Soumyashant Nayak

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Postdoctoral Affiliation

Postdoctoral Researcher in Bioinformatics at ITMAT, Smilow Center for Translational Research in the **Perelman School of Medicine, University of Pennsylvania**. (September 2016 - present)
Mentored by **Gregory Grant**.

Education

Philosophiae Doctorate in Mathematics,
awarded by the **University of Pennsylvania**, Philadelphia in August 2016.
Thesis - *On the Diagonals of Projections in Matrix Algebras over von Neumann Algebras*
Advisor - **Richard V. Kadison**

Bachelor of Mathematics (Hons.), Mathematics (2008-2011)
Indian Statistical Institute, Bangalore Centre

Research Interests

Operator Algebras, Representation Theory, Statistical Methods in Bioinformatics, Systems Biology

Awards and Honors

Fellowships :

- Selected for Ramanujan Fellowship, Science and Engineering Research Board (SERB), Dept. of Science and Techology (DST), Govt. of India, 2019 - SB/S2/RJN-035/2019.
  (declined due to acceptance of regular faculty position at Indian Statistical Institute, Bangalore Centre).
- Benjamin Franklin Fellowship - University of Pennsylvania, Philadelphia 2011 - 2016.
- Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship, Dept. of Science and Technology, Govt. of India, 2006-2011.
- Selected for the Summer Research Fellowship Programme (SRFP) for 2 consecutive years, 2010-2011 by Indian Academy of Sciences.
  (Hosted by V. S. Sunder and Partha Sarathi Chakraborty, respectively, at the Institute of Mathematical Sciences, Chennai).
- National Talent Search Examination (NTSE) scholarship, National Council of Educational Research and Training (NCERT), 2006.
  (declined due to acceptance of KVPY Fellowship).

Others :

- Selected among top 30 students in India in the Indian National Mathematical Olympiad (INMO) for 3 consecutive years, 2006-2008.
- Gold Medal in International Olympiad on Astronomy and Astrophysics (IOAA) 2007 held in Chiang Mai, Thailand.
- Bronze Medal in International Astronomy Olympiad (IAO) 2006 held in Mumbai, India.
- Silver Medal in International Astronomy Olympiad (IAO) 2005 held in Beijing, China.

- Placed among top 1% in National Standard Examination in Physics 2007.

Publications and Preprints

Mathematics :

1. **S. Nayak;** *The Hadamard Determinant Inequality - Extensions to Operators on a Hilbert Space*, J. Funct. Anal. 274 (2018), no. 10, 2978–3002. [DOI:10.1016/j.jfa.2017.10.009], [arXiv:1704.05421]
2. M. Gaál, **S. Nayak**; *On a class of determinant preserving maps for finite von Neumann algebras*, J. Math. Anal. Appl. 464 (2018), no. 1, 317–327. [DOI:10.1016/j.jmaa.2018.04.006], [arXiv:1711.08786]
3. **S. Nayak**; *Jensen's inequality in finite subdiagonal algebras*, Bull. Lond. Math. Soc. 50 (2018), no. 6, 1102–1112. [DOI:10.1112/blms.12208], [arXiv:1807.11652]
4. **S. Nayak**; *A constructive proof of the derivation theorem*, Math. Student 88 (2019), Nos. 3–4.
5. **S. Nayak**; *Matrix algebras over algebras of unbounded operators*, Banach J. Math. Anal. [DOI:10.1007/s43037-019-00052-y], [arXiv:1812.06872]
6. **S. Nayak**; *The Douglas Lemma for von Neumann Algebras and Some Applications* (submitted, 16 pp). [arXiv:1707.04378]
7. **S. Nayak**; *A framework for rank identities - With a view towards operator algebras* (submitted, 33 pp). [arXiv:1801.08072]
8. **S. Nayak**; *On Murray-von Neumann algebras - I: Topological, order-theoretic and analytical aspects.* [arXiv:1911.01978]
9. **S. Nayak**, K. Schrempf; *An invitation to free associative algebras* (in preparation).

Bioinformatics :

1. Arjun Sengupta, Seth D Rhoades, Eun Ji Kim, **Soumyashant Nayak**, Gregory R Grant, Peter Meerlo, Aalim M Weljie; *Sleep restriction induced energy, methylation and lipogenesis metabolic switches in rat liver*, The International Journal of Biochemistry and Cell Biology, Vol. 93 (2017), 129-135 pp. [DOI:10.1016/j.biocel.2017.08.014]
2. Preetika Gupta, Ogul E Uner, **Soumyashant Nayak**, Gregory R Grant, Robert G Kalb; *SAP97 regulates behavior and expression of schizophrenia risk enriched gene sets in mouse hippocampus*, PLoS ONE 13(7): e0200477. [DOI:10.1371/journal.pone.0200477]
3. Iryna Shakhmantsir, **Soumyashant Nayak**, Gregory R. Grant, Amita Sehgal; *Spliceosome factors target timeless (tim) mRNA to control clock protein accumulation and circadian behavior in Drosophila*, eLife 2018;7:e39821. [DOI:10.7554/eLife.39821]
4. Shaon Sengupta, Soon Yew Tang, Jill Devine, **Soumyashant Nayak**, Shirley Zhang, Alex Valenzuela, Carolina B Lopez, Gregory R. Grant, Garret A. FitzGerald; *Circadian control of lung inflammation in influenza infection*, Nature Communications volume 10, Article number: 4107 (2019) . [DOI:10.1038/s41467-019-11400-9], [bioRXiv preprint:doi:10.1101/381814]

5. **Soumyashant Nayak**, Nicholas Lahens, Eun Ji Kim, Emanuela Ricciotti, George Paschos, Sarah Tiskoff, Dimitra Sarantopoulou, Shaon Sengupta, Barry Cooperman, Tilo Grosser, Gregory R. Grant; *Iso-relevance functions - A systematic approach to ranking genomic features by differential effect size* (submitted).
   [bioRXiv preprint:doi:10.1101/381814v2]
6. Dimitra Sarantopoulou*, **Soumyashant Nayak***, Thomas G. Brooks, Nicholas F. Lahens, Gregory R. Grant; *Comparative evaluation of full-length isoform quantification from RNA-Seq* (submitted). $*$ - equal contribution.
7. Nicholas Lahens, Thomas G. Brooks, Dimitra Sarantopoulou, **Soumyashant Nayak**, Cris Lawrence, Anand Srinivasan, Jonathan Schug, John B Hogenesch, Yoseph Barash, Gregory R. Grant; *CAMPAREE: A robust and configurable RNA expression simulator* (submitted).
8. **Soumyashant Nayak**, Eric McGivney, Thomas G. Brooks, Nicholas Lahens, Gregory R. Grant; *TEQILA: A tool for gene-set differential feature distribution analysis* (in preparation).

Teaching Experience

Instructor, University of Pennsylvania

- Math 241, Calculus IV, Introduction to Partial Differential Equations (Summer Session II, 2016)
- Math 170, Ideas in Mathematics (Full Summer Session 2016)
- Official Math Help Tutor, All Undergraduate Courses (Summer Session II, 2015)
- Math 114, Introduction to Multivariable Calculus (Summer Session II, 2013)

Teaching Assistant, University of Pennsylvania

- Math 608, Complex Analysis, Fall 2014
- Math 509, Advanced Analysis, Spring 2014
- Math 180, Analytical Methods in Economics, Law and Medicine, Fall 2013
- Math 425, Partial Differential Equations, Spring 2013
- Math 312, Linear Algebra, Fall 2012

Conferences Attended

- RECOMB - 2019 at George Washington University, Washington, DC. 5–8 May, 2019.
- NEAM - 2018 at SUNY, New Paltz. 19–21 October, 2018.
- ITMAT 2018 Symposium - A Sense of Momentum; Translational Science Comes of Age at Smilow Research Center, University of Pennsylvania, Philadelphia. 15–16 October, 2018.
- ECOAS - 2018 at Texas Christian University. 13–14 October, 2018.
- Conference on Intelligent Systems for Molecular Biology (ISMB) - 2018 at Hyatt Regency, Chicago. 6–10 July, 2018.
- Pacific Symposium for Biocomputing - 2018 at Fairmont Orchid, the Big Island of Hawaii. 3–7 January, 2018.
- ITMAT 2017 Symposium : Structures, Technologies and Discoveries in Translational Science at Smilow Research Center, University of Pennsylvania, Philadelphia. 16–17 October, 2017.
- AMS Fall Southeastern Sectional Meeting, University of Central Florida, Orlando. 23–24 September, 2017.

- COSy - 2017 at Lakehead University. 29 May – 1 June, 2017.
- Penn Symposium on Mathematical and Computational Biology at University of Pennsylvania, Philadelphia. 22–23 May, 2017.
- Noncommutative Geometry and Operator Algebras (NCGOA) Spring Institute at University of Bonn. 17–25 May, 2016.
- CBMS conference at University of Wyoming, Laramie. 8–12 June, 2015.
- RMMC Summer School at University of Wyoming, Laramie. 1–5 June, 2015.
- Great Plains Operator Theory Symposium (GPOTS) - 2015 at Purdue University, West Lafayette. 26–30 May, 2015.
- Classification Of C*-Algebras, Flow Equivalence of Shift Spaces, And Graph and Leavitt Path Algebras at University of Louisiana, Lafayette. 11–15 May, 2015.
- Lecture Series on Quantum Groups by Dr. Moritz Weber at the Institute of Mathematical Sciences, Chennai. 5–24 Jan, 2015.
- 2013 CNA Summer School: Topics in Nonlinear PDEs and Calculus of Variations, and Applications in Materials Science, at CMU, Pittsburgh. 29 May – 7 June, 2013.
- NCGOA - 2013 at Vanderbilt University, Nashville. 3–9 May, 2013.
- Riviere-Fabes Symposium at University of Minnesota, Twin Cities. 19–21 April, 2013.
- 3rd Ohio River Analysis Meeting at University of Cincinnati. 9–10 March, 2013.

Talks

Contributed Talks

- *Northeastern Analysis Meeting* (20 October, 2018), SUNY, New Paltz.
- *AMS Fall Southeastern Sectional Meeting* (23 September, 2017), University of Central Florida, Orlando.
- *Canadian Operator Algebras Symposium* (30 May, 2017), Lakehead University, Thunder Bay.
- *RMMC Summer School* (2 June, 2015), University of Wyoming, Laramie.
- *Great Plains Operator Theory Symposium* (27 May, 2015), Purdue University, West Lafayette.

Colloquia and Seminar Talks

- *Inverse Problems and Analysis Seminar* (12 November, 2019) University of Delaware, Newark.
- (29 June, 2018) Chennai Mathematical Institute, Chennai.
- (28 June, 2018) Indian Statistical Institute, Bangalore Centre.
- (27 June, 2018) Indian Institute of Science, Bangalore.
- *Analysis Seminar* (7 June, 2018) Indian Statistical Institute, Kolkata.
- *SOPM - 2017* (24 June, 2017) NISER, Jatni, Bhubaneswar.
- *Analysis Seminar* (14 April, 2017) Drexel University, Philadelphia.