRI) in Children and Adolescents with Specific Learning Disorder (dyslexia), *Asian Journal of Psychiatry*,50 (2020) 101945, <https://doi.org/10.1016/j.ajp.2020.101945>.
- f. Ghosh S, Basu A, **Kumar SS**, Khushu S. Functional mapping of language networks in the normal brain using a word-association task. *Indian J Radiol Imaging*. 2010;20(3):182-7. PMID: 21042440

8. Conducted *fundamental research on MRI and nuclear magnetic resonance imaging*.

- a. Prabhjot Kaur, **S Senthil Kumaran**, RP Tripathi, Subash Khushu, Sameer Kaushik. Protocol Error Artifacts in MRI: Sources and Remedies Revisited, *Radiography*, 13 (4), 291-306, 2007. **Corresponding Author**
- b. Khushu S, **Kumar SS**, Tripathi RP, Gupta A, Jain PC, Jain V. Functional magnetic resonance imaging of the primary motor cortex in humans: response to increased functional demands. *J Biosci*. 2001;26(2):205-15. PMID: 11426056
- c. **Kumar, S.S.** Ramesh, K.P. Ramakrishna, J. PMR studies of molecular motions, phase transitions and quantum tunneling in NH_4SnCl_3 and $\text{N}(\text{CH}_3)_4\text{SnCl}_3$. *Molecular Physics* 2001; 99(16):1373-1380.
- d. **S. Senthil Kumaran**, K.P. Ramesh, J. Ramakrishna. Proton NMR T-1 studies in methylammonium trichloro stannate (II) ($\text{CH}_3\text{NH}_3\text{SnCl}_3$) Phase Transitions. 2002, 75(6), 597-605.

B. Human Resource – Training: Conducted Workshops/Symposium/Conferences to impart training to participants from science and medical backgrounds on topics listed below:

- a. Workshop on Image processing, Cognitive Neuroscience Center, NIMHANS (National facility for fMRI research set up with the grants of DST under their Cognitive Science Initiative), 8-12 August, 2011.
- b. SERC School on “Biophysics in Medicine: Advanced Training in Imaging of Experimental Models”, February 3 - 9, 2011, India Habitat Center, Lodi Road, New Delhi and AIIMS, New Delhi (Secretary).
- c. Image processing workshop, April 2015, March 2017 and April 2019, IIT-D, Delhi

d. Organised the 25th National Magnetic Resonance Society Meeting & Conference on Magnetic Resonance in Medicine, February 13-16, 2019 (Convener).

C. Contribution to Clinical Management

As Faculty-in-Charge, Clinical MRI Facility (2006-2010, 2012-2013, 2014-present), carried out Procurement, installation, maintenance of MRI, and MR compatible accessories.

Presently, there are three MRI scanners: Two 3 Tesla (Ingenia 3 T and Achieva 3.0T TX) and one 1.5 Tesla (Magnetom Aera) MR scanners

Clinical MRI services are available round-the-clock from Aug, 2018

D. Teaching and Research

Guided 4 PhD students as Chief-Supervisor, 25 PhD students as Co-Supervisor;

Guided 2 M. Biotech students as Chief-Supervisor

Guided 5 DM Students as Co-Supervisor;

Guided 22 MD Students as Co-Supervisor;

Presently Guiding 2 PhD students as Chief-Supervisor, 7 PhD, 2 DM and 5 MD students as Co-Supervisor;