



Open Ph.D. Research Position on the Topic Causality-Aware Path Learning

Hiring Organization
Princeton University

Job Location
Princeton, New Jersey

Starting Date
Fall 2027

Application Deadline
December 21, 2026,
11:59 pm EST

► **Apply here**

Version
2026-10-27-v2.0

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The **Complex Infrastructure Systems Group** at Princeton University invites applications for a Ph.D. position in **path learning**, at the intersection of network science, machine learning, and complex systems. We seek a motivated researcher interested in developing new methods for learning from sequences of interactions constrained by the structure and dynamics of networks.

Position Overview: Many real-world processes unfold along paths, from transportation routes and power-grid events to the spread of information and genetic material. Conventional graph models represent connectivity but overlook the order and history of interactions; sequence models capture order but do not automatically respect network constraints. The central challenge is to learn not only which paths are possible but also which are probable. Your research will develop **causality-aware path learning** using event graphs, higher-order networks, graph neural networks, and sequence models. Topics include path representation learning, trajectory and destination prediction, path anomaly detection, and scalable learning with our open-source **pathpyG** library. The work combines fundamental machine learning advances with applications in transportation, communication, energy distribution, and environmental and societal systems.

Qualifications: Applicants should hold, or expect to complete before enrollment, a Master's degree or equivalent in Computer Science, Engineering, Mathematics, Physics, or a related field. We seek strong analytical skills and proficiency in Python, ideally with experience in machine learning, graph algorithms, or network science. Familiarity with PyTorch, PyTorch Geometric, temporal networks, or sequence modeling is an advantage but not essential. Applicants should be curious, independent researchers who enjoy collaborative work and can communicate scientific ideas clearly in English. Official program requirements are available here.

Application Instructions: Apply through the Princeton University Graduate School portal for the Civil and Environmental Engineering Ph.D. program. Select Prof. Hackl among the faculty whose research matches your interests. The deadline is **December 21, 2026, at 11:59 pm EST**.

For questions about the research, contact Prof. Dr. Jürgen Hackl at hackl@princeton.edu with the subject line "PhD Application - Path Learning: <Your Name>".

We look forward to hearing from candidates eager to advance path learning and its applications at the Complex Infrastructure Systems Group.

Princeton University is an equal opportunity employer, and all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, disability status, protected veteran status, or any other characteristic protected by law.

