Multiscale Analysis, Modeling and Simulation

-Top Global University Project, Waseda University-

REPORT ON STUDY ABROAD

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Date: June 6, 2020

1. Study Abroad Destination: Technische Universität Darmstadt, Germany

2. Dates of Stay: December 2, 2019 – March 1, 2020 (91days)

3. Purpose: To study the latest works on the Navier-Stokes equations

4. Host Professor: Prof. Reinhard Farwig (Technische Universität Darmstadt)

5. Education and Research Activity in the Destination

I) Seminars, Lectures, Conferences, etc:

- Prof. Detlef Müller (Universität Kiel): Wave equation and spectral multipliers on manifolds with sub-Riemannian geometry (January 22, 2020)
- Prof. Stefano Modena (Technische Universität Darmstadt): Convex integration and the equations of fluid dynamics (February 5, 2020)

II) Presentations:

- Optimality of logarithmic interpolation inequalities and extension criteria to the Navier-Stokes and Euler equations in Vishik spaces, Oberseminar Analysis, Technische Universität Darmstadt, December 18, 2019.

III) Research Results:

I considered Serrin type extension criteria to the Navier-Stokes equations with Prof. Farwig. We first proved the logarithmic interpolation inequalities by means of function spaces $\dot{V}^s_{p,q,\theta}$, $\dot{U}^s_{p,\beta,\sigma}$ which are in some cases larger than $\dot{B}^s_{p,q}$. Next, as an application of those inequalities, we showed that strong solutions to the Navier-Stokes equations can be extended if a scaling invariant quantity is finite. We finally made a co-authored paper on the above contents.

6. Other Comments

This was the first time I had visited Technische Universität Darmstadt. In these three months, I really had a wonderful stay in Darmstadt. Finally, I am deeply grateful to Prof. Farwig, Prof. Shibata, Ms. Ishizaki and Top Global University project (Waseda University) for giving me such a great opportunity to join the program.

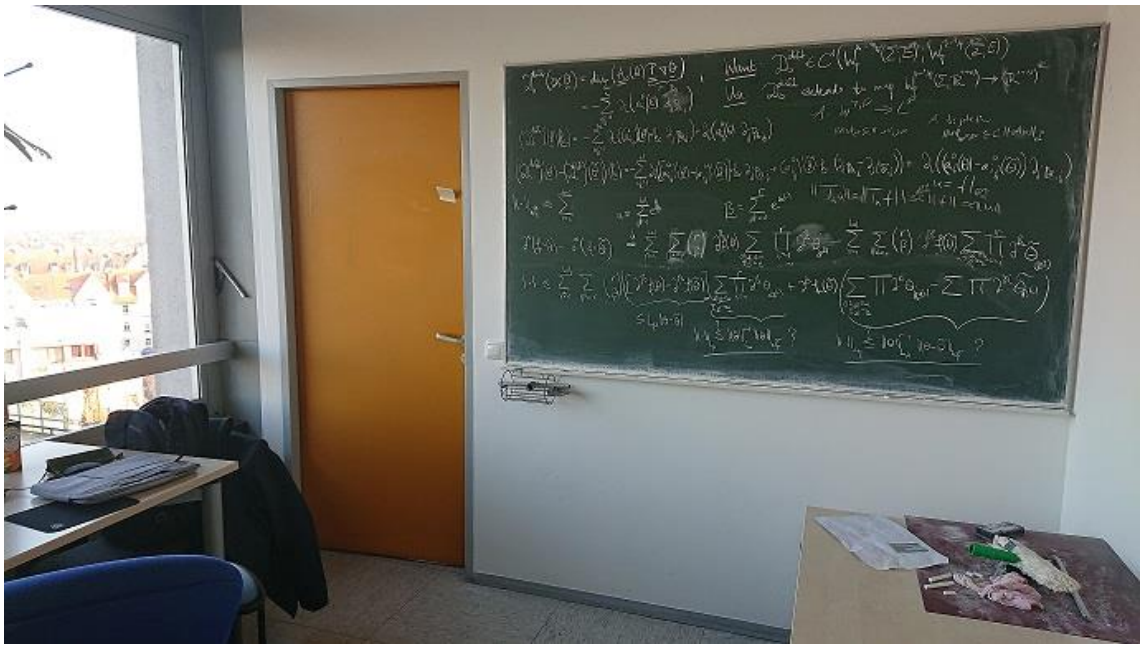

Figure 1: In my office shared with Dr. Björn Augner

Figure 2: At an Italian restaurant with Prof. Reinhard Farwig