Report on the Random Metric Graphs Workshop

organized jointly by working groups 1 and 4

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16–18 September 2026

The *Random Metric Graphs* workshop was held at the Faculty of Mathematics and Physics of Charles University in Prague, Czechia, on 16–18 September 2026. It was jointly organized by Working Groups 1 and 4 of COST Action CA24122, mSPACE, bringing together researchers in spectral theory, stochastic geometry, material science, and mathematical physics.

The scientific programme focused on connections between the geometry of random graphs and the spectral properties of differential operators on metric graphs. Topics included random tessellations, graph limits, hyperuniform point processes and networks, spectral gaps, and localization. A central motivation was to understand how geometric and topological features of a network influence its spectrum and transport properties, with applications ranging from stochastic microstructure modelling to the design of network materials.

The list of participants comprised 34 researchers and students. The country distribution was the following: 18 from Czechia, 3 from Sweden, 2 each from Austria, Germany, and Slovenia, and 1 each from Hungary, Israel, Poland, Slovakia, Ukraine, and the United States, together with 1 participant jointly affiliated with institutions in Türkiye and Denmark. Counting both countries for this joint affiliation, 13 countries were represented.

The working group 1 was represented by 35% of participants, working group 4 by 41% and the remaining 24% of participants were from outside mSPACE. The workshop brought together researchers at different career stages, including 6 doctoral students, 1 master student and 6 postdoctoral researchers.

The three-day programme comprised 18 presentations: 6 introductory talks, 6 contributed talks, and 6 short talks. The introductory lectures provided a shared foundation across the participating disciplines, while the contributed and short talks presented recent results and open questions. Topics ranged from the spectral geometry of quantum graphs and random graph limits to hyperuniformity, random Laguerre tessellations, and graph-based models of material microstructures.

Five hours were allocated to discussion, including a two-and-a-half-hour session in small groups on the final afternoon. Participants explored intersections between their research areas, with particular attention to formulating a meaningful notion of hyperuniformity for random graphs and developing a rigorous definition of a random metric graph. Several groups were formed to continue these collaborations beyond the workshop, strengthening links between WG1 and WG4. A conference dinner on 17 September provided an additional opportunity for informal scientific exchange.

The detailed programme, abstracts, and participant list are available at:

`https://wg14.karlin.mff.cuni.cz/`

Acknowledgement

The organizers gratefully acknowledge financial support from COST Action CA24122, mSPACE, which supported the organization of the workshop and international participation.