Curriculum Vitae: Kuldeep Kumar

Address: 604-3455 Chemin de la Côte-des-Neiges, Montréal QC, Canada, H3H 1T6
email: kuldeep.kumar@umontreal.ca kuldeepkumar.iitkgp@gmail.com
Phone: +1 514 515 5988

Education

2013/09 - 2018/09	**Ph.D.** (*Best Thesis award*), ETS Montreal, Canada Thesis: Data-driven methods for characterizing individual differences in brain MRI Advisor: Prof. Christian Desrosiers	Gpa: 4.30/4.30
2011/07 - 2012/06	**Master of Technology** (dual degree program) Visual Information and Embedded Systems Indian Institute of Technology Kharagpur, India	Gpa: 8.61/10.0
2007/07 - 2011/05	**Bachelor of Technology** (*Honours*) Electronics and Electrical Communication Engineering Indian Institute of Technology Kharagpur, India	Gpa: 8.61/10.0

Work Experience

2018/09 - PRESENT	**Postdoctoral Researcher**, *Lab Jacquemont* CHU Sainte-Justine Research Center, University of Montreal, Canada *Developed methods that integrate neuroimaging, psychiatric genetics, cognition, and psychopathology to characterize the effect of rare genomic variants on human brain*
2016/10 - 2017/3	**Visiting Researcher**, *Aramis lab*, ICM, Inria Paris, France *Developed method for white matter fiber segmentation using functional varifolds*
2012/06 - 2013/08	**Scientist**, *Indian Space Research Organization (ISRO)*, SAC Ahmedabad, India *Developed satellite image registration algorithms; deployed satellite image based crop forecasting software (FASALSoft); calibrated thermal imaging data for Mars Orbiter Mission*
2011/05 - 2011/07	**Research Assistant**, *LIVIA* MITACS Globalink Research Internship, ETS Montreal, Canada *Developed manifold learning models to predict future states of time-evolving structure*
2010/05 - 2010/07	**Research Assistant**, *GREYC Lab*, Universite de Caen Basse-Normandie, France *Compared neural networks, SVM, random forest for diffusion MRI data classificaiton*

Awards and Recognitions

2018/11 - 2020/10	IVADO Postdoctoral Scholarship (C$ 140,000) Institute for Data Valorization (IVADO), Apogée/CFREF, Canada
2020/09	MICCAI 2020 Outstanding Reviewer Award Medical Image Computing and Computer Assisted Intervention Society
2019/03	*Best* thesis award, Prix d'excellence du Conseil d'administration de l'ÉTS ÉTS Montréal, Canada
2018/05	*Best* poster award, Artificial Intelligence in Medicine (IAM) (C$ 1,000) Faculté de Médecine, Université de Montréal, Canada
2016/10 - 2017/3	FRQNT-REPARTI International training scholarship (C$ 15,000) Fonds de recherche du Québec - Nature et technologies (FRQNT), Canada
2016/10 - 2017/3	Mitacs Globalink Research Award-Inria (C$ 10,000) MITACS and Inria, Canada-France
2013/9 - 2015/8	Mitacs Globalink Graduate Fellowship (C$ 60,000) MITACS, Canada
2011/7 - 2012/4	Dual degree Assistantship (GPA based, C$ 1,200) Indian Institute of Technology Kharagpur, India
2011/5 - 2011/7	Mitacs Globalink Internship Award (C$ 7,500) MITACS, Canada
2007/7 - 2011/4	Merit Cum Means Scholarship (C$ 3,000) Indian Institute of Technology Kharagpur, India

Publications

Refereed Journals

Scholar profile: https://scholar.google.ca/citations?user=Ujqe9DsAAAAJ&hl=en
ORCID: https://orcid.org/0000-0003-3313-135X

1. Kopal, J., **Kumar, K.**, Shafighi, K., Saltoun, K., Modenato, C., Moreau, C. A., Huguet, G., Jean-Louis, M., Martin, C.-O., Saci, Z., et al. (2024). Using rare genetic mutations to revisit structural brain asymmetry. Nature Communications, 15(1), 2639

2. Schleifer, C., Chang, S., ..., **Kumar, K.**, Hoftman, G., Bearden, C.E., (2024). Unique functional neuroimaging signatures of genetic versus clinical high risk for psychosis. BioRxiv. Under revision at Biological Psychiatry

3. Kopal, J., Huguet, G., Marotta, J., Aggarwal, S., Osayande, N., **Kumar, K.**, Saci, Z., Jean-Louis, M., et al. (2024). High-effect gene-coding variants impact cognition, mental well-being, and neighborhood safety substrates in brain morphology. MedRxiv, 2024

4. Boen, R., Kaufmann, T., Van der Meer, D., et al. (2024). Beyond the global brain differences: Intraindividual variability differences in 1q21. 1 distal and 15q11. 2 bp1-bp2 deletion carriers. Biological Psychiatry, 95(2), 147–160

5. Huguet, G., Renne, T., Poulain, C., Dubuc, A., **Kumar, K.**, Kazem, S., Engchuan, W. B., Shanta, O., et al. (2024). Effects of gene dosage on cognitive ability: A function-based association study across brain and non-brain processes. BioRxiv, 2024– 04

6. **Kumar, K.**, Modenato, C., Moreau, C., Ching, C. R., Harvey, A., et al. (2023). Subcortical brain alterations in carriers of genomic copy number variants. American Journal of Psychiatry, 180(9), 685–698

7. Kopal, J., **Kumar, K.**, Saltoun, K., Modenato, C., Moreau, C. A., et al. (2023). Rare cnvs and phenome-wide profiling highlight brain structural divergence and phenotypical convergence. Nature Human Behaviour, 7(6), 1001–1017

8. Moreau, C. A., **Kumar, K.**, Harvey, A., et al. (2023). Brain functional connectivity mirrors genetic pleiotropy in psychiatric conditions. Brain, 146(4), 1686–1696

9. Moreau, C. A., Harvey, A., **Kumar, K.**, Huguet, G., Urchs, S. G., Douard, E. A., Schultz, L. M.,Sharmarke, H., Jizi, K., Martin, C.-O., et al. (2023). Genetic heterogeneity shapes brain connectivity in psychiatry. Biological Psychiatry, 93(1), 45–58

10. Harvey, A., Moreau, C. A., **Kumar, K.**, Urchs, S., et al. (2023). Challenges in multi-task learning for fmri-based diagnosis: Benefits for psychiatric conditions and cnvs would likely require thousands of patients. Under review at Imaging Neuroscience.

11. Mollon, J., Schultz, L. M., Huguet, G., Knowles, E. E., Mathias, S. R., Rodrigue, A., Alexander-Bloch, A., Saci, Z., Jean-Louis, M., **Kumar, K.**, et al. (2023). Impact of copy number variants and polygenic risk scores on psychopathology in the uk biobank. Biological Psychiatry, 94(7), 591–600

12. Sønderby, I. E., Ching, C. R., Thomopoulos, S. I., et al. (2022). Effects of copy number variations on brain structure and risk for psychiatric illness: Large-scale studies from the enigma working groups on cnvs. Human Brain Mapping, 43(1), 300–328

13. Chauvin, L., **Kumar, K.**, Desrosiers, C., Wells, W., and Toews, M. (2021). Efficient pairwise neuroimage analysis using the soft jaccard index and 3d keypoint sets. IEEE transactions on Medical Imaging, 41(4), 836–845

14. Modenato, C.*, **Kumar, K.***, Moreau, C., Martin-Brevet, S., Huguet, G., Schramm, C., Jean-Louis, M., Martin, C.-O., Younis, N., Tamer, P., et al. (2021). Effects of eight neuropsy-

chiatric copy number variants on human brain structure. Translational Psychiatry, 11(1), 399

15. Modenato, C., Martin-Brevet, S., Moreau, C. A., Rodriguez-Herreros, B., **Kumar, K.**, Draganski, B., Sønderby, I. E., and Jacquemont, S. (2021). Lessons learned from neuroimaging studies of copy number variants: A systematic review. Biological Psychiatry, 90(9), 596–610

16. Moreau, C. A., **Kumar, K.**, Harvey, A., Huguet, G., Urchs, S., Douard, E. A., Schultz, L. M., Sharmarke, H., Jizi, K., Martin, C.-O., et al. (2021). Atlas of functional connectivity relationships across rare and common genetic variants, traits, and psychiatric conditions. MedRxiv

17. Moreau, C. A., Ching, C. R., **Kumar, K.**, Jacquemont, S., and Bearden, C. E. (2021). Structural and functional brain alterations revealed by neuroimaging in cnv carriers. Current opinion in genetics and development, 68, 88–98

18. Sønderby, I. E., Van der Meer, D., Moreau, C., Kaufmann, T., Walters, G. B., Ellegaard, M., Abdellaoui, A., Ames, D., Amunts, K., Andersson, M., et al. (2021). 1q21. 1 distal copy number variants are associated with cerebral and cognitive alterations in humans. Translational Psychiatry, 11(1), 182

19. Moreau, C. A., Urchs, S. G., **Kumar, K.**, Orban, P., Schramm, C., Dumas, G., Labbe, A., Huguet, G., Douard, E., Quirion, P.-O., et al. (2020). Mutations associated with neuropsychiatric conditions delineate functional brain connectivity dimensions contributing to autism and schizophrenia. Nature Communications, 11(1), 1–12

20. Chauvin, L., **Kumar, K.**, Wachinger, C., Vangel, M., de Guise, J., Desrosiers, C., Wells, W., and Toews, M. (2019). Neuroimage signature from salient keypoints is highly specific to individuals and shared by close relatives. NeuroImage

21. **Kumar, K.**, Siddiqi, K., and Desrosiers, C. (2019). White matter fiber analysis using kernel dictionary learning and sparsity priors. Pattern Recognition, 95, 83–95

22. **Kumar, K.**, Toews, M., Chauvin, L., Colliot, O., and Desrosiers, C. (2018). Multi-modal brain fingerprinting: A manifold approximation based framework. NeuroImage, 183, 212–22622.

23. **Kumar, K.**, Desrosiers, C., Siddiqi, K., Colliot, O., and Toews, M. (2017). Fiberprint: A subject fingerprint based on sparse code pooling for white matter fiber analysis. NeuroImage, 158, 242–259

Peer-reviewed Conferences and Workshops

24. Chauvin, L., **Kumar, K.**, Desrosiers, C., De Guise, J., Wells, W., and Toews, M. (2019). Analyzing brain morphology on the bag-of-features manifold. Information Processing in Medical Imaging (IPMI), 11492, 45–56

25. **Kumar, K.**, Chauvin, L., Toews, M., Colliot, O., and Desrosiers, C. (2017). Multi-modal analysis of genetically-related subjects using sift descriptors in brain MRI. Computational diffusion MRI, Miccai 2017 (pp. 219–228). Springer International Publishing (*Oral presentation*)

26. **Kumar, K.**, Gori, P., Charlier, B., Durrleman, S., Colliot, O., and Desrosiers, C. (2017). White matter fiber segmentation using functional varifolds. Mathematical Foundations of Computational Anatomy (MFCA), MICCAI 2017, 10551, 92–100

27. Chauvin, L., **Kumar, K.**, Desrosiers, C., De Guise, J., and Toews, M. (2017). Diffusion orientation histograms (DOH) for diffusion weighted image analysis. Workshop on

Computational Diffusion MRI, MICCAI 2017

28. **Kumar, K.**, Desrosiers, C., Chaddad, A., and Toews, M. (2016). Spatially constrained sparse regression for the data-driven discovery of neuroimaging biomarkers. 2016 23rd International Conference on Pattern Recognition (ICPR), 2162–2167

29. Zhang, M., **Kumar, K.**, and Desrosiers, C. (2016). A weighted total variation approach for the atlas-based reconstruction of brain MR data. 2016 IEEE International Conference on Image Processing (ICIP), 4329–4333

30. **Kumar, K.**, and Desrosiers, C. (2016). A sparse coding approach for the efficient representation and segmentation of white matter fibers. 2016 IEEE 13th International Symposium on Biomedical Imaging (ISBI), 915–919

31. **Kumar, K.**, Desrosiers, C., and Siddiqi, K. (2015). Brain fiber clustering using non-negative kernelized matching pursuit. Machine Learning in Medical Imaging: 6th International Workshop, MLMI 2015, Held in Conjunction with MICCAI 2015, Munich, Germany, October 5, 2015, Proceedings 6, 144–152

32. **Kumar, K.**, and Desrosiers, C. (2014). Group sparse kernelized dictionary learning for the clustering of white matter fibers. STMI, MICCAI Workshop 2014

Select Conference Abstracts

- **Kumar, K.**, Kazem, S., Liao, Z., Kopal, J., et al. (2024). Rare variant genetic architecture of human cortical organization. OHBM 2024
- Kazem, S., **Kumar, K.**, Renne, T., et al. (2024). Gene dosage architecture across complex traits and Common diseases. Machine Learning in Computational and Systems Biology, MLCSB, ISMB 2024
- **Kumar, K.**, Modenato, C., Moreau, C., Ching, C., Bearden, C., Thompson, P. M., and Jacquemont, S. (2024). Subcortical brain alterations across copy number variants converge with those in severe mental illnesses. Biological Psychiatry, 95(10), SOBP 2024
- **Kumar, K.**, Kazem, S., Liao, Z., Kopal, J., et al. (2024). 295. rare variant genetic architecture of the human cortical MRI phenotypes in general population. Biological Psychiatry, 95(10), S220–S221. SOBP 2024
- Schleifer, C., Chang, S., ..., **Kumar, K.**, Hoftman, G., Bearden, C.E., (2024). 36. unique functional neuroimaging signatures of genetic versus clinical high risk for psychosis. Biological Psychiatry, 95(10), S89–S90. SOBP 2024
- **Kumar, K.**, Kazem, S., Huguet, G., et al. (2023). W56. unraveling the impact of genomic variations on cognitive ability across the human cortex: Insights from gene expression and copy number variants. European Neuropsychopharmacology, 75, S133. WCPG 2023
- Kazem, S., **Kumar, K.**, Huguet, G., Lizotte, M., et al. (2023). F66. from gene to cognition: Mapping the effects of genomic deletions and duplications on cognitive ability. WCPG 2023. European Neuropsychopharmacology, 75, S255–S256. WCPG 2023
- Liao, Z., **Kumar, K.**, Kopal, J., Jacquemont, S., and Paus, T. (2023). W66. copy number variants and the tangential growth of the cerebral cortex. European Neuropsychopharmacology, 75, S138–S139. WCPG 2023
- Engchuan, W., Thiruvahindrapuram, B., MacDonald, J. R., Shanta, O., **Kumar, K.**, Klein, M., et al. (2023). 70. gene-based analysis of rare cnvs across six psychiatric disorders identifies common biological components but distinctly different genetic effects in autism and schizophrenia. European Neuropsychopharmacology, S93–S94. WCPG 2023

Select Oral Presentations

2024/05	Subcortical brain alterations across copy number variants converge with those in severe mental illnesses The Society of Biological Psychiatry (SOBP 2024), Austin, USA
2023/11	Autism and cognitive ability: insights from gene dosage and large scale brain networks. American Society of Human Genetics (ASHG, 2023), DC, USA
2023/09	Gene dosage across the human brain and effects on cognition and ASD risk. Genes to Mental Health (G2MH) annual meeting, NIMH, USA (2023)
2023/02	Genomic deletions and duplications show effects on cognitive ability along the hierarchical gradient of the cortical organization Feindel Virtual Brain and Mind Lecture Series, McGill University
2022/06	Using organizing principles of the human brain to map genome-wide the effect sizes of gene dosage on cognition Gradients workshop 2022, Cambridge, UK
2022/05	Subcortical brain alterations across copy number variants converge with those in autism and neurodevelopmental psychiatric disorders. The International Society for Autism Research (INSAR 2022)

Teaching and Mentoring

2024	Teaching assistant, Neuromatch Academy 2024 Computational Neuroscience course
2022; 2023	Neuromatch Academy 2022 / and 2023 Mentor Mentored Neuromatch Academy students for their final projects
2020-present	PhD students supervision
2019; 2021	CHU Sainte-Justine undergraduate Internship supervision
2016	Globalink Mentor, MITACS Mentored five Globalink Research Interns (GRIs) from: Tunisia, India, & France
2015	Globalink Mentor, MITACS Mentored six Globalink Research Interns (GRIs) from: China, Mexico, & Vietnam
2011-12	Teaching assistant, Digital signal processing laboratory Indian Institute of Technology Kharagpur, India
2011-12	Teaching assistant, Basic electronics laboratory Indian Institute of Technology Kharagpur, India

Public outreach and science dissemination

2021/07	Canada as a student destination, Panelist; MITACS and Montreal International, Montreal, Canada
2019/10	MITACS program, Policy feedback meeting: Govt. of Canada MITACS and Govt. of Canada
2019/07	Presentation; Montréal: a Research and Innovation Hub MITACS and Montreal International

Other activities

Collaborations	Autism Research Centre (ARC), University of Cambridge, UK PGC-CNV ENIGMA-CNV CAMP project, Genes to Mental Health Network
Reviewing	IEEE Transactions on Medical Imaging (IEEE TMI) Biological Psychiatry; Human Brain Mapping (HBM); Journal of Psychiatric Research; Medical Image Computing and Computer Assisted Intervention (MICCAI); IAPR International Conference on Machine Vision Applications (MVA)