ACTIVITY REPORTING FORM
FOR CDC GRANTS PROGRAM
Abel Visiting Scholar Program

(Deadline for completion: four (4) week after the end of the research visit)

Please note that at least four pictures of the supported activity should be included/ attached to this report.
(by email).
After consideration by CDC, the intention is that this activity report and pictures will be made publicly available on the CDC website.

Name of grantee: Mina Bigdeli
Home institution and country of grantee: IPM, Iran
Name of the host: Sara Faridi
Name of the host institution and country: Dalhousie University, Canada
Topic of the research activity: Translation of Reisner's criterion for Cohen-Macaulayness from Stanley-Reisner complexes to facet complexes

Dates spend at the center/host institution: Oct 29 -Dec 14, 2021

The progress report should a brief (one page) activity report:

1. Summary statement (1-2 sentences) of major outcome of your visit:
2. Brief description of your research activities during your research visit:
3. Students and post-doctoral fellows advised:
4. Joint activities with your host:
5. Research in progress (as a result from the visit):
6. Papers published or in preprint form as a result from the research visit:
7. Planned future activities as a result of your research visit:

The main question we investigated was how to tell from the generating set of a monomial ideal whether it is Cohen-Macaulay. The first tool we used was the Reisner's criterion for Cohen-Macaulayness of Stanley-Reisner ideals. We developed Macaualy2 software codes for comparing the homologies of the related complexes under study. We then broke down Reisner's criterion and translated it in the language of the generators of the ideal. This led us to a broader question of cohomology theory of simplicial complexes. At the moment we are developing a method to relate the homology of a simplicial complex A with the cohomology of a specific associated simplicial complex A'. This method will enable us to compare the Cohen-Macaulayness of the two complexes, as our final step. This work is under progress and we plan to continue our collaboration in the future, using online platforms and also possibly some in-person meetings. We will publish the results on a joint paper once the last step is completed.

I was invited to give a 50 minutes talk on Nov 15, 2021 in the weekly colloquium seminars held at the Department of Mathematics and Statistics of Dalhousie University. The topic of the talk was "Monomial Ideals with Simple Free Resolution". Together with Prof. Faridi, we also attended virtual seminars held by IPM.

With my signature I agree that my <u>Activity Report</u> and <u>pictures</u> can be published on the CDC website.

Date: Dec 21, 2021

Signature Grantee: