Curriculum vitae

20-11-2018

Personal information

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Date of birth	1st of February 1982
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ORCID	0000-0003-3176-791X
Academic titles	MSc, PhD
Language skills	Norwegian, Danish, Swedish, English

Education and training

PhD Civil Engineering. Technical University of Denmark (DTU), Denmark. 9/2013 → 10/2016
MSc Civil Engineering. Technical University of Denmark (DTU), Denmark. 2/2007 → 8/2009
BSc Civil Engineering. Technical University of Denmark (DTU), Denmark. 8/2003 → 1/2007
Mathematics 1. University of Oslo (UiO), Norway. 1/2003 → 5/2003

Exam Philosophicum and Exam Facultatum. University of Oslo (UiO), Norway. 8/2002 → 12/2002

Team leader in the Norwegian Army, His Majesty the King's Guard. Norwegian Army. 8/2001 → 9/2002

Professional experience

10/2017 → Present: **Postdoc** in pavement mechanics at DTU

11/2016 → 09/2017: **Pavement specialist**, COWI A/S

09/2013 → 10/2016: **Industrial PhD candidate**, COWI A/S

08/2009 → 08/2013: **Pavement engineer**, COWI A/S

Expertise

Asmus Skar has a broad civil engineering education with focus on pavement technology, structural- and geotechnical engineering. Moreover, he holds a PhD degree in civil engineering from DTU in 2017. After receiving his Master's degree in 2009, he began to work as a pavement engineer in the consultancy company COWI. He has been involved in several research and development projects from the beginning of his career and entered the Danish Industrial PhD programme in 2013, whereafter he joined DTU as a Postdoc researcher in 2017. Moreover, he has experience in several aspects of pavement construction and rehabilitation such as surveys and supervision, pre-investigations, pavement condition studies and pavement evaluation and analysis, feasibility studies, and pavement design, being the principal pavement design engineer on over 60 projects during the past 10 years.

In general terms, his work aims for improved forecastability of behavior of pavements under service. The main focus area of his research builds on the traditional university strengths in the fields of numerical modeling and sensors; it also builds in the local (Danish) industry strengths in non-destructive pavement testing. Consequently, the focus of his research is the following:

- Response Modeling – Effectively and accurately computing the mechanical responses of pavements due to different excitation sources.
- Embedded and Mobile Instrumentation. Promoting innovative techniques to sense and measure in situ responses.
- Inverse Analysis of Properties - Developing model-guided methods for analyzing sensor readings as means of characterizing usage and identifying properties.

His work include developments within inverse analysis of Moving Measurement Platform data and Embedded sensors, computational modelling, Finite Element Analysis (FEA), constitutive modelling, fracture mechanics, as well as soil-structure interaction problems. Currently Asmus Skar is leading a work package under the Live Road Assessment (LiRA) project supported by Innovation Fund Denmark. This project aims to develop a new method for road-condition surveying based on data collected from modern car sensors using car-fleet data and machine learning.

Research interests

Pavement mechanics, computational modelling, Finite Element Modelling (FEM), constitutive modelling, fracture mechanics, forward and inverse pavement analysis.

International experiences

PhD project “Deterioration Models for Cement Bound Materials in Structural Design an Evaluation of Heavy Duty Pavements” (TU Delft/TNO DIANA, Netherlands);
The NordFoU research and development project "Pavement Performance Models" and "Validation of Performance Models" (Denmark, Iceland, Norway, Sweden);
Airport pavement design and reconstruction projects in Andenes, Oslo, Ørland, Bodø, Lakselv, Evenes and Bergen (Norway), Vagar (Faroe Islands), Riga (Latvia), Muscat, Salalah and Ja'aluni (Oman), Dhaka (Bangladesh) and De Nacala (Mozambique);

Container terminal and industrial heavy duty pavement projects in Stockholm (Sweden), Klaipeda (Lithuania), Dublin (Ireland), Ras Laffan (Qatar), Dubai (United Arab Emirates) and Mtwara (Tanzania) and;
Engineering internship (COWI, Uganda).

Supervision

Master projects:

Athanasiadis, N. and Zoulis, P. (2019). *Viscoelastic pavement modelling of the Dynatest Raptor*. (30 ECTS). **Co-supervisor**.

Special courses:

Zoulis, P. (2019). Foundation characterization for slab-on-grade constructions. (2.5 ECTS). **Supervisor**.

Nielsen, J. (2018). *Inverse analysis of mechanical pavement properties with external sensors.* (10 ECTS). **Co-supervisor**.

Nielsen, J. and Sørensen, M. (2017). *Response modelling of geosynthetic in flexible pavement.* (10 ECTS). **Co-supervisor**.

Memberships of scientific committees

International Advisory Committee (IAC) for BCRRA (Bearing Capacity for Roads, Railroads and Airfields), 2018 →

Funding grants

- Innovation Fund Denmark, Grand Solutions [No. 8090-00048B]: 12.4M DKK, **Work package leader / Key person**
- EIC-FTI-2018-2020, Fast Track to Innovation [EU proposal 831120 – Snowless]: €2.42M, **Key Person**
- COWIfund [No. C-123.03]: 0.45M DKK, **Principal Investigator**
- Innovation Fund Denmark, Industrial PhD project [No. 1355-00060]: 0.56M DKK, **Principal Investigator**

Publications

Number of peer-reviewed	9
publications	seventeen – 17
Citations	Twenty two – 22
H-index	three – 3

Publications

Peer review: 5

Not peer reviewed: 0

Journal article

1. Skar, A., Poulsen, P. N., & Olesen, J. F. (2017). Cohesive cracked-hinge model for simulation of fracture in one-way slabs on grade. *The International Journal of Pavement Engineering*. DOI: 10.1080/10298436.2017.1293263.
2. Skar, A., Poulsen, P. N., & Olesen, J. F. (2017). General cracked-hinge model for simulation of low-cycle damage in cemented beams on soil. *Engineering Fracture Mechanics*, *175*, 324-338. DOI: 10.1016/j.engfracmech.2017.01.016.
3. Skar, A., Poulsen, P. N., & Olesen, J. F. (2017). A simple model for fatigue crack growth in concrete applied to a hinge beam model. *Engineering Fracture Mechanics*, *181*, 38-51. DOI: 10.1016/j.engfracmech.2017.06.018.
4. Skar, A., & Poulsen, P. N. (2015). 3-D cohesive finite element model for application in structural analysis of heavy duty composite pavements. *Construction and Building Materials*, *101*, 417-431. DOI: 10.1016/j.conbuildmat.2015.10.052.

Journal article – under review

5. Skar, A., Levenberg, E., Andersen, S. & Andersen, M. B. (2019). Analysis of the Raptor moving measurement platform for project-level pavement evaluation. Submitted to *International Journal of Pavement Engineering*.

Contribution to conference

Peer review: 4

Not peer reviewed: 1

Paper

1. Skar, A., Levenberg, E. & Ingeman-Nielsen, T. (2018). *Mechanistic Analysis of Frost Action under Pavements.* Paper presented at Transportation Infrastructure Engineering in Cold Climates, Sisimiut, Greenland.

2. Skar, A., Poulsen, P. N., & Olesen, J. F. (2017). *Cyclic cohesive model for fatigue crack growth in concrete* . Paper presented at 2nd International Symposium on Multiscale Experimental Mechanics: Multiscale Fatigue, Lyngby, Denmark.

3. Skar, A., & Poulsen, P. N. (2015). *Modelling of composite concrete block pavement systems applying a cohesive zone model* . Paper presented at 11th International Conference on Concrete Block Pavement, Dresden, Germany.

4. Hildebrand, G., Baltzer, S., Skar, A., Holst, M. L., Hudecz, A. (2010). *Modeller for vejbelægningers nedbrydning – baseret på moderne målemetoder*. Paper presented at: Vejforum 2010; Denmark.

5. Hildebrand, G., Baltzer, S., Skar, A., Holst, M. L., Hudecz, A. (2012). *New Nordic Performance Model for Maintenance Planning*. Paper presented at: EPAM4, Malmö, Sweden

Professional magazines

1. Skar, A., Andersen, M. B., Larsen, J., Rasmussen, S., Levenberg, E. (2018). *New system for continuous measurement of road bearing capacity*. Published in: Danish road magazine, April 2018

2. Skar, A. (2017). *Fracture mechanics models in pavement design.* Published in: Danish road magazine, April 2017

3. Skar, A. (2014). *Design of Port- and Industrial Pavements*. Published in: Danish road magazine, April 2014

Research reports

1. Larsen, J., Holst, M. L., Mollerup, M., Baltzer, S., Skar, A. (2012). *NordFoU PPM2 - Validation of Performance Models.* Danish Road Directorate

2. Skar, A., Hildebrand, G., Baltzer, S. (2010). *Implementation strategy.* NordFoU pavement performance models part 1: network level models, Danish Road Directorate

3. Skar, A., Holst, M. L., Hildebrand, G., Baltzer, S. (2010). *Development of performance measures, modelling and calibration.* NordFoU pavement performance models part 1: network level models, Danish Road Directorate

4. Busch, C., Skar, A., Holst, M. L., Hildebrand, G., Baltzer, S. (2010). *Identification and Selection of Pavement Performance Models.* NordFoU pavement performance models part 1: network level models, Danish Road Directorate

Projects

Postdoc

1. LiRA – Live Road Assessment. Skar, A. and Levenberg, E., 01/02/2019 → ongoing. This project deals with development and demonstration of a method for performing road-condition surveys based on car sensor data. Specifically, the electric car fleet operated by GreenMobility in Copenhagen will be utilized for this purpose. Ultimately, a hybrid model will be developed to express the interrelations between road-conditions and car-sensor data. This model will be based on a combination of machine learning and physical modeling.

2. SNOWLESS – Development of an automatic de-icing and snow control system for heavily trafficked pavements. Levenberg, E., Ingeman-Nielsen, T., Skar, A., 01/12/2018 → ongoing. This project deals with further development of an automatic de-icing system comprised of an improved amorphous alloy heating ribbon, controlled by a smart monitoring system. This system is currently applied to lightly-trafficked pavements such as exit ramps, walkways, and parking lots. The intention herein is to broaden the system's usage within the current arena and its applicability to heavily-trafficked pavements such as airport runways and taxiways, bridges, local roads, and intercity highways.

3. AWAPAVE - Development of a high-speed pavement evaluation tool based on modern sensing technologies. Skar, A., Levenberg, E., 01/10/2017 → 01/10/2018. This project deals with building a new moving measurement platform for non-destructive pavement evaluation while traveling at highway speeds. The work includes theoretical advances, numerical implementation, and execution of both forward and inverse analyses. The work are geared towards interpretation of collected data for supporting development decisions (e.g., sensitivity, calibration, sensing) and for generating knowledge of engineering worth.

PhD

4. Deterioration Models for Cement Bound Materials in Structural Design an Evaluation of Heavy Duty Pavements. Skar, A., Poulsen, P. N., Zania, V., Levenberg, E., Chabot, A. & Khazanovich, L. 01/09/2013 → 20/04/2017. Industrial PhD project with the aim to develop a mechanistic approach based on constitutive models for analysis of heavy duty pavements. The work included fracture mechanics, concrete and other cemented materials, development of numerical models, development of engineering tools, cyclic constitutive crack models, finite element analysis, two-parameter soil-structure interaction models

Research and development

5. NordFoU - Validation of Pavement Performance Models (PPM2). Larsen, J., Holst, M. L., Mollerup, M., Baltzer, S., Skar, A. 01/01/2012 → 31/12/2012. Refinement and validation of pavement performance models and software application developed under the NordFoU "Pavement Performance Models" project.

6. NordFoU – Pavement Performance Models. Skar, A., Busch, C., Holst, M. L., Hildebrand, G., Baltzer, S., Mollerup, M., Larsen, J. 01/01/2008 → 31/12/2010. Development of uniform pavement performance models, harmonized data acquisition and common database for the Nordic countries on network level.

7. CG-demonstration section at Høgild, Denmark. Skar, A., Busch, C. 01/09/2009 → 31/12/2010. Evaluation of data on the CG (Cement stabilized Gravel) test section and HMA (High Modulus Asphalt) test section at Høgild.

Selected commercial projects

1. Condition analysis of airport pavements, 2017 → 2018, Pavement Specialist. Condition survey of six military airports for The Norwegian Defence Estates Agency: Visual inspection applying the ASTM D5340 method. Analysis of data in MicroPaver and development of strategic maintenance and rehabilitation solutions.

2. MARS - Conceptual design. 2017 → 2018, part time. Pavement Specialist. Development of operation site at the new port expansion at the Port of Frederikshavn: Design of granular heavy duty pavements for extreme crane crawler loads with maximum lifting capacity of 2,300 ton including optimization of ground improvement and pavement structure.

3. Andøya Airport. 2012 → 2015, part time. Discipline leader pavements/civil works airside. Rehabilitation of airfield pavements for Andøya Airport: Collection of background data, analysis of Falling Weight Deflectometer (FWD) measurements. Pavement inspection, pavement condition evaluation and preparation of rehabilitation and pavement repair solutions for airfield areas (including a project for new de-icing platform).

4. Hazrat Shahjalal International Airport, Bangladesh. 2012 → 2014, part time. Pavement Design Engineer and Specialist. Detailed Reconstruction Design of taxiway pavements on Hazrat Shahjalal International Airport: Pavement condition analysis, design of reconstruction alternatives and quality control during construction.

5. Klaipedos Smelte Container Terminal. 2011 → 2013, part time. Pavement Design Engineer. Development of Klaipedos Smelte Container terminal: Preliminary and detailed design of pavement areas for dynamic loads (from handling equipment) and static loads (from container stacking). Evaluation of pavement types and recommendation with regard practical considerations and materials selection.

6. Helsingør Highway, M14. 2011 → 2014, part time. Pavement Design Engineer. Widening of Helsingør Highway, from 4 to 6 lanes: Visual condition survey, evaluation of existing pavement including Falling Weight Deflectometer (FWD) and Traffic Speed Deflectograph (TSD) measurements. Development of design basis from outline design and new field measurements (geotechnical, geometrical and traffic planning mainly). Detailed design of new pavement structures and reconstruction of existing pavement.

7. Muscat and Salalah International Airport, Oman. 2009 → 2014, part time. Pavement Design Engineer. Development of Muscat (MU) and Salalah (SA) International Airport: Detailed pavement design of runways, taxiways and aprons stands including Heavy Weight Deflectometer (HWD) analysis of existing airfield pavements. Technical support regarding design issues. Review of contractors design for both airside and landside pavements. Re-design of concrete pavements.