



**Opponent's opinion on the inaugural proceedings of Doc. Mgr. Radoslav Harman, PhD. in Mathematics.**

- Evaluation of pedagogical and educational competence

Doc. Mgr. Radoslav Harman, PhD. is carrying out continuous pedagogical and scientific activities since 1997 at the Department of Applied Mathematics and Statistics of FMFI UK. The total scope of his teaching is 387 semester hours. In addition, he also worked as a teacher for 8 semester hours at the Johannes Kepler Universität in Linz, Austria.

He taught and currently teaches core subjects of study programs Actuarial Mathematics (Bachelor's Programme), Data Science (Bachelor's Programme), Probability and Mathematical Statistics (Master's Programme) and Applied Mathematics (PhD Programme), which include Cluster Analysis and Data Classification, Design of Experiments, Non-Linear Statistical Models, Principles of Data Science, Probability and Statistics, Basics of Probability and Statistics, Regression Models, Probability Distributions, Simulation Methods, Stochastic Simulation Methods, Stochastic Optimization Methods, Multivariate Statistical Analyses, Probabilistic and Statistical Methods of Artificial Intelligence.

Doc. Mgr. Radoslav Harman, PhD. is an excellent lecturer, always fully prepared both professionally and pedagogically. He is an excellent, internationally recognized expert in the listed disciplines, which is a guarantee of the high professional level of his lectures. He is very meticulous in his work, but also in his nature. His lecturing activity is at a high pedagogical level. He wrote (in co-authorship) 3 teaching texts for his lectures, which also demonstrates his professional and pedagogical competence.

Doc. Mgr. Radoslav Harman, PhD. was the supervisor of 35 successfully defended diploma or master theses and 25 bachelor's final theses, which once again confirms his excellent pedagogical and educational competence. He led 4 ŠVOČ (Student scientific and professional activity) works, which were evaluated as very successful even on a Czechoslovak level.

Doc. Mgr. Radoslav Harman, PhD. supervised 8 dissertations. In 4 successfully defended dissertations was Doc. Mgr. Radoslav Harman, PhD. the supervisor, in 2 successfully defended dissertations was Doc. Mgr. Radoslav Harman, PhD. the consultant and 2 are currently being supervised (one after the dissertation exam) by him.

- Evaluation of scientific research capacity

Doc. Mgr. Radoslav Harman, PhD. is the author or co-author of 11 scientific papers in foreign scientific journals that are registered and processed by the Current Contents service, furthermore of 8 scientific papers in other foreign journals, and of 1 scientific paper in other domestic journal, 11 scientific papers in foreign journals registered in the Web of Science and/or SCOPUS databases, 1 scientific paper in domestic journal registered in the Web of Science and/or SCOPUS databases, 4 published contributions at foreign scientific conferences, 3 published contributions at domestic scientific conferences.

All scientific journals in which Doc. Mgr. Radoslav Harman, PhD. published his works, are very highly scientifically evaluated from an international point of view, they have a high scientific reputation. This testifies the high scientific level of the works of doc. Harman. These publications are not only the highest rated according to (certain) "table" indicators, but are a real scientific



contribution in the international context in the field of mathematical-statistical research, stochastic simulation methods, optimization, especially in the field of the optimal design of statistical experiments.

The required high, internationally recognized scientific level of the works of Doc. Mgr. Radoslav Harman, PhD. also confirms 303 citations to his publishing activity. Of these, there are 227 citations in foreign publications registered in citation indexes, 5 citations in domestic publications registered in citation indexes, 20 citations in foreign publications not registered in citation indexes, 3 citations in domestic publications not registered in citation indexes, 46 citations in publications registered in citation indexes and 2 citations in a publication registered in other databases except citation indexes.

- Personal scientific contribution of Doc. Mgr. Radoslav Harman, PhD. for the development of the scientific field

I would like to highlight several areas of research on optimal design of experiments, in which Doc. Mgr. Radoslav Harman, PhD. "pushed" the boundaries of current knowledge:

1. He simplified the problem of designing experiments by identifying experiments that cannot be part of the support of an optimal approximate design (especially in the article: Harman R, Pronzato L (2007): Improvements on removing non-optimal support points in D-optimum design algorithms, *Statistics & Probability Letters*, Volume 77, pp. 90-94).
2. He developed effective heuristic principles for solving problems of exact design of experiments under special limitations (especially in the article: Harman R, Bachratá A, Filová L (2016): Construction of efficient experimental designs under multiple resource constraints, *Applied Stochastic Models in Business and Industry*, Volume 32, pp. 3-17).
3. He developed an algorithm for calculating optimal designs for large dataset problems. This can be used, for example, to calculate the minimum volume ellipsoid, which contains a large set of data points (see for example: Rosa S, Harman R (2022): Computing minimum-volume enclosing ellipsoids for large datasets, *Computational Statistics & Data Analysis*, Volume 171).
4. He proposed a new parametric class of distributions, the advantageous properties of which can be used, among other things, for efficient simulation generation from a uniform distribution on a multidimensional sphere and from a uniform distribution on the surface of a multidimensional sphere (especially in the paper: Lacko V, Harman R (2012): A conditional distribution approach to uniform sampling on spheres and balls in  $L_p$  spaces, *Metrika*, Volume 75, pp. 939-951).

For each of the abovementioned papers of Doc. Mgr. Radoslav Harman, PhD. there are several notable citations. Citations of papers of Doc. Mgr. Radoslav Harman, PhD. (especially the notable ones) show last but not least the creation of his own scientific school and also that fact that Doc. Mgr. Radoslav Harman, PhD. means a significant contribution also in the international context for the development of the scientific field.

- Facts confirming that Doc. Mgr. Radoslav Harman, PhD. is a recognized scientific, pedagogical and professional personality with his own scientific school

Scientific school Doc. Mgr. Radoslav Harman, PhD. is evidenced by 4 successfully completed doctoral students (in the position of supervisor), 2 successfully completed doctoral students (in the position of consultant) and also currently 2 supervised doctoral students (whereas one of the



doctoral students has completed her dissertation exam). All successfully completed defences showed the excellent scientific level of his graduating doctoral students.

Of course, a successful postdoctoral scientific resp. scientific-pedagogical career of the aforementioned PhD students proves that the scientific school Doc. Mgr. Radoslav Harman, PhD is a real fact.

Indeed there are also other important facts that point to the fact that Doc. Mgr. Radoslav Harman, PhD. is an internationally recognized scientific and scientific-pedagogical personality. He

- was the leader of the research team (responsible researcher) of 4 VEGA research projects,
- was a member of 5 VEGA research projects,

- completed 4 study stays abroad (USA, Czech Republic, University of Cambridge, Johannes Kepler University in Linz),

- is co-guarantor of the Bachelor's study program Insurance Mathematics, co-guarantor of the Bachelor's study program Data Science, main guarantor of the Master's study program Probability and Mathematical Statistics and co-guarantor of the doctoral study program Applied Mathematics,

- actively participated in 40 international scientific conferences (of which he had at 19 an invited lecture)

- delivered 16 invited lectures at seminars abroad.

He is a member (associate editor) of the journal Statistical Papers (Springer, Q1), a permanent board member of international conferences "Model-oriented Design and Analysis of Experiment".

He is also a member of the Scientific Council of FMFI UK and was a member of the scientific section of the committee of the Slovak Mathematical Society. He has written more than 100 reviews in renowned scientific journals of international importance. He wrote opponent reviews for 2 dissertation thesis and a review for 1 habilitation thesis.

At several conferences, I listened to the lecture of Doc. Mgr. Radoslav Harman, PhD. The lectures were always at a high scientific level and enjoyed great interest.

In conclusion, I conclude that from the previous evaluations of scientific research capacity, pedagogical-educational capacity, as well as from the facts that Doc. Mgr. Radoslav Harman, PhD. is an internationally recognized scientific, pedagogical and professional personality with his own scientific school, I unequivocally **recommend** his appointment as a professor in **Mathematics**.

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