Two PhD Positions in Graph Neural Networks

FWF project EXOSPHERE – Efficient, Expressive and Robust GNNs · University of Vienna, Austria

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The Faculty of Computer Science at the University of Vienna is offering **two PhD positions** (project staff, predoctoral, 75 %) in the research project **EXOSPHERE – Efficient, Expressive and Robust GNNs**, funded by the Austrian Science Fund (FWF). The project is a collaboration between the Numerical High Performance Computing work group led by Prof. Wilfried Gansterer and the Machine Learning with Graphs work group led by Prof. Nils M. Kriege.

Positions	2 PhD positions (project staff, predoc)
Start	(anticipated) January 2027 (a later start is possible)
Extent	75 % (30 hours/week)
Duration	40 months (fixed-term, duration of the project)
Location	Faculty of Computer Science, University of Vienna, Austria
Application deadline	until positions are filled; applications received until November 20, 2026 are guaranteed full consideration

The project

Graph Neural Networks (GNNs) are the method of choice for learning from structured data such as molecules or social networks. Deployed on resource-constrained hardware or under adversarial conditions, they need to be efficient, expressive, and robust at the same time – goals that are usually studied in isolation and often conflict with each other. EXOSPHERE investigates the interplay of these three dimensions. The two positions address different aspects of this interplay, but they will collaborate closely.

Position A – Efficient and robust GNNs

Supervision: Prof. Wilfried Gansterer, Numerical High Performance Computing

This position focuses on algorithmic and numerical aspects of efficiency and robustness of GNNs. Possible topics include:

- novel quantization techniques for GNN components, including eager quantization strategies,
- the numerical behavior of low-precision computations in GNN training and inference,
- the vulnerability of quantized and pruned GNNs to fault injection attacks, and the design of robust architectures and defense mechanisms,
- efficient prototype implementations and systematic benchmarking of the developed methods.

Specific profile: a documented (via course work at University-level) solid background in numerical algorithms, numerical computing and in machine learning, solid programming skills (e.g., Python), and an interest in highly efficient implementations. Experience with quantization, low- and mixed-precision arithmetic, fault tolerance, hardware-related aspects of machine learning and with machine learning libraries such as PyTorch or PyTorch Geometric is highly desirable.

Position B – Expressivity and theory of efficient GNNs

Supervision: Prof. Nils M. Kriege, Machine Learning with Graphs

Theoretical results on the expressive power of GNNs typically assume exact computations with real numbers, whereas practical applications run with limited numerical precision, often controlled by quantization. This position addresses this gap and focuses on the theoretical foundations of efficient GNNs. Possible topics include:

- new, well-founded GNN architectures and learning algorithms that balance efficiency and expressivity,
- the expressive power of quantized and pruned GNNs, e.g., in relation to the Weisfeiler–Leman hierarchy,
- a quantized version of the Lottery Ticket Hypothesis and the expressivity-aware generation of winning tickets.

Specific profile: a solid background or strong interest in machine learning, graph theory, and their mathematical foundations; solid programming skills (e.g., Python); experience with machine learning libraries such as PyTorch or PyTorch Geometric and familiarity with the expressivity of GNNs or the Weisfeiler–Leman method is desirable.

Your duties

- You carry out research within the EXOSPHERE project and contribute to its scientific goals.
- You publish your results in scientific articles and present them at international conferences.
- You work on your dissertation and focus on completing it within a reasonable time; we expect you to complete your doctoral thesis agreement within the first 12 months.
- You interact and collaborate closely with the other members of the project team and take part in project meetings.

Your profile

- Completed Master's or Diploma degree in computer science, mathematics, or a related field (applications from candidates close to completing their degree are welcome; employment can only start once the degree has been completed)
- Excellent command of English (speaking and writing)
- Ability to work in a team
- Basic experience in research methods and academic writing

What we offer

- Research on a timely topic in a project of two closely collaborating work groups
- An international team with excellent research infrastructure
- Flexible working hours and the option to partially work in home office
- Salary according to the collective bargaining agreement for university staff (§48 VwGr. B1 Grundstufe, praedoc): the base salary is about EUR 2,875 gross per month for 30 hours per week (14 payments per year, 2027 rates)
- Contract: standard fixed-term for the duration of the project (40 months). Further employment beyond the project is possible subject to funding.

How to apply

Please send your application as ***a single PDF file*** to **applications-exosphere@cs.univie.ac.at** as soon as possible. Applications received by **November 20, 2026** are guaranteed full consideration. Applications received after November 20 will be considered until the positions have been filled. Please indicate in your letter of motivation whether you are applying for Position A, Position B, or both. Your application has to include:

- Academic curriculum vitae
- Letter of motivation, including your research interests and how they relate to the EXOSPHERE project
- A compact and precise statement about why and how your profile fits to the specific profiles mentioned above for each position
- Abstract of your Master's thesis
- Master's or Diploma degree certificate (if already available) or anticipated date of graduation
- Complete transcript of records (all courses taken at University-level)
- List of publications and evidence of teaching experience (if available)

Please note that applications which are incomplete or do not follow these guidelines will not be considered!

For questions regarding Position A, please contact Prof. Wilfried Gansterer (wilfried.gansterer@univie.ac.at); for questions regarding Position B, please contact Prof. Nils M. Kriege (nils.kriege@univie.ac.at).