Emergent Research:
The PIMS Postdoctoral Fellow Seminar

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Pacific Institute for the **Mathematical Sciences**

Positivity Preservers
Forbidden to Operate
on Diagonal Blocks

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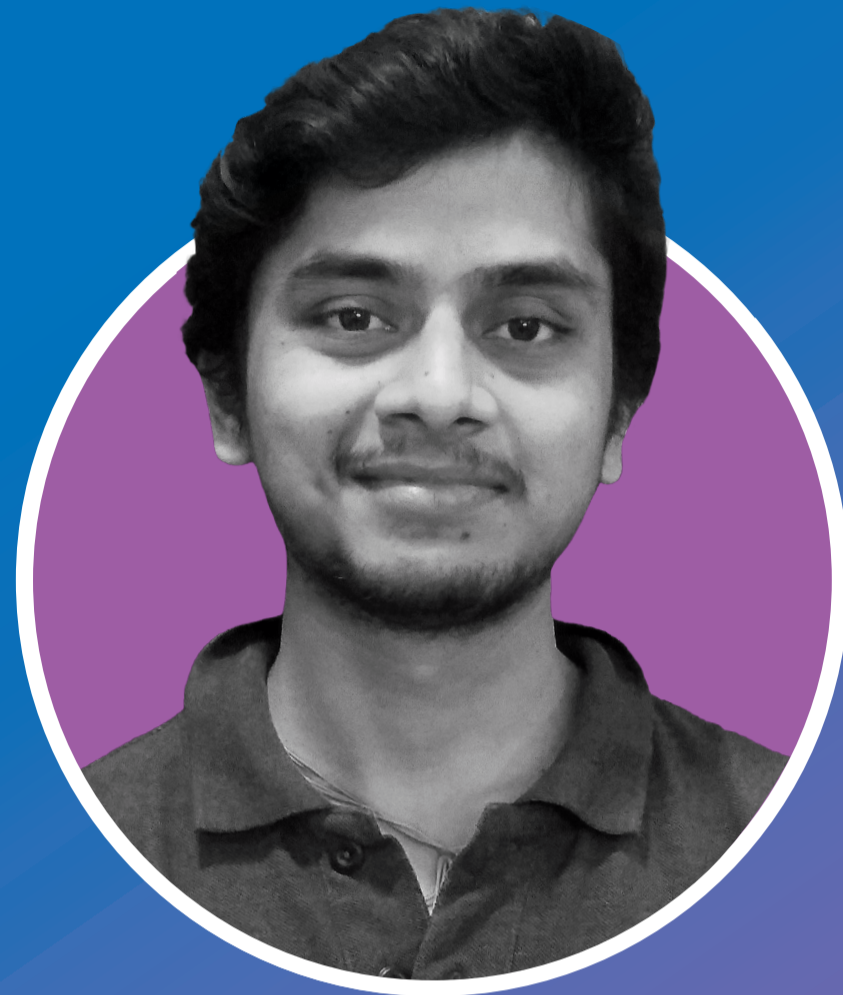
ABSTRACT:
The question of which functions acting entrywise preserve positive semidefiniteness has a long history, beginning with the Schur product theorem [Crelle 1911], which implies that absolutely monotonic functions (i.e., power series with nonnegative coefficients) preserve positivity on matrices of all dimensions. A famous result of Schoenberg and of Rudin [Duke Math. J. 1942, 1959] shows the converse: there are no other such functions. Motivated by modern applications, Guillot and Rajaratnam [Trans. Amer. Math. Soc. 2015] classified the entrywise positivity preservers in all dimensions, which act only on the off-diagonal entries. These two results are at "opposite ends", and in both cases the preservers have to be absolutely monotonic. We complete the classification of positivity preservers that act entrywise except on specified "diagonal/principal blocks", in every case other than the two above. (In fact we achieve this in a more general framework.) The ensuing analysis yields the first examples of dimension-free entrywise positivity preservers—with certain forbidden principal blocks—that are not absolutely monotonic.

SPEAKER BIO:
Prateek Kumar Vishwakarma is a PIMS postdoctoral fellow at the University of Regina, working under the mentorship of Professor Shaun Fallat, in the area of Matrix Analysis and Positivity. Prateek defended his Ph.D. thesis in December 2021 under the supervision of Professor Apoorva Khare at the Indian Institute of Science (IISc) Bangalore, India. He was awarded the Canadian Queen Elizabeth II Diamond Jubilee Scholarship to support his first visit to Regina as a visiting graduate student when he worked under Professor Fallat for the Fall 2019 semester. He was also awarded the Professor K. Venkatchalaienger scholarship in January 2021, at the Department of Mathematics, IISc, based on his scholastic achievements. He has visited and has been invited to visit or speak at various international conferences in India, Canada, the US, Slovenia, the UK, and Ireland.

For more information and registration:
https://www.pims.math.ca/seminars/PIMSPDF

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