



Postdoctoral Opportunities in AI and Automation for Smart Operation and Maintenance of Transportation Infrastructure

Shandong University | Jinan, China

We are recruiting postdoctoral researchers to join the **Geotechnical Engineering Research Group at Shandong University**, working with **Prof. Kai Yao** on **smart operation, maintenance, and climate adaptation of transportation infrastructure**, with particular emphasis on **highways and expressways**.

The research will integrate artificial intelligence, robotics, advanced sensing, numerical modelling, and climate risk assessment to improve the safety, reliability, and resilience of pavements, embankments, slopes, bridges, tunnels, and associated foundations.

We welcome applicants interested in one or more of the following research directions:

- **AI for infrastructure inspection and condition assessment:** Develop computer vision and deep learning methods to detect pavement cracks, potholes, tunnel lining defects, and bridge deterioration. Integrate images and monitoring data to assess embankment settlement, slope deformation, and damage following extreme weather events.
- **Automated inspection and robotics:** Develop intelligent inspection methods using instrumented vehicles, drones, and mobile robots. Topics include robotic perception, navigation, path planning, and automated data collection for routine highway inspections and rapid assessment following floods, landslides, and other disruptive events.
- **Intelligent sensing and nondestructive testing:** Integrate ground-penetrating radar, LiDAR, imaging, and embedded sensors to assess infrastructure condition. Apply AI and sensor fusion to identify concealed defects and track moisture, groundwater, pore-water pressure, and deformation associated with infrastructure deterioration.
- **Automation of highway maintenance:** Investigate intelligent equipment and robotic methods for pavement crack sealing, pothole repair, drainage maintenance, and targeted infrastructure repair. Topics include defect localisation, intervention planning, automated equipment control, repair quality assessment, and safe operation near traffic and workers.
- **Digital twins and performance prediction:** Combine monitoring data, numerical simulations, and physics-informed machine learning to develop infrastructure digital twins. Incorporate traffic loading, environmental observations, and climate scenarios to predict deterioration, settlement, and remaining service life while accounting for uncertainty.
- **Climate risk assessment and adaptation:** Assess infrastructure vulnerability to extreme rainfall, flooding, heat, changing groundwater conditions, and compound hazards. Develop and evaluate adaptation measures such as drainage upgrades, erosion and scour protection, slope stabilisation, and pavement or



foundation rehabilitation to support performance under future climate conditions.

- **Predictive maintenance and resilient asset management:** Integrate condition monitoring, weather forecasts, and risk assessment to support early warning, inspection scheduling, and maintenance prioritisation. Optimise maintenance and adaptation investments by considering life-cycle costs, service continuity, traffic disruption, and recovery following extreme events.

Applicants should:

- Hold a PhD in Civil Engineering, Transportation Engineering, Geotechnical Engineering, Environmental Engineering, Mechanical Engineering, Robotics, Computer Science, or a closely related field, obtained within the past three years, or be approaching PhD completion.
- Be **35 years old or younger**.
- Have research experience relevant to at least one of the topics above.
- Be proficient in **Python, MATLAB, C++, or another relevant programming language**. Experience with AI, robotics, sensor integration, numerical modelling, climate risk assessment, or reliability analysis is desirable.
- Be available for full-time postdoctoral research at Shandong University and meet the university's appointment requirements.

Salary and benefits will follow Shandong University's applicable postdoctoral policies.

Interested applicants should email the following to **Prof. Kai Yao** at yaokai@sdu.edu.cn:

1. A CV, including a publication list.
2. A one-page cover letter outlining your relevant experience, preferred research direction, and suitability for the position. Please indicate your age and PhD completion date or expected completion date.

Email subject: Postdoctoral Application–Smart and Climate-Resilient Transportation Infrastructure–[Your Name]

Application deadline: [30 Sep 2026]

Starting date: As soon as mutually agreed.

Only shortlisted candidates will be contacted. Please share this opportunity with interested colleagues and early-career researchers.