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## Uddannelse

April 2011 Ph.D. in Robotics at The Maersk Mc-Kinney Moller Institute
University of Southern Denmark, Odense, DK
Roblood – Automatic blood sampling

February 2010 Visiting Scholar at LCSR/VISR lab
Johns Hopkins University, Baltimore, MD, USA
Multimodal image fusion for surgical robotics

June 2007 M.Sc.Eng. Computer System Engineering
University of Southern Denmark, Odense, DK
Specialized in medical imaging and image analysis
Thesis: Automatic detection and parametrizing of blood veins by computer vision.

## Ansættelser

2020 - currentlyProfessor at The Maersk Mc-Kinney Moller Institute
University of Southern DenmarkOdense, DK
•Medical Robotics

2014 - 2019Associate Professor at The Maersk Mc-Kinney Moller Institute
University of Southern DenmarkOdense, DK
•Medical Robotics

2011-2014Assistant Professor at The Maersk Mc-Kinney Moller Institute
University of Southern Denmark Odense, DK
•Medical Robotics, Realtime vision

2010Medical Vision Engineer
Intuitive Surgical Inc. Sunnyvale, CA, USA
•Multimodal image fusion and navigation for surgical robotics

## Projects

2020 – 2021 AI-pathology: National project, Workpackage leader
2019 – 2019 Collaborative Robots: National project, Project leader
2018 – 2021 AIID: National project, Project leader
2017 – 2020 ROPCA Ultrasound: National project, Project leader
2015 – 2018 ReconCell: EU project, Workpackage leader, Co-PI
2014 - 2018 ROSOR: National project, Workpackage leader
2011 - 2014 IntellAct: EU project, Technical coordinator

## Priser

**Information's Ph.D.-Cup 2011**
Savarimuthu, Thiusius Rajeeth (Modtager), 14. maj 2012

## Publikationer

**Smart hardware integration with advanced robot programming technologies for efficient reconfiguration of robot workcells**
Gašpar, T., Deniša, M., Radanovič, P., Ridge, B., Savarimuthu, T. R., Kramberger, A., Priggemeyer, M., Roßmann, J., Wörgötter, F., Ivanovska, T., Parizi, S., Gosar, Ž., Kovač, I. & Ude, A., dec. 2020, I : Robotics and Computer-Integrated Manufacturing. 66, 17 s., 101979.

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**Comparing Objective Functions for Segmentation and Detection of Microaneurysms in Retinal Images**
Andersen, J. K. H., Grauslund, J. & Savarimuthu, T. R., 2020, I : Proceedings of Machine Learning Research.

**Combined Optimization of Gripper Finger Design and Pose Estimation Processes for Advanced Industrial Assembly**
Hagelskjær, F., Kramberger, A., Wolniakowski, A., Savarimuthu, T. R. & Krüger, N., nov. 2019, *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).* IEEE, s. 2022-2029 (I E E E International Conference on Intelligent Robots and Systems. Proceedings).

**Microaneurysm detection in retinal fundus images using deep convolutional U-net with focal loss objective function**
Andersen, J. H., Grauslund, J. & Savarimuthu, T. R., 1. jul. 2019, I : Investigative Ophthalmology & Visual Science. 60, 9, 1520.

**Surgeons' muscle load during robotic-assisted laparoscopy performed with a regular office chair and the preferred of two ergonomic chairs: A pilot study**
Dalager, T., Jensen, P. T., Winther, T. S., Savarimuthu, T. R., Markauskas, A., Mogensen, O. & Søgaard, K., 1. jul. 2019, I : Applied Ergonomics. 78, s. 286-292

**Robotically assisted electrical bio-impedance measurements for soft tissue characterization: a feasibility study**
Schwaner, K. L., Dall'Alba, D., Cheng, Z., Mattos, L. S., Fiorini, P. & Savarimuthu, T. R., 24. jun. 2019, *Proceedings of the 12th Hamlyn Symposium on Medical Robotics 2019.* Deligianni, F., Dagnino, G. & Yang, G-Z. (red.). London: The Hamlyn Centre, s. 31-32 (Hamlyn Symposium on Medical Robotics).

**Neural networks for automated scoring of joint disease activity on doppler ultrasound images**
Andersen, J. K. H., Skyttegaard Pedersen, J., Sundahl Laursen, M., Holtz, K., Grauslund, J., Savarimuthu, T. R. & Just, S. A., 15. jun. 2019.

**Microaneurysm detection in retinal fundus images using deep convolutional U-net with focal loss objective function.**
Andersen, J. K. H., Grauslund, J. & Savarimuthu, T. R., 29. apr. 2019.

**Deep Learning–Based Algorithms in Screening of Diabetic Retinopathy: A Systematic Review of Diagnostic Performance**
Nielsen, K. B., Lautrup, M. L., Andersen, J. K. H., Savarimuthu, T. R. & Grauslund, J., apr. 2019, I : Ophthalmology Retina. 3, 4, s. 294-304

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**Finger joint detection vision algorithm for autonomous rheumatoid ultrasound scan**
Iversen, N., Just, S. A. & Savarimuthu, T. R., 2019, *Advances in Service and Industrial Robotics: Proceedings of the 27th International Conference on Robotics in Alpe-Adria Danube Region (RAAD 2018).* Aspragathos, N. A., Koustoumpardis, P. N. & Moulianitis, V. C. (red.). Springer, s. 538-550 (Mechanisms and Machine Science, Bind 67).

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Iturrate, I., Roberge, E., Ostergaard, E. H., Duchaine, V. & Savarimuthu, T. R., 2019, *2019 IEEE 15th International Conference on Automation Science and Engineering, CASE 2019.* IEEE, s. 553-560 (IEEE International Conference on

Automation Science and Engineering, Bind 2019-August).

### Towards Reversible Dynamic Movement Primitives
Juan, I. I. S., Sloth, C., Kramberger, A., Petersen, H. G., Østergård, E. H. & Savarimuthu, T. R., 2019, *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).* IEEE, s. 5063-5070 8968270. (I E E E International Conference on Intelligent Robots and Systems. Proceedings).

### Using spatial constraints for fast set-up of precise pose estimation in an industrial setting
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### PROGRAMMING A ROBOT BY DEMONSTRATION
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### Efficient Evaluation and Optimization of Automated Gripper Finger Design for Industrial Robotic Applications
Kapilavai, A., Wolniakowski, A., Jorgensen, T. B., Lindvig, A. P., Savarimuthu, T. R. & Kruger, N., 8. okt. 2018, *Proceedings of the 23rd International Conference on Methods and Models in Automation and Robotics, MMAR 2018.* IEEE, s. 709-714

### Using Fully Convolutional Networks For Semantic Segmentation of Diabetic Retinopathy Lesions in Retinal Images
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### Fully Convolutional Neural Networks for Automatic Extraction of Diabetic Retinopathy Features in Retinal Fundus Images
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### Teaching a Robot the Semantics of Assembly Tasks
Savarimuthu, T. R., Buch, A. G., Schlette, C., Wantia, N., Roßmann, J., Martinez, D., Alenya, G., Torras, C., Ude, A., Nemec, B., Kramberger, A., Worgotter, F., Aksoy, E. E., Papon, J., Haller, S., Piater, J. & Kruger, N., 1. maj 2018, I : IEEE Transactions on Systems, Man, and Cybernetics: Systems. 48, 5, s. 670-692

### Fully Convolutional Neural Networks for Automatic Extraction of Diabetic Retinopathy Features in Retinal Fundus Images
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### Design and implementation of a wireless instrument adapter
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### Simulation-based optimization of camera placement in the context of industrial pose estimation
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### Increasing precision of the Raven-II surgical robot by applying cascade control
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### Kunstig intelligens og screening af diabetisk retinopati
Andersen, J. K. H., Savarimuthu, T. R. & Grauslund, J., 2018, I : Oftalmolog. 38, 4, s. 9-11 3 s.

### Movements of the camera during robotic assisted and handheld laparoscopy
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**Surgeons' muscular load during robotic-assisted laparoscopy and the effect of an ergonomic chair**
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**Movements of the camera during robotic assisted and handheld laparoscopy**
Kjer, J. J., Munk, T., Jensen, P. T., Vaarning, C., Xie, Z. & Savarimuthu, T. R., 19. maj 2017. 1 s.

**Individualised and adaptive upper limb rehabilitation with industrial robot using dynamic movement primitives**
Nielsen, J., Sørensen, A. S., Christensen, T. S., Savarimuthu, T. R. & Kulvicius, T., 2017. 4 s.

**Learning and Correcting Robot Trajectory Keypoints from a Single Demonstration**
Iturrate, I., Østergaard, E. H., Rytter, M. & Savarimuthu, T. R., 2017, *Proceedings of the 3rd International Conference on Control, Automation and Robotics.* IEEE, s. 52-59

**Optical coherence tomography based 1D to 6D eye-in-hand calibration**
Antoni, S. T., Otte, C., Savarimuthu, T. R., Rajput, O. & Schlaefer, A., 2017, *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems.* IEEE, s. 5886-5891 8206481

**Multimodal Feedback in Human-Robot Interaction: An HCI-Informed Comparison of Feedback Modalities**
aus der Wieschen, M. V., Fischer, K., Kuklinski, K., Jensen, L. C. & Savarimuthu, T. R., 29. jun. 2016, *Handbook of Research on Human-Computer Interfaces, Developments, and Applications.* Rodrigues, J., Cardoso, P., Monteiro, J. & Figueiredo, M. (red.). IGI global, s. 135-161 27 s. (Advances in Human and Social Aspects of Technology).

**A Comparison of Types of Robot Control for Programming by Demonstration**
Fischer, K., Kirstein, F., Jensen, L. C., Krüger, N., Kuklinski, K., aus der Wieschen, M. V. & Savarimuthu, T. R., 2016, *Proceedings of the 11th ACM/IEEE International Conference on Human-Robot Interaction.* Bartneck, C., Nagai, Y., Paiva, A. & Šabanović, S. (red.). New Jersey, USA: IEEE Press, s. 213-220

**Industrial Assembly Cases**
Ellekilde, L-P., Buch, J. P., Iversen, T. M., Laursen, J. S., Mathiesen, S., Sørensen, L. C., Kraft, D., Savarimuthu, T. R., Petersen, H. G., Chrysostomou, D., Hansson, M. & Schou, C., 2016, Syddansk Universitet. Mærsk Mc-Kinney Møller Instituttet. 22 s. (Technical Reports - Maersk Mc-Kinney Moller Institute, University of Southern Denmark; Nr. 1).

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**Device for dynamic switching of robot control points**
Savarimuthu, T. R., Sølvason, D., Kuklinski, K., Krüger, N., Fischer, K., aus der Wieschen, M. V., Kirstein, F. & Marhenke, I., 25. jun. 2015, Patentnr. WO2014DK50412, 3. dec. 2014, Prioritetsdato 17. dec. 2013, Prioritetsnr. DK20130070783

**A novel tele-operation device allowing for dynamic switching between control points during learning from demonstration**
Kuklinski, K., Savarimuthu, T. R., Fischer, K., Beck, R., Krüger, N., Miatliuk, K., Kirstein, F., Marhenke, I., aus der Wieschen, M. V. & Sølvason, D., 2015, *Proceedings of the 10th International Workshop on Robot Motion and Control.* IEEE, s. 314-318

**Adaptation of manipulation skills in physical contact with the environment to reference force profiles**
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**An online vision system for understanding complex assembly tasks**
Savarimuthu, T. R., Papon, J., Buch, A. G., Aksoy, E. E., Mustafa, W., Wörgötter, F. & Krüger, N., 2015, *Proceedings of the 10th International Conference on Computer Vision Theory and Applications.* Braz, J., Battiato, S. & Imai, F. (red.). Institute for Systems and Technologies of Information, Control and Communication, Bind 3. s. 454-461

### Teach it Yourself - Fast Modeling of Industrial Objects for 6D Pose Estimation
Thomas, S., Savarimuthu, T. R., Buch, A. G., Beck, A. B., Krüger, N. & Aanaes, H., 2015, *Computer Vision Systems: 10th International Conference, ICVS 2015, Copenhagen, Denmark, July 6-9, 2015, Proceedings.* Nalpantidis et al., L. (red.). Springer, s. 289-302 (Lecture Notes in Computer Science, Bind 9163).

### Technologies for the Fast Set-Up of Automated Assembly Processes
Krüger, N., Ude, A., Petersen, H. G., Nemec, B., Ellekilde, L-P., Savarimuthu, T. R., Jørgensen, J. A., Fischer, K., Buch, A. G., Kraft, D., Mustafa, W., Aksoy, E. E., Papon, J., Kramberger, A. & Worgotter, F., nov. 2014, I : Kuenstliche Intelligenz. 28, 4, s. 305-313

### Manipulation monitoring and robot intervention in complex manipulation sequences
Savarimuthu, T. R., Buch, A. G., Yang, Y., Mustafa, W., Haller, S., Papon, J., Martínez, D. & Aksoy, E. E., 13. jul. 2014. 2 s.

### A new benchmark for pose estimation with ground truth from virtual reality
Schlette, C., Buch, A. G., Aksoy, E. E., Steil, T., Papon, J., Savarimuthu, T. R., Wörgötter, F., Krüger, N. & Roßmann, J., 2014, I : Production Engineering - Research and Development. 8, 6, s. 745-754

### Detection of needle insertion point for phlebotomy in human forearms
Savarimuthu, T. R. & Sørensen, A. S., 2014, I : International Journal of Mechanics and Control. 15, 1, s. 61-66

### Enhanced 3D face processing using an active vision system
Lidegaard, M., Larsen, R., Kraft, D., Jessen, J. B., Beck, R., Savarimuthu, T. R., Gramkow, C., Neckelmann, O., Haustad, J. & Krüger, N., 2014, *Proceedings of the 9th International Conference on Computer Vision Theory and Applications.* Battiato, S. (red.). SCITEPRESS Digital Library, Bind 3. s. 466-473

### Fast programming of peg-in-hole actions by human demonstration
Yang, Y., Lin, L., Song, Y. T., Nemec, B., Ude, A., Buch, A. G., Krüger, N. & Savarimuthu, T. R., 2014, *Proceedings of the 2014 International Conference on Mechatronics and Control (ICMC).* IEEE, s. 990-995

### Peg-In-Hole Assembly under Uncertain Pose Estimation
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### Reasons for singularity in robot teleoperation
Marhenke, I., Fischer, K. & Savarimuthu, T. R., 2014, *HRI '14 Proceedings of the 2014 ACM/IEEE international conference on Human-robot interaction.* IEEE Press, s. 242-243 2 s.

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