Popular science summary of the PhD thesis

PhD student	Kenneth Mahagarn Jensen
Title of the PhD thesis	Estimation of Passenger Car Brake Pad Wear and Remaining Useful Life From On-Road Usage Data Considering Variable Vehicle Mass
PhD school/Department	DTU Construct

Science summary

* Please give a short popular summary in Danish or English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology. Before the thesis defence, the summary is sent to DTU's Office for Communication and Media and to the media *Ingeniøren*:

Ensuring the safety of car passengers and those around them hinges on a reliable braking system. Modern cars predominantly rely on friction brakes, particularly disc brakes, to manage their substantial kinetic energy. However, braking leads to wear of the friction components, prompting the need for physical inspections or, alternatively, wear estimation for effective maintenance planning.

This research, presented in five original papers, tackles the challenge of predicting brake pad wear in passenger cars from vehicle usage. Leveraging data from on-board sensors, including an inertial measurement unit, global navigation satellite system, and vehicle on-board diagnostics (OBD-II), the study introduces a new method for estimating brake pad wear. To account for varying vehicle loads, for example from passengers and luggage, the research also considers real-time mass estimation of the vehicle.

The findings, validated through nearly 20,000 km of real-world driving from across all of Scandinavia in different passenger cars, demonstrate that vehicle mass and brake pad wear can be accurately estimated. The proposed models consider factors such as road gradients, aerodynamic drag, and rolling resistance, providing a more accurate understanding of wear patterns.

What sets this research apart is its practical implications. By integrating these methods, it becomes possible to implement condition-based and predictive maintenance strategies. This is not only relevant for individual vehicle owners but holds particular significance for fleet management scenarios, optimizing maintenance resources and improving overall road safety.

In essence, this work contributes not only to advancing our understanding of brake pad wear but also offers tangible solutions for enhancing maintenance efficiency and road safety.

Please email the summary to the PhD secretary at the department